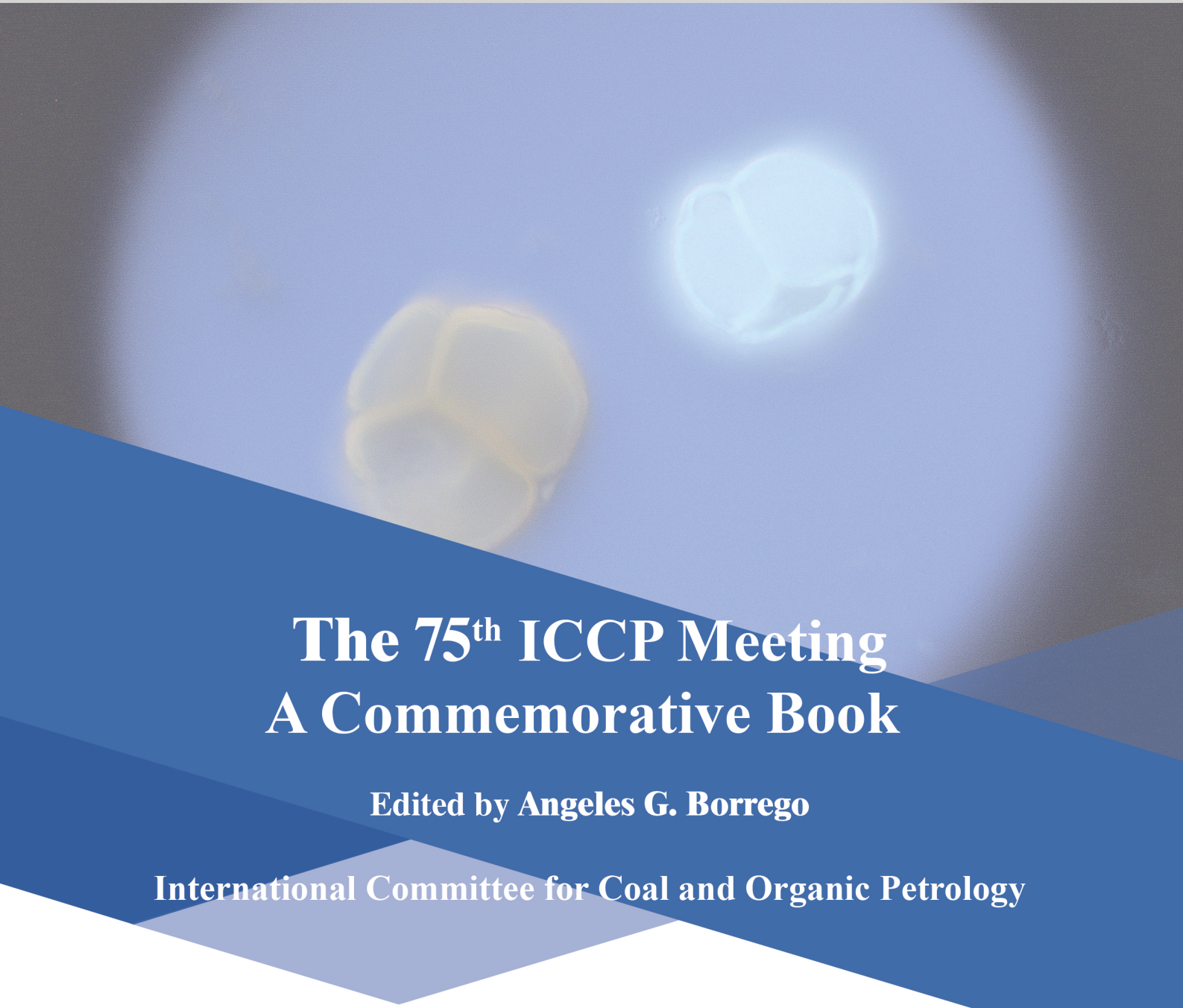
75 ICCP Meeting

22-28 September 2024
Oviedo, Spain



The 75th ICCP Meeting
A Commemorative Book

Edited by Angeles G. Borrego

International Committee for Coal and Organic Petrology

Instituto de Ciencia y Tecnología del Carbono (INCAR-CSIC) · Oviedo Spain

INCAR CSIC Consejo Superior de Investigaciones Científicas DELEGACIÓN EN ASTURIAS

ICCP Meeting
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A Commemorative Book

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PREFACE FROM THE EDITOR OF THE 50th ICCP MEETING COMMEMORATIVE VOLUME

Manuel J. Lemos de Sousa [1,2,3]

[1] Academy of Sciences of Lisbon, Lisboa, Portugal;
[2] I3ID - University Fernando Pessoa, Porto, Portugal;
[3] MARE – Marine and Environment Science Centre - URI Coimbra, Portugal.

There is now international consensus in the fields of history, philosophy, and methodology of the sciences that a given scientific domain, or one of its branches, should be considered independent once it has obtained its own body of doctrine and research methods. It is also considered essential that the doctrinal set in question be recorded in a book considered to be its basis.

In this context, it can therefore be rightly considered that, what we now call Organic Petrology has as its founding book Erick *Stach's Lehrbuckh der Kolenpetrographie,* published in 1935. In fact, this was the manual that succeeded in making the first synthesis of the knowledge and doctrine of this field, independently of the remarkable previous contributions by illustrious pioneers, such as H. Potonié, M. Stopes, etc. The base rock studied in this scientific discipline was, at the time, of course, only coal.

Especially due to the development in the utilization of this solid fuel in industry, mainly steelmaking at the time, through the production of metallurgical coke, there was a need to study, in detail, its petrographic constitution in order to standardize, at an international level, not only the terminology of the constituents, but also the methods of analysis to be used. Thus, was born the International Committee for Coal Petrology - ICCP which, as we know, had its first meeting in 1953 (Geleen, The Netherlands). The work developed, and the results obtained over the years, were outstanding and are translated into the volumes of the *International Handbook of Coal Petrology* (1st edition, including only the first contributions by the "Nomenclature Commission", 2nd edition in 1963 and respective 1971, 1975 and 1993 supplements). These studies would lead to the current set of works that is now jointly referred as the ICCP System 1994, and the ISO 7404 standard series (Parts 1-5).

Such progress was successively recorded in new reference books, in the various editions of *Stach's Textbook of Coal Petrology* (2nd edition - 1975 and 3rd edition - 1982) and also in the successive editions of van Krevelen's Coal (1st edition in 1961, 2nd edition in 1981 and 3rd edition in 1993).

Meanwhile, on the one hand, in 1950 and 1963 van Krevelen had published the modern studies on Coal Geochemistry, namely through the now renowned van Krevelen Diagram and, on the other hand, in the 2nd edition (1975) of *Stach's Textbook of Coal Petrology*, giving attention to the genetic characteristics and maturation of all fossil organic matter in sedimentary basins, highlighting new concepts, such as kerogen, bitumen and Dispersed Organic Matter (DOM), and the potential of applying such concepts to other rocks and organic products (oil shales, source-rocks, oil and associated natural gas, coalbed methane, etc.) and to the study of the respective reservoirs.

For us, this represents the true birth of modern Organic Geochemistry, whose reference synthesis book would become, shortly after, the 1st edition (1978) of Tissot and Welte's *Petroleum Formation and Occurrence.*

Otherwise unavoidable, such evolution (perhaps even, revolution) had consequences, it became necessary to also standardize the terminology and petrographic nomenclature, and the methods of analysis of these new entities, thus opening new fields of study within the ICCP, now rather frequently linked with the methods of Organic Geochemistry.

As the technologies for the use of coal evolved (combustion, hydrogenation and liquefaction, etc.) so did new areas of research, including the study of mixtures and blends of coals of different qualities, and studies of residues resulting from different technological processes, such as the petrography of char.

Such developments meant the reorganization of the ICCP into the three Commissions that currently comprise it, and the reformulation of its original designation, becoming known as the International Committee for Coal and Organic Petrology, whilst retaining the acronym ICCP.

Keeping in mind that the starting point was the petrological and geochemical study of coal, successively extended to all other rocks and organic products and even to their derivatives, a new reality was eventually reached, with its own body of doctrine and study methods, which is called Organic Petrology, englobing the genesis and evolution (maturation) of all fossil organic matter contained in the sedimentary basins, which has as its new reference book, the treatise *Organic Petrology* by Taylor et al., published in 1998, which, in our opinion, is, in fact, an embodiment especially evident in the van Krevelen diagrams, modified van Krevelen (also called pseudo-van Krevelen, this making the link with geochemical parameters) and Karweil diagram. In fact, the latter, first proposed in 1956 and successively improved by, among others, Hacquebard, Teichmüller, Bostick and Alpern, constitutes the complement, in terms of thermodynamics, capable of explaining the geochemical evolution evident in van Krevelen's diagrams.

What is herewith recorded constitutes, in our opinion, the essence of the history of the ICCP and the framing of its activities in the current unified scientific domain of Petrology and Organic Geochemistry. The important activities of this scientific organization are clearly evidenced by developments and achievements acquired in the organization of its meetings, which, in 2024, number 75.

When I organised the 50th ICCP Meeting in Porto in 1998, I was at the time President of the ICCP and therefore motivated to publish a special volume to mark the occasion. To prepare such book I invited the ICCP Honorary Members, Thiessen Medallists and Past-presidents to contribute with papers reflecting their main recollections and concerns about the ICCP past, present and future, as well as, their own experience in actively participating in the ICCP during so many years. The invitation was also extended to some long-standing prominent members who played an important role in the implementation of the ICCP work program during the first five decades. As a result, the 50th ICCP Meeting Commemorative volume was produced with contributions from many members who were living history of the organization at that time, surpassing original expectations. In that volume a wide variety of texts were included comprising personal recollections, history of activities in different countries, synthesis based on archived documents, all contributed to the value of the publication and enhancing the prestige of the ICCP.

When I received the invitation from the Chair of the 75th Meeting to participate in this volume, celebrating this occasion, I thought that many of the topics were already covered in the first Commemorative volume, and that it might be difficult to retain the interest in a new volume. I regret that we have lost many of the contributors to the 50th Commemorative volume in the last 25 years, although many of the concerns they expressed remain valid. It is also sad to see that we do not have a contribution from Belgium or France, countries that were key to the development of the ICCP, and from which there are no members left in 2024.

The 1st Commemorative volume had such review papers as those on applied brown coal petrology by Jacob and on coal classification by Alpern, Pinheiro and myself, and many individual contributions with reflections and reminiscences of earlier times, with projections to the future (Taylor, Smith, Cameron, Davis, Cook, Alpern, Prado and Teichmüller). This first volume also had a contribution from Japan (Aihara) highlighting the coal petrological activities in the country and which may have served as inspiration for the conception of the actual volume, very much centred on the regional contributions to the ICCP.

Some sections that were present in the first volume have been updated to account for the developments that took place since, and an attempt was made to retain all countries with membership representation. In fact, the bulk of the progress made over the past 25 years within the ICCP, both at international level, such as the very important Accreditation and Training Programmes, and the developments within the different countries, are thus once again recorded in this volume organized by Dr. Borrego, whom we congratulate for the initiative.

Having reached this far, and let us face it, with tangible success, the only way forward is to continue with the mission for which the ICCP was created, that is, to focus on the development and establishment of standardized terminologies, nomenclatures, and methods of analysis in the field of Petrology and Organic Geochemistry. In fact, with 71 years of experience and having promoted 75 meetings, through times when, whether we like it or not, and despite several false messages being propagated in context with energy in transition, the fact remains that fossil fuels will still be, for decades, the major component of primary energy, petrochemical and metallurgy systems. Its study by experts, adding to the required progress in technologies, including those assisting with mitigating the impact of its use on the environment, is essential and, consequently, will also contribute to the application of the true concept of sustainability, as *expressed in the United Nations Brundtland Report,*

Porto, July 2024.

PRESIDENTIAL ADDRESS

Stavros Kalaitzidis

ICCP President, Department of Geology. University of Patras, Greece.

The herein Commemorative Issue of the 75th ICCP Meeting is a marvelous initiative by our this-year host in Spain and previous ICCP President Dr. Ángeles Gómez Borrego. I would like to sincerely acknowledge her efforts compiling such a demanding Memoir, which attempts briefly covering the achievements in the Organic Petrology discipline during the last seven decades.

The overwhelming contributions by ICCP Members from 38 counties in all the continents, demonstrate the internationalized resonance of our Committee and its dynamic future potential despite the progressing decarbonization.

In a personal note I feel extremely lucky having been introduced to ICCP some 25 years ago during the 51st Meeting in Bucharest; since then my professional carrier and my social life have been enriched by the interaction with many of you, as well as with beloved colleagues no longer being among us.

The ICCP in its 71-year history has accomplished establishing and promoting Organic Petrology as a vigorous scientific field, engaging various and sometimes seemingly heterogenous disciplines, in improving our knowledge, and hence, of society's well-being. In its infancy ICCP standardized coal optical features, whereas as the decades passed, the objectives broadened through expansion into the fields of hydrocarbon geology, industrial applications and products, as well as environmental studies. This diversified scope strengthened our ability to operate in a flexible manner, to expand and, of course, to increase our visibility in a global context.

These attributes of our Membership are exactly the ones required to drive ICCP through the nowadays challenging environment in both Academia and Industry by engaging Organic Petrology in the continuously evolving Science and Technology.

I am confident that the collective historical memory of the ICCP inscribed within this Issue, will serve both as a reminder of what has been achieved up to now and more importantly, as an inspiration to our young members to follow up on the legacy of the ICCP founders and overall the ICCP family.

PREFACE FROM THE EDITOR

Angeles G. Borrego

Instituto de Ciencia y Tecnología del Carbono (INCAR-CSIC)
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As a quite long-standing member of the ICCP (I celebrated last year 30 years of membership) I always wished to host the ICCP friends at home. Although I have participated in the organizing committee of the previous 1994 and 2008 meetings held in Oviedo, more senior members were in charge of the organization at that time. During my term as President (2016-2023), I thought on a number of occasions to issue an invitation to come back to Oviedo, but there was always other invitations and I didn't want to compete with them. When the invitation to go to Freiberg in 2024 had to be withdrawn due to changes in the university department organizing the event, an opportunity opened for me. There were meetings scheduled for 2023 and 2025 and a new venue had to be offered for 2024 in a relatively short time frame. I offered the venue of the Institutional Delegation of CSIC in Asturias, which is the building of the Chamber of Commerce of the town, and it was accepted by Council and proposed to the General Assembly. My previous position as CSIC Institutional Delegate for three years facilitated all the process with such an urgency. It was only last year, at the meeting in Patras when I realized that the one in Oviedo would be the 75th Meeting. What a nice occasion to celebrate!!.

When General Secretary and President, I very often made use of the 50th ICCP Meeting Commemorative Volume that Manuel Lemos de Sousa edited on the occasion of the meeting organized in 1998 in Porto. When some reminiscences of the early times were needed or some events needed to be put into context, this book was extremely useful. I would like to thank Manuel for this contribution which compiled many documents whose sources are in the archives but in a form that is not always very easy to find. In addition, the contributions were colourfully embellished by the members who kept alive their memories, giving the volume a warm and charismatic flavour. I thought that the 75th Meeting in 2024 would be a nice occasion again to prepare a Commemorative Volume and here we are. You have in your hands the product of this generous and collective effort. Thank you very much!!

The book will necessarily have a very different orientation than the previous one since the 25 years lapsed between the two books have taken a toll on the early members contributing to the first book. We do not have any more with us the founder members authoring contributions: Marlies Teichmüller (†2000), Boris Alpern (†2014) and A. Harold V. Smith (†2023). I was trying to contact Harold to participate in this volume when I found out about his passing. His son Graham Smith let us know how proud and fond he was of his ICCP membership and activities. Some of the Thiessen Medallists who also contributed to the 50th volume as Alex R. Cameron (†2000), Alan C. Cook (†2010), Helmut Jacob (†2014), Geoffrey H. Taylor (†2017), Javier G. Prado (†2020), and some others who have been key in the development of the ICCP such as Duncan G. Murchison (†2013), Monika Wolf (†2022) and Walter Pickel (†2022) are no longer with us. It has been a privilege for me to meet most of them and share with them the spirit of the early times of the ICCP.

Fortunately, we still have some authors out of those who built up the first volume who are active and willing to contribute to this one such as the past-Presidents, Honorary Members, and Thiessen Medallists Alan Davis and Manuel Lemos de Sousa and also Ricky Pinheiro. I really appreciate these contributions which help to build bridges between the previous anniversary and this one. Many members have incorporated to this volume: some of them have responsibilities in Council as Stavros Kalaitzidis, Paul C. Hackley, Nikki Wagner, Peter Crosdale, Dragana Zivotic Jolanta Kus, Georgios Siavalas and Sandra Rodrigues, and have enthusiastically welcomed this proposal. Some others as Magda Misz-Kennan, Maria Mastalerz, Deolinda Flores, Lopo Vasconcelos and Petra David have had responsibilities in the implementation of some of the most successful programs of the ICCP and in the subcommittees that support the action of the organization. But I am particularly grateful, to the individual members, many of them recently incorporated to the organization who have accepted the challenge of writing about the ICCP in their countries contributing to construct this piece of collective memory.

When I planned this volume, I was thinking in having a section of questions still open in which the ICCP has been working over the years. I identified two: standardization of fluorescence and rotating stage versus rotating polarizer for anisotropy measurements. One of them is a reality thanks to Jolanta Kus and Paul Hackley. Two unplanned contributions came from our Canadian colleagues one about bitumen nomenclature and relevance for rock maturity assessment and the other about graptolite reflectance as a tool for thermal maturity assessment. For the former the ICCP has and active WG on Identification of Thermal Maturity Relevant Organic Matter (Convener Paul Hackley) and for the later two WGs: Geological Application of Graptolite Reflectance (in Commission II) and Classification and Terminology of Zooclasts in old sediments (in Commission I) both convened by Xiaowei Zheng and Thomas Gentzis.

The contributions by country are asymmetric. It couldn't be different considering that we have countries with over 30 members and countries with just one member and also countries involved in the ICCP since the first meeting in Geleen in 1953 and others with one-year permanence. But it is very nice that one another have committed themselves to the success of this target. I have contacted you many times in the last six months, especially if you were not promptly reacting and I apologize if I became too insistent. But seeing the wide participation you have to accept that it was worth to do so. One never manages to have a complete collection but having in this book over 70 % of the countries and over 90 % of the membership represented, we must admit that it has been a success. I would like to thank particularly those who have taken the challenge of writing about countries with many members from various institutions: Atul Varma (India), Petra David and Angelika Vieth (Germany), Magdalena Misz-Kennan (Poland), Peter Crosdale (Australia), Alan Davis (USA), João Graciano Mendonça Filho (Brazil) because of the extra effort of having to summarize all these contributions. And also, those who wrote about countries which have been key in the development of the ICCP and have now a days very few members such as United Kingdom (Edward Lester), The Netherlands (Georgios Siavalas and Petra David), Bulgaria (Alex Zdravkov) because of an early shut down of coal industry or other circumstances. I am responsible for the long list of references in Bulgarian from Bulgaria, because Alex asked me and I wanted to keep them in this beautiful Cyrillic alphabet to pay a tribute to the early times in which the ICCP was truly multilingual, as highlighted by many of the authors of the 50th Commemorative volume. Unfortunately, I could not manage to have all the countries represented but I think we have reasons to see the glass half full. I am happy with the contributions of Latin-American countries. They actively contribute to various working groups and although their members do not attend regularly the meetings, they are here represented. I have ordered the contributions from countries alphabetically. This has been a conscious decision to increase the mixture between countries as it effectively occurs in the ICCP activities.

The membership is a living organism and is continuously changing. This causes that countries which were very relevant for the origin and evolution of the ICCP such as France and Belgium have since 2024 no more active members and therefore no contribution to this volume. They remain alive in the memory of those who had contact with their members and one can still see them in some of the photos which illustrate this volume.

Some overlapping is unavoidable in such a collective volume, although in my view it is more complementary information than overlapping. Let me give you a couple of examples: the legendary photo at the stairs of the Centraal Laboratorium in Geleen in 1953 taken during the first founding meeting is present in two chapters: the German one and the Indian one; the photo of the first ICCP Training course given in Potsdam is also present in two chapters. Is this overlapping or better a reflection of the relevance of a given event in the collective memory of the contributors? I guess is the second option.

Another aspect that I would like to remark is the high mobility of the ICCP members. Alan Davis is vindicated as British, Australian and American having worked in organic petrology in all these countries. This is not an exception, high flux between Europe and Australia, United States and Africa, and within European countries is derived from the contributions in this book, strengthening the relationships between the ICCP family.

In this period in which equality and balance are taken into account we learn from the General Secretary that ICCP membership is very well gender-balanced as it is also the Council (6 ladies/5 gents). The figures from the gallery of presidents are not bad at all, if one thinks in the time span covered (1953-2024): 4 ladies/9 gents in 71 years. It took eighty years to have the first lady in the presidency of the Spanish National Research Council (CSIC), by the way an ICCP member (Rosa Menéndez).

I would like to make a special mention to Deolinda Flores as Archives Keeper. The production of a volume like this one has resulted in many requests to the archives in the University of Porto that have been always

attended to. Thanks a lot for the support!. I have frequently asked for advice to Petra David and Peter Crosdale, thank you friends!! Some of the updated general information about meetings, records of honorary members, ICCP Presidents and statutes have been prepared using as main source the ICCP Newsletter and the 50th Commemorative volume, I apologize for any imprecision.

The ICCP faces threats and challenges with many countries phasing out fossil fuels and research departments and universities having to re-direct the research topics. Luckily, organic petrology is a versatile discipline with multiple applications and therefore an optimistic forecast can be made. To end this preface, I would like to thank each of you contributing to this volume for your effort and generosity, and I am very sure that this volume will be for many of you as useful as it was the first 50th Commemorative volume for me. We will make a pdf version available in the webpage for wider distribution. Remember, this meeting is our 75th Meeting. We have something to celebrate in Oviedo. Enjoy a friendly town. Long life to the ICCP!! We meet again in the centenary!!

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Chapter 1

INTRODUCTION

THE INTERNATIONAL COMMITTEE FOR COAL AND ORGANIC PETROLOGY-ICCP

As stated in the ICCP statutes **(Annex 1; https://www.iccop.org/about/statutes/),** the Association shall be called the International Committee for Coal and Organic Petrology (ICCP), founded as International Committee for Coal Petrology.

The Association shall be a non-profit making body. Its objects shall be:

- to secure the continuing international exchange of scientific information relating directly or indirectly to organic petrology and
- to develop and publish definitive descriptions and methods in furtherance of previous object

The first Meeting took place in Geleen, The Netherlands in June 1953 and this year 2024, the 75th Meeting is celebrated.

The ICCP has not always had the structure we know nowadays. According to Noël (1987) the first Commission within the ICCP was created in 1954, The **Nomenclature Commission** to deal with the harmonization of terminology systems used in the different countries and establish an international generally accepted nomenclature of petrographic terms. In 1957 another Commission was added to deal with the analytical procedures in coal petrology, the **Analysis Commission**. Subsequently, a specific Subcommission was created in 1962 to deal with **Lignite Nomenclature**. This structure was maintained for some years until the publication of the International Handbook of Coal Petrology in 1957 (1st edition), 1963 (2nd edition) and 1971 (1st supplement to the second edition).

The first edition published in 1957, was essentially as a glossary in three languages: German, French and English. The second edition was published in 1963 and consisted on two parts: Part I dealing with revised and updated nomenclature and Part II with methods of analysis. Subsequent additions were published as supplements to the second edition. Three supplements have been published so far: first one in 1971, second one in 1975 and third one in 1993. These publications contained the body of knowledge of the ICCP and are available through the webpage:

ICCP, International handbook of coal petrography. 2nd ed., 1963. ISBN 978-84-617-5821-0
ICCP, International handbook of coal petrography, 1st Suppl to 2nd ed.,1971. ISBN 978-84-617-5822-7
ICCP, International handbook of coal petrography, 2nd Suppl to 2nd ed.,1975. ISBN 978-84-617-5823-4
ICCP, International handbook of coal petrography, 3rd Suppl to 2nd ed.,1993. ISBN 978-84-617-5824-1.

In 1971, the MOD (Matière Organique Dispersée)-group focused on the study of dispersed organic matter in source rocks, relevant for the oil industry was promoted to the Commission level (Commission II) and immediately afterwards a Commission was created to deal with industrial applications of coal petrology, notably coking (Commission III). In 1976, a profound restructure of the ICCP was attained and the tasks of the former Nomenclature and Analysis Commissions were assumed by Commission I and the scope of Commissions II and III were formally defined. According to Teichmüller reminiscences (1998), the first formal meeting of the three Commissions occurred in Oviedo in 1983 with M. Wolf as Chair of Commission I, P. Robert as Chair of Commission II and A. Davis as Chair of Commission III. The three commissions have a changing number of WGs whose detailed description can be found in the webpage.

- **Commission I:** General Coal and Organic Petrology **(https://www.iccop.org/commissions/commission-i/)**
- **Commission II:** Application of Coal and Organic Petrology to Geology, including the Prospecting for Oil and Gas **(https://www.iccop.org/commissions/commission-ii/)**
- **Commission III:** Application of Coal Petrology to Utilization **(https://www.iccop.org/commissions/commission-iii/)**

The strength of the oil industry and the incorporation of organic petrology to oil prospecting lead also to the modification of the name of the ICCP to incorporate organic petrology, although the abbreviation was maintained. The project of revising the handbook has been in progress for many years. The first output of this process has been the revised maceral classification and definitions known as **ICCP System-1994:**

- International Committee for Coal and Organic Petrology, 1998 **The new vitrinite classification (ICCP system 1994).** Fuel 77, 349-358.

- International Committee for Coal and Organic Petrology, 2001. **The new inertinite classification. (ICCP System 1994).** Fuel 80,459-471.
- Sýkorová, I., Pickel, W., Christianis, K., Wolf, M., Taylor, G.H., Flores, D., 2005. **Classification of huminite- ICCP System 1994.** International Journal of Coal Geology 62, 85-106.
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The ICCP publishes regularly a **Newsletter** with three issues per year, which are available through the webpage **(https://www.iccop.org/publications/iccp-news/; see further details in this volume).**

The outgoing reports of the ICCP president, previously published in the journal Fuel are also included in the corresponding Newsletter.

In addition, the WGs are active in the dissemination and publication of results and all this information can be found in the various sections of the ICCP Webpage and in many of the contributions to this book.

The memory of the ICCP is kept with the **Archives** at the University of Porto (see details in this volume).

The finances are handled by the **Honorary Treasurer**, at this moment Joan Esterle in Australia and previously Peter Crosdale (AU), Jane Pearson (CA), Rudolf Schwab (UK), Duncan G. Murchison. The ICCP is indebt with all of them for maintaining the healthy finances of the ICCP and reporting yearly to the General Assembly.

The ICCP recognises the achievements in the field of organic petrology with two highly prestigious awards: The **Reinhardt Thiessen Medal** and the **Organic Petrology Award**. Details about the awards and awardees can be found in a contribution by the chairs of both selection sub-committees.

The ICCP has two relevant programs for pursuing the objectives of the organization: The **Accreditation Program** focused in certifying the ability of an analyst in applying petrographic methods; and the **ICCP Training Program** focused in promoting the nomenclature and procedures of the ICCP in the new generations. The training program has also a travel grant to facilitate the attendance to the courses (Walter Pickel student travel grant). The following sections of this book contain:

i) a description of the main activities and programs of the ICCP,
ii) some questions which are still open after many years of work and in which the ICCP has active WGs: Standardization of Fluorescence measurements, bitumen nomenclature and relevance for rocks maturity and graptolite reflectance as a tool for thermal maturity assessment
iii) the regional distribution of the organization and its impact in the different countries from which the members come from and
iv) the individual reminiscences of the membership.

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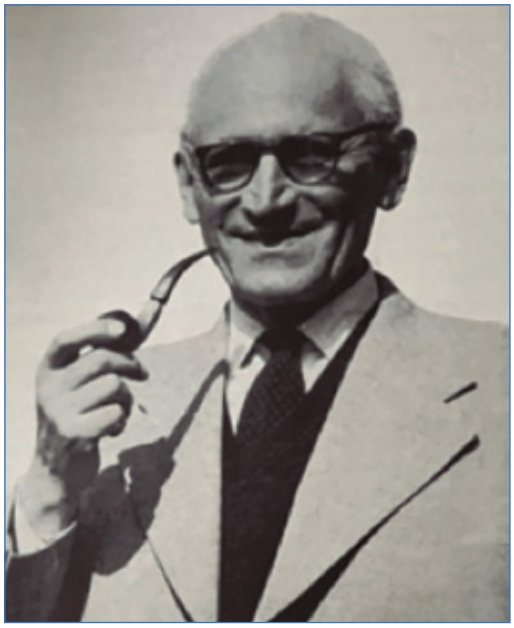
GALLERY OF ICCP PRESIDENTS

Robert Potonié was born in 1889 in Berlin, Germany. He followed studies of geology, chemistry and botany and got the PhD in 1920 after having served in the army during the 1st World War. In 1926 he became full professor at the Technical University in Berlin and few years after started his venture in palynology. After having served in the army again in 2nd World War he became department head of micropaleontology, palynology, coal petrography and paleobotany in Krefeld at the Geological Survey of North-Rhine-Westphalia and Professor at the University of Bonn. R. Potonié lab in Krefeld and Bonn were sought by many students and became a center of palynological exchange in the 1950s and 1960s. He will be remembered as one of the founding fathers of palynology in Germany describing hundreds of new taxa still in use today and revolutionizing how palynotaxonomy and nomenclature were organized. He was awarded with the Reinhardt-Thiessen-Medal of ICCP in 1964.



Robert Potonié
(1953-1960)

Erich Stach was born in Berlin, Germany in 1896. He studied geology, mineralogy and chemistry at the Friedrich Wilhelm University Berlin and passed his doctorate examination in 1923 after returning from the front and incorporated to the Prussian Geological Survey in Berlin where he was involved in mapping projects. At the same time and when the field work was not possible he was working with his typical enthusiasm and tenacity on methodological problems in coal petrology. In 1935 he published the Textbook of Coal Petrology that for tens of years became a reference for aspiring coal petrologists. Erich Stach developed relief- and plane-polishing techniques, he introduced polished grain mounts, coal petrographic analysis techniques, and introduced oil immersion objectives for coal petrology. After a break in the 2nd World War where he served in the air force he was asked to establish and head a coal petrological laboratory within the (now) Geological Survey of North Rhine-Westphalia in Herne, later in Krefeld. In 1964 he was honoured by receiving the Reinhardt-Thiessen-Medal of ICCP which he himself had created in earlier years.



Erich Stach
(1960-1971) **Elected honorary president in 1971*



Raymond Noël
(1971-1975)

Raymond Noël was born in Huy, Belgium and studied botany in the University of Liège where he graduated in 1946 and got the PhD in 1951. From 1947 to 1952 he worked first as associate and then as full staff member in "Fonds National de la Recherche Scientifique" in Belgium. A period in which he was also linked to CNRS and at times to La Sorbonne. Most of its career developed at INICHAR (Institut national des industries charbonnières) later ISSeP where he had various management responsibilities. His achievements include the creation of a coal petrology laboratory, a laboratory for palynologic and palyno-stratigraphic studies, the petrographic characterization of all Belgian coal seams and research into the relationships of petrographic and physico-chemical parameters, extending his interest to source rocks as part of applied petrology. For his contributions in these fields was awarded with the Reinhardt-Thiessen-Medal in 1975. Raymond is remembered by his gracious demeanour at the meetings and his contribution to ICCP was significant hosting five meetings in the early times, serving as General Secretary for two times, chairing various commissions and being the first keeper of the ICCP Archives until 1993.



Marie-Therese Mackowsky
(1975-1979)

Marie-Therese Mackowsky was born in Koblenz, Germany in 1913. Her professional life started in 1940 in Essen when she was employed by the Syndicate for Mining Interests. At the time there existed a Research Department for Raw Materials which thanks to her influence developed into world renowned Coal Petrographic Laboratory of the Bergbau-Forschung GmbH that she directed since 1965. She moved from crystallography and theoretical mineralogy to a more practice-oriented applied mineralogy. She was awarded with the Reinhadt-Thiessen-Medal of ICCP in 1971 for her successful research into applied coal petrology, particularly in the area of maceral analysis, coal pyrolysis, mineral matter in coal and the assessment of coke properties from petrographic coal analyses, as well as in honour of her international reputation as university professor and as scientific expert in her field. She is specifically remembered for her community spirit, and a legendary ability to translate French-English-German at the ICCP Meetings.

Duncan G. Murchison was born 1928 in the UK and graduated in geology from King's College Newcastle in 1953. He then worked as a geologist for the Royal Dutch Shell prior to completing his PhD at the University of Durham. He was appointed as Research Associate in the University of Newcastle in 1958 and from this position promoted to Senior Lecturer and Professor in Geochemistry. He founded the Organic Geochemistry Unit in the Department of Geology (NRG) at Newcastle in 1968, a UK reference center for coal petrology and organic geochemistry and became Dean of the Newcastle upon Tyne Faculty of Science in 1980 and Pro-Vice-Chancellor from 1986 until his retirement. He occupied key positions in Council of the Geological Society of London the Royal Microscopical Society. He published an important body of work on the optical properties of metal oxides, ore minerals, natural and carbonised coal macerals and the impact of igneous intrusions on coal rank and sediment maturity. He carried out pivotal early work in establishing vitrinite reflectance as a front-line tool for assessing coal and sediment thermal history and is considered the father of UK organic petrology for which he was awarded with the Reinhardt-Thiessen-Medal of ICCP in 1987.



Duncan G. Murchison
(1979-1983)

Boris Alpern was born in Paris, France in 1921. He studied at the University of Paris graduating in Natural Sciences in 1945 and obtaining the doctor degree in 1957. He joined afterwards CERCHAR (Centre d'Etudes et Recherches des Charbonnages de France) at Verneuil-en-Halatte, Creil, where he developed an important scientific career as Researcher for 26 years. In 1978 he joined the Research Group on Fossil Fuels at the University of Orléans, France, and was appointed Full Professor at this University in 1981. He worked in virtually all domains of organic petrology and Geochemistry, viz.: nomenclature, methods of analyses, coke making, coke petrography and the role of macerals and microlithotypes in coke formation, combustion, mine outbursts, oil shale valorization and cleat system. His contribution to the UN-ECE Coal classification was crucial. He was awarded with the Reinhardt-Thiessen-Medal of ICCP in 1975.



Boris Alpern
(1983-1987)



Monika Wolf
(1987-1991)

Monika Wolf was born 1932 in Plauen, Germany. She first studied and conducted research at the Technical University of Munich, where she received her doctorate in 1961. Afterwards she incorporated to the Geological Survey of North Rhine-Westphalia in Krefeld until 1981 when she became professor at the Chair of Geology, Geochemistry and Deposits of Petroleum and Coal at the RWTH Aachen until her retirement in 1994. She was a scientist by conviction and enjoyed passing on her great expertise to her students. During her professorship, the laboratory of Aachen became a reference for organic petrology worldwide, training many researchers who later established their own laboratories in several countries. Her research interest focused on the study of lignite and coal petrology and her achievements made her to win the Reinhardt-Thiessen-Medal of ICCP in 1995.



Alan Davis
(1991-1995)

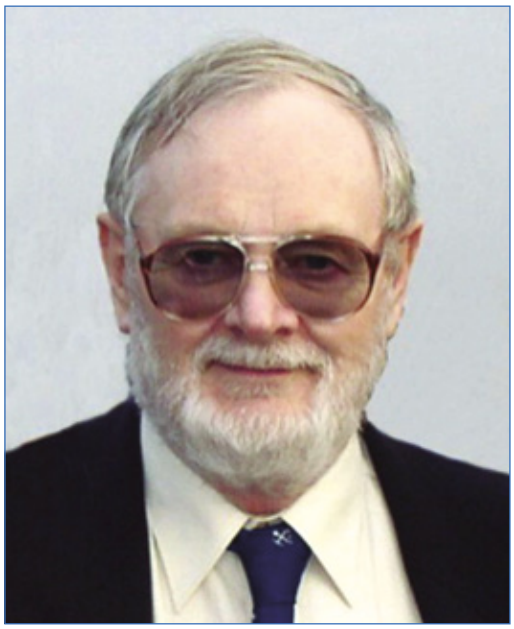
Alan Davis was born in Chester, UK and was educated at Imperial College in London, The Pennsylvania State University and the University of Newcastle-upon-Tyne. Early experience in coal came through working for the National Coal Board's Opencast Executive and its Coal Survey. He was employed with the Geological Survey of Queensland from 1965 to 1973, establishing a Coal Petrological Laboratory. As Professor of Geology at Penn State he served as Director of the Energy and Fuels Research Center and of the Coal and Organic Petrology Laboratories. Davis joined the ICCP in 1965. He served as President of the Commission on Industrial Applications from 1981 to 1988 and General Secretary from 1988 to 1991. He received the Reinhardt Thiessen Medal in 1994 and became an Honorary Member in 2001. In 2023 he was awarded an Honorary Lifetime Membership of The Society for Organic Petrology.

Manuel João Lemos de Sousa was born in 1937 in Porto, Portugal. He Graduated in geology, in the University of Porto in 1965 and doctorate at the same University in 1975 becoming professor in Geology in 1979 and head of the department in 1994. In 2004 he became Professor of the University Fernando Pessoa. His main research contributions have been in the field of Organic Petrology and Geochemistry of conventional (oil/natural gas) and non-conventional reservoirs (coalbed methane), Coal, oil and natural gas prospecting/exploration/modelling; CO_2 geological sequestration, Coal technologies: coking and combustion and Carboniferous and Permian Stratigraphy and Palaeobotany. He is Correspondent member of the Academy of Sciences of Lisbon since 2000, Member of the European Academy of Arts, Sciences and Humanities (Paris) and foreign member of the Royal Academy of Sciences of Madrid. He was awarded with the Reinhardt-Thiessen-Medal of ICCP in 2001.



Manuel João Lemos de Sousa
(1995-1999)

Alan C. Cook was born in Newcastle upon Tyne, UK in 1935. He received his BA at King's College, Cambridge in 1957 and was awarded a PhD and DSc at the University of Cambridge in 1970 and 1990, respectively. After working for the National Coal Board's Opencast Executive in the UK, Alan immigrated to Australia in 1959. His first position there was at CSIRO working on coal and coke petrography, leading to the development of methods for predicting the strength of coke produced from Australian coals. In 1964 Alan transferred to the Wollongong University College (UNSW), eventually founding the Geology Department of which he became Head. In 1973 Professor Cook was appointed to the Foundation Chair of Geology. In 1990 he left the University and continued his petrologic endeavours within his firm Keiraville Konsultants. Cook's research interests covered several examples of the lateral, vertical and temporal variations in coal properties. He was awarded with the Reinhardt-Thiessen-Medal of ICCP in 1996.



Alan C. Cook
(1999-2007)



Petra David
(2007-2015)

Petra David was born in 1960 in Scherfede, Germany. As undergraduate student, she studied Geology at the RWTH Aachen, Germany and the University of British Columbia in Vancouver, Canada. After returning to Germany, she specialized in the field of Coal and Petroleum Geology at LEK (RWTH Aachen) with Monika Wolf as her professor. She graduated in 1988 in geology, and received her PhD degree in 1995. Her research was related to the organic petrology and organic geochemistry of black shales. In 1992 she joined the Geological Survey of the Netherlands in Heerlen and worked with automated image analysis for coal characterization and specialized in basin modeling. After the merge of the Geological Survey with TNO in 1998, she moved to Utrecht, The Netherlands and worked in different positions, related to applied research in the field of organic geochemistry, basin modeling and CO_2 sequestration. From 2011-2021 she was employed as Petroleum Systems Analyst at Wintershall GmbH in Kassel, Germany.



María Ángeles Gómez Borrego
(2015-2023)

Angeles G. Borrego was born in 1964 in Madrid, Spain. She graduated in Geology in 1987 at the Complutense University of Madrid and moved afterwards to INCAR-CSIC to follow a doctorate program in the University of Oviedo where she got the PhD degree in 1992. She worked as postdoctoral researcher at LEK (RWTH Aachen) with a Marie Curie fellowship and returned to INCAR in 1996. Her research has mainly focus on the relationships between organic petrology and geochemistry in organic sediments and the petrographic characteristics of chars and the behavior of macerals upon pyrolysis. She has been Institutional Delegate of CSIC in Asturias (2018-2021), CSIC Vice-president for international affairs (2021-2022), and chair the TGK2 dealing with projects on coal utilization from the RFCS (Research Funds for Coals and Steel) in the framework of the Green Deal since 2009. She got the Organic Petrology Award of the ICCP in 2008.

Stavros Kalaitzidis was born in 1973 in Singen, Germany. He studied Geology at the University of Patras (Greece) and obtained his PhD degree in 2007. As postgraduate student he worked in several research programs at the University of Patras in collaboration with Universities and Institutions in Germany, UK, and The Netherlands, but also for the Hellenic Survey of Geology and Mineral Exploration (HSGME), and the Institute for Solid Fuels Technology and Applications (ISFTA) in Athens. From 2008 to 2014 he served in various positions in the Australian mining industry, initially in the exploration and mining sectors of BHP Billiton, and later as Senior Geologist at Integral Resource Consulting Ltd. based in Brisbane, Queensland. Currently he holds an Associate Professor position in the field of Economic Geology at the University of Patras. His main research interests are related to peat petrology, source rock evaluation, ore modelling and resource estimation, environmental impacts of mining, environmental applications of raw materials including coals, and their industrial wastes. He got the Organic Petrology Award of the ICCP in 2023.



Stavros Kalaitzidis
(2023-)

HONORARY MEMBERS OF THE ICCP

According to the ICCP Statutes Honorary Members shall be those, if any, drawn from the **Full** and **Retired Membership**. Member shall not be liable to pay an annual fee.

The ICCP statutes established the category of Honorary Membership but did not mention what criteria should be considered. Therefore, Council had no independent process for determining who should or should not be an Honorary Member. There were no set of criteria against which to assess an application and or nomination. At the Council Meeting in Gramado (2009), it was decided that a set of criteria should be agreed for considering a member as Honorary Member of the ICCP. The outcome of this discussion was presented to the General Assembly at the Belgrade Meeting, 2010 and approved.

Honorary Membership of the ICCP acknowledges **relevant contributions of ICCP members to the development and progress of the institution** manifested in any or all:

- Attendance to meetings and participation in the working groups.
- Leading activities within the ICCP.
- Relevant and outstanding contributions to the acknowledgement of the Institution by third parties.
- Serving as Officer in the Institution.
- It would normally be expected to be member for 25 years.

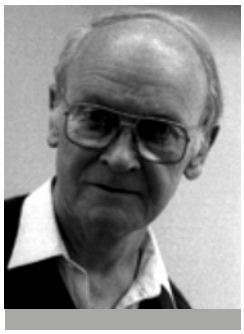
Resolution ICCP10/6/3. Council forwards to the Plenary a new procedure for awarding Honorary membership status based on outstanding contributions to the ICCP over the years. Candidates should be nominated to the ICCP Council, who will rule on the nomination and make their recommendation to the General Assembly.

The ICCP Members who have been awarded with Honorary Membership are listed below.



Erich Stach, Germany. Elected Honorary President in **1971.**
Geological Survey of North Rhine-Westphalia in Herne, later in Krefeld.

President of the ICCP (1960-1971), elected honorary president in 1971. Key in the foundation and establishing the structure of the ICCP and the objectives and structure of the handbook. Chair of the Nomenclature Commission. Hosting the Meetings in Krefeld (14th, 1961 and 24th, 1971).



Geoffrey H. Taylor, Australia, **1983.**
Director of the Centre for Resource and Environ-mental Studies. Professor at the Australian National University & CSIRO, Australia.

Secretary of the Nomenclature Commission (1965-1967). A pioneer of coal petrology in Australia, contributing to understanding the mesophase formation and the acceptance of organic petrology by the coal industry. Translator and co-author of the Stach's textbook on coal petrology (1982) and Editor and author of a widely used Organic petrology textbook (1998).



Marlies Teichmüller, Germany. **~1984.**
Geologische Landesamt Nordrhein-Westfalen in Krefeld, Germany.

Chair of the Nomenclature Commission of the ICCP. Key in establishing the body of knowledge of the ICCP including the classification and definition of macerals Stopes-Heerlen system. Author of organic petrology textbooks (1982, 1998).



Innokentii I. Ammosov, Russia. **~1985.**
Academy of Sciences of the U.S.S.R., Moscow, Russia

Key in establishing the equivalence between Russian nomenclature and reflected light nomenclature used in western Europe. ICCP Handbook. Hosting the 28th ICCP Meeting (Moscow, 1975).



Duncan G. Murchison, UK. **1987.**
Newcastle Research Group (NRG) on Fossil Fuels and Environmental Geochemistry, Newcastle upon Tyne, United Kingdom.

President of the ICCP (1979-1983), General Secretary (1975-1979), Honorary Treasurer (1984-1997). Hosting the 29th ICCP Meeting (Newcastle-upon-Tyne, 1976), made major contributions to both the original glossary publications and their reprinting, key in drafting the statutes.



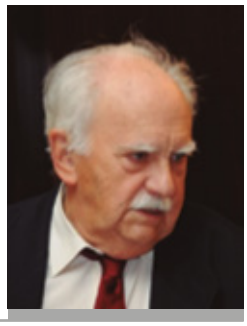
Boris Alpern, France. **1989.**
Research Group on Fossil Fuels at the University of Orléans, France.

Founder member of the ICCP and President (1983-1987), Chair of Commission II. Hosted the Meetings in Verneuil (2nd, 1954), Paris (9th, 1957) and Lille-Paris (26th, 1973). Key in the acceptance of petrographic parameters for the classification of in-seam coals.



Harold V. Smith, UK. **1992.**
Emeritus Professor. University of Sheffield, United Kingdom.

Founder member of the ICCP, Secretary and Chair of Commission I. Hosting the ICCP Meetings in Sheffield (20th, 1967) and Doncaster (39th, 1986); Key in the editorial revision of the handbook, impulsor of the ICCP Accreditation Program. Returning Officer.



Víctor Hevia-Rodríguez, Spain. **1994.**
Instituto de Ciencia y Tecnología del Carbono, INCAR-CSIC, Oviedo, Spain.

Secretary of the Analysis Commission during the time of drafting the handbook. Established the first organic petrology laboratory in Spain (Oviedo). Spanish representative in ISO; Hosting the ICCP Meetings in Madrid (6th, 1955; 13th, 1960 and 19th, 1966).



William Spackman, USA, **1998.**
Emeritus Professor at College of Earth and Mineral Sciences, Penn State University, USA.

Vice-President (1988-1991); Chair of the Nomenclature Commission (1964-1975); key in introducing organic petrology in major coke companies such as US Steel and Bethlehem Steel.



Alan Davis, USA. **2001.**
Emeritus Professor of Geology at Penn State University, USA.

President of the ICCP (1991-1995), before General Secretary (1988-1991) and Chair of Commission III (1981-1988); hosting the ICCP Meetings in Urbana (32nd, 1979) and Penn State (44th, 1992); Impulsor of the ICCP Accreditation Program. Key in drafting the hydrogenation residues sheets of the handbook (3rd suppl 1993); Convener of the Coal blends WG.



Hans Hagemann, Germany. **2001.**
Lehrstuhl für Geologie, Geochemie und Lagerstätten des Erdöls und der Kohle RWTH Aachen

Innovator in applications of fluorescence microscopy, active participant in many WGs activities in the over 20 years of regular attendance to meetings. Contributing to build up LEK in Aachen as a reference for organic petrology in Europe.



Peter Hacquebard, Canada. **2001.**
Geological Survey of Canada, Nova Scotia, Canada.

Contributed to the establishment of a good correlation between the American nomenclature system and the Stopes-Heerlen system in the early years of ICCP. Introduced in Canada the importance of studying vitrinite components and their effect on the technological properties of coal. Performed extensive regional assessment of rank in Canadian coal-bearing strata, using reflectance.



Karl Ottenjann, Germany, **2001.**
Geologische Landesamt Nordrhein-Westfalen in Krefeld, Germany.

Key in the development of fluorescence microscopy and in the drafting of Fluorecence microscopy sheets of the handbook (3rd suppl 1993): Part I: Fluorescence intensity and part II: spectral fluorescence. Convener of the standardization of Fluorescence measurements WG.



Javier González Prado, Spain. **2001.**
Instituto de Ciencia y Tecnología del Carbono, INCAR-CSIC, Oviedo, Spain.

Convener of the Oxidation WG and active participant in many WGs activities in the over 30 years of regular attendance to meetings in the 60s-90s; Hosting the 36th Meeting in Oviedo (1983).



Neely Bostick, USA. **2001.**
U.S. Geological Survey, MS-939. Denver Federal Center, Colorado, USA.

Vice-president (1991-1995), Secretary of Commission II in the 70s, Convenor of Bibliography of sedimentary organic matter WG, Convener of the Thermal indices WG; Contributing to the multilingual translation in the early times of the ICCP



Evamarie Wolff-Fischer, Germany. **2001.**
Bergbau-Forschung GmbH, Essen, Germany.

Editor of the ICCP (1989-1993); Chair of Commission I (1988-1992) and Secretary of Commission III. Contributing to the acceptance of organic petrology by coking industry. Active in the participation of the reactive inertinite WG.



Monika Wolf, Germany. **2001.**
Prof. of the Lehrstuhl für Geologie, Geochemie und Lagerstätten des Erdöls und der Kohle RWTH Aachen.

President of the ICCP (1987-1991) and before General Secretary and Chair of Commission I. Leading the revision of the maceral definitions of inertinite and vitrinite groups in the revised ICCP 1994 System. Key in establishing liaison and training with many organic petrology schools worldwide; Editor of the Newsletter (1993-2000).



Claus F.K. Diessel, Australia. **2003.**
Emeritus Professor of the University of Newcastle, Australia.

Chair of Commission III. Key in establishing a classification of char and inertinite reactivity in coking processes. Guiding the Fieldtrip of the 42nd ICCP Meeting in Wollongong (1990); Trainer of the ICCP training program. Impulsor of the revision of maceral classification ICCP system 1994.



John Vleeskens, The Netherlands. **2004.**
Netherlands Energy Research Foundation ECN, Petten, The Netherlands.

Active participant in Commission III activities, especially in the combustion WG in the over 20 years on regular attendance (between 80s and early 2000). Fostering the acceptance of organic petrology by the electric companies.



Jack Burgess, USA. **2004.**
Humble Geochemical Services, Texas, USA

Regularly attending ICCP Meetings in the 70s-90s and actively participating in Commission II activities. Contributing to the acceptance of organic petrology in the oil industry in USA. Convener of the Isolation of Organic matter WG and co-convener of the Classification of DOM WG.



Barbara Kwiecinska, Poland. **2005.**
AGH University of Science and Technology. Faculty of Geology, Geophysics and Environmental Protection. Cracow, Poland.

Vice-President of the ICCP (1995-2003), drafting the graphite, semi-graphite, natural coke, and natural char sheets (Kwiecinska and Petersen, 2004). Key in the establishment of organic petrology in Poland. Hosting the 47th Meeting in Krakow (1995).



Manuel João Lemos de Sousa, Portugal. **2005.**
Prof. Department of Geology, University of Porto, Afterwards Prof. of Universidade Fernando Pessoa, Porto, Portugal.

President of the ICCP (1995-1999) and before Chair of Commission I (1992-1995). Established the organic petrology research in Portugal. Convener of the Coal classification WG. Key in the acceptance of petrographic parameters for the classification of in-seam coals. Portuguese representative in ISO. Editor of the 50th Meeting Commemorative book in 1998.



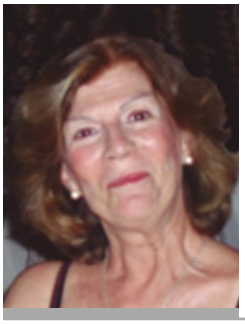
Rudi Schwab, UK. **2007.**
Royal Dutch Shell. Later Sustainable Energy C.B., Great Barrow Chester, United Kingdom

Honorary treasurer (1997-2007); Returning Officer. Regularly attending the ICCP Meetings for over 40 years.



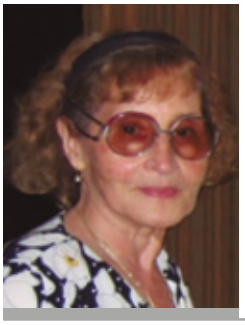
Marco Ercegovac, Serbia. **2009.**
Serbian Academy of Sciences and Arts, Belgrade, Serbia.

Established the organic petrology research in Serbia and hosted the Meetings in Dubrovnik (38th, 1985) and Belgrade (62nd, 2010). Participated in many WG activities over the years.



Zuleika Correa da Silva, Brazil. **2009**.
Prof. Department of Geology. Universidade Federal do Rio Grande do Sul, Brazil.

General Secretary of the ICCP (1996-2000) Key in the establishment of organic petrology in Brazil creating a school that extended throughout the country. Hosting the 33rd Meeting in Porto Alegre (1991); Convener of the Gondwana coals WG.



Cornelia Panaitescu, Romania. **2010.**
Faculty of Applied Chemistry and Materials Science. University POLITEHNICA of Bucharest, Romania.

Co-Convener of Microscopy of Carbon Materials WG (2008-2017); Key in the establishment of organic petrology in Romania. Hosting the 51st Meeting in Bucharest (1999).



Paul Lyons, USA. **2010.**
United States Geological Survey, Reston, USA.

Introduced the macerals secretinite and funginite in the inertinite group (ICCP system-1994). Regularly attended the meetings in the 80s-90. Proposed the CBM-CO_2 WG in 1998 with the aim of identifying possible contributions of organic petrology to coalbed methane studies.



Krystyna Kruszewska, Poland. **2011.**
University of Silesia in Katowice, Poland.

Convener of reactive inertinite WG and saprovitrinite WG. Promoting organic petrology in both South Africa and Poland.



Jane Pearson, Canada. **2019.**
David E. Pearson & Associates Ltd., Victoria, Canada

Honorary treasurer (2007-2019).



Lopo Vasconcelos, Mozambique. **2019.**
Departamento de Geologia, Faculdade de Ciências Universidade Eduardo Mondlane, Maputo, Mozambique.

Established the organic petrology research in Mozambique and hosted the 54th Meeting in Maputo-Pretoria (2002); Vice-president of the ICCP (2003-2007); Key for the implementation of the ICCP training program. Convener of the Temporal Variation of Coals.

Chapter 2

ONGOING ACTIVITIES AND PROGRAMS

WHENCE AND WHITHER ICCP[1]

Alan Davis

Penn State University.

It has been my honor to have served the ICCP as Chairman of Commission III, General Secretary, President and Chairman of the Reinhardt Thiessen Award Committee. As a result, I was invited to write for the commemorative book produced for the 50th meeting. Now, in time for the 75th meeting I have once again been asked to contribute. This gives me the opportunity to reflect on not only my history with the ICCP but also the trends which have taken place during the Committee's existence.

My first ICCP meeting was in Geleen, The Netherlands in 1964. I suspect that current members may not recognize many of the faces in a group photograph taken at that meeting **(Figure 1).** The signatures of those attending are also attached **(Figure 2).**

Altogether I was fortunate to be able to attend 18 meetings, my last being that held in Budapest in 2004. In 1992 the meeting was hosted by Penn State University which was a proud moment for me as organizer.



Figure 1. Attendees at the 17th ICCP Meeting, 1964, held in Geleen, The Netherlands.

1. Archaic English for "Where From" and "Where To"



Figure 2. Banquet Menu with Signatures of Some Attendees at the Geleen Meeting in 1964.

At its founding in 1953 the ICCP created just one Commission, for Nomenclature, and nomenclature was certainly the dominant focus at my first meeting in 1964. A second Commission, which eventually was named as the Application of Coal and Organic Petrology to Geology, including the Prospecting for Oil and Gas was formed in 1971, and a third, for Industrial Applications was added in 1972. Today these three Commissions together cover the activities of about 30 Working Groups, not all of them having consistent levels of attention but nevertheless demonstrating the very broad range of our members' concerns. Summaries of the activities of these groups can be seen in the reports of our annual meetings.

Contributors to the 50th Anniversary Book offered some complaints or perhaps regrets about the paths the ICCP has followed over the years. Chief among those was the observation that subsequent generations of petrologists have tended to repeatedly overlook past contributions and discussions. It was noted that the wide dispersion of meetings around the world, compared to the Eurocentric focus of the early years, makes it difficult for members to attend regularly. The changing scene of major centers and sources of funding for organic petrology adds to the problem. I would like to re-emphasize that complaint and note again the suggestions offered to avoid repeated re-invention of the wheel.

In the past it was the practice for the ICCP President, at the end of each 4-year term of office and to conform with our Statutes, to submit a report for submission to Council and published in the form of *Comptes Rendus* covering ICCP activities and accomplishments. For a number of years, for example, our Presidential reports were published in Fuel (i.e. Noël, 1972; Wolf, 1993; Davis, 1996). Recently, the practice has been more haphazard, although sometimes substantial summaries of 4-year activities have appeared in ICCP News (i.e. Cook, 2007; David, 2015; Borrego, 2023). These reports could instead be given a more prominent place on our website, along with the Handbooks. Fortunately, the website carries reports of Working Group progress, but there is currently no facility for discussion on the site so there is no opportunity for comment, especially from members who are unable to attend meetings. This too could be a useful addition.

In the ICCP News Nº 33 from 2004, Duncan Murchison aired a similar concern about the lack of availability of the collections of papers presented during the early days of coal petrology that had been assembled into the Proceedings of the ICCP in 1954, '56 and '60. He wondered whether some or all of these volumes could be republished. The considerable evolution and scope of our website might not have been foreseen when he wrote that. In sympathy with the kind of hope expressed by Murchison, I think our current and future membership would benefit from having these major summaries of our early work readily available on the website, even though copying them might be a laborious task in the short term.

Another concern was expressed by Javier Prado in the 50th Anniversary book and dealt with the reporting of reflectance measurement. He summarized the arguments as to why random and not maximum reflectance should be preferred, noting that both temperature and pressure play a role in influencing reflectance and anisotropy through the rank range. Also, Prado observed that the arithmetic mean of series of readings is inadequate where the reflectance distribution is asymmetrical. Unfortunately, any move to standardize the reporting of reflectance will encounter a resistance to abandoning the procedures already established at individual labs. These preferences vary geographically and by industry. Data bases have been built over many years and there are many useful correlations with physical and chemical properties and industrial behaviors. I note that a proposal was made at Prague to establish a Working Group in the correlation of maximum and random reflectance; this would be done using a rank suite of coals in order to achieve "multiplication factors" at each rank level. Such a goal has merit but it would not be a move in the direction which Prado and others have envisioned. However, I can foresee that the growing use of image analysis systems in our science could lead towards a trend in the acceptance of random reflectance as the norm.

Looking to the future one might see also that there will be a growing trend towards image analysis as the means of performing maceral analysis. The ICCP has long been concerned with the development of a standard nomenclature, and more recently with both accreditation of analysts and the establishment of a standard for statistical appraisal. There is no reason why improved means of quantifying precision and accuracy of maceral analysis should not continue to be sought; in particular, advantage could be taken of the numbers and types of readings available from image analysis systems.

I mentioned above the wide range of interests now covered by the ICCP Working Groups; these can have either a direct or peripheral relationship to industrial operations. Some of these are in research areas which reflect the continued interest of industry over many years; others involve coal uses whose potential seemed to shine

brightly for a while but which now have been abandoned owing to the cost and environmental difficulties which emerged during scaled-up testing. I was involved in the production of the ICCP classification of hydrogenation residues in 1993 (ICCP, 1993) and that avenue of commercial coal liquefaction appears to have fallen by the wayside. However, Commission III continues activities to examine residues produced by pyrolytic methods of liquefaction.

Other current ICCP activities reflect recent interests brought on by environmental concerns. In fact, an Environmental Application of Organic Petrology Working Group began operation in 1993 and should receive continued support.

The effects of the burning of fossil fuels have been recognized for decades and the public and political call for limits on its use have grown accordingly. Nevertheless, the global demand for an increase in power generation has been met largely through coal mining. For example, steam coal production grew from roughly 3000 Mt in 1990 to roughly 6000 Mt in 2019. Metallurgical coke production has also remained high, more than doubling from values in the early 1990s; during this time there have been and will continue to be shifts in both where the coal is produced and used.

So, by historical standards, total coal production is close to its highest level at about 8000 Mt and is forecast by the IEA to remain flat until 2025. This is in spite of the commitments made by many countries to "phase down" their use of coal at the United Nations' COP26 climate conference.

Inevitably, the political and commercial acceptance of the causes of global warming will have a growing impact on the level and direction of support for scientific study from the energy industries and appropriate government organizations. Commission III has a broad range of Working Groups some of which look to the future as well as the present. Also, petrologic studies could assist in the development of processes that use fuels more efficiently.

On the occasion of the ICCP's 50th Anniversary Harold Smith dared to hope that it would be in a position to repeat the writing of a commemorative volume at its centenary. Half-way to that date the ICCP is a vigorous successor to the pioneers of our science. Just as I wrote at its 50th Anniversary, I look forward to a long and productive future for the Committee.

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THE ACCREDITATION PROGRAM OF THE ICCP

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The ground of the Accreditation Program

The Accreditation Program finds the origin in the many exercises carried out over the years first in the Analysis Commission and afterwards within Commission I to establish precision and bias of the methods for petrographic analysis of coal. Reports of these exercises were prepared over the years and are disseminated in the minutes included in the archives sitting at the University of Porto. All these exercises proved that a trained analyst could perform petrographic analysis with a significant degree of agreement that needed to be in any case established in a more formal way. The evaluation of the results of the early round robin exercises was essentially based on the calculation of the statistical mean and standard deviation of the group excluding the outliers, but no further information or feedback was provided to the participants. This section intends to yield tribute to the many people that have contributed to establish and maintain the ICCP accreditation program over the years. It has been the result of the joint and generous effort of all those who contributed with their work and capacities on a voluntary basis to build a remarkable success history of the ICCP.



AHV Smith. Initial promoter of Accreditation Programs



Reinhold Kutzner. Convener of 1993-94 pre-accreditation exercises

Figure 1. Early promoters of the ICCP Accreditation Program.

The first proposal for establishing an ICCP Accreditation Program dates back to 1986 at the meeting in Doncaster (UK) and A. Harold V. Smith **(Figure 1)** was instrumental in pushing the process (Depers, 2003). It was the vitrinite reflectance analysis and the maceral groups composition in coal the two kind of analyses that were considered mature enough to be part of an Accreditation Program. The accreditation procedures were first established at the meeting in Aachen (Germany) in 1988 and the two first round robin exercises were conducted by Reinhold

Kutzner (Figure 1) in 1993 and 1994 and the results evaluated using the reproducibility criteria of ISO 7404. These exercises had a significant number of participants 24 (1993) and 35 (1994) and served to establish the number of samples to be analysed in the future for accreditation (6) and provided a significant amount of data to be statistically evaluated.

Procedures for data Evaluation

Fixing the statistical Evaluation. Two independent teams evaluated the data of 1993-94 exercise following different procedures: i) a chi-squared test ($\chi 2$) and analysis of Variance (ANOVA) performed by Willem Fermont and Petra David and ii) applying the Standard Practice for Conducting an Interlaboratory Study to Determine the Precision of a Test Method (ASTM E 691) carried out by Alan Davis, Alan C. Cook and Aivars Depers (Cook et al., 1997) (Figure 2). After significant discussion, a Z-score technique was selected which is explained in the section Statistical Evaluation in Detail **(https://www.iccop.org/accreditation/statistical-evaluation-in-detail/).**



Figure 2. Key persons for establishing the evaluation procedures for the data of the Accreditation Program.

The initial evaluation of data was performed using spreadsheet software to deal with data. The various and complex permutations of data involved in evaluation lead to the development of an automated system to perform the evaluation. The first one was a Microsoft's Access V3 software developed in 1996 by Sandradurage Padmasiri (Paddy) Ranasinghe (Figure 3) and was further adapted in 2006 to perform the evaluation of DOMVR Accreditation Program. The actual evaluation procedure is a Microsoft Excel with VBA (Visual Basic for Applications) programming and the integration of this system with MS Word for the automatic creation of the certificates, the participants' reports, and an application to compile the list of accredited petrographers to be uploaded in the ICCP webpage. The databases for the three APs were developed by INTERRELATE Lda (a spin-off of the University of Porto) by Álvaro Figueira and Vilma Ramos in 2015 first to the CBAP and then to SCAP and DOMVR. Thus, a similar instrument is used by the three ICCP Accreditation Programs actually available and handles all procedures from the early stages of incorporating participants to evaluation and generation of certificates as well as the screening system for beginners since 2008 when it was implemented. Deolinda Flores was key in the implementation of this procedure.



Paddy Ranasinghe.
1st Evaluation Database

Interrelate Lda. Excel-based
Program developer

Figure 3. Developers of the database used for the evaluation of the data from the Accreditation Programs.

Management structures

The **Accreditation Sub-Committee** (Ac-SubC) was created at the time the SCAP Accreditation Program was established. Initially the composition of the Sub-committee was the organizer of SCAP (Aivars Depers), the two officials in Council from Commission I since SCAP was a Commission I activity (Chair: Walter Pickel and Secretary: Deolinda Flores) and one additional representative of other Commission (Rosa Menéndez) with the Chair of Commission I chairing the Sub-Committee. In 2006 two additional tests were incorporated to the Accreditation Program: the Dispersed Organic Matter Accreditation Program (DOMVR) developed in Commission II and the Coal Blends Accreditation Program (CBAP) developed in Commission III. The three Commissions were then involved in accreditation, the need for coordination increased and the tasks of the Accreditation Sub-Committee were re-defined:

i. Maintain a review over the range of accreditation activities,
ii. Act as a contact between the President and Council and the Organizers of each Accreditation Program,
iii. Satisfy itself as to the validity of the methods associated with each accreditation activity,
iv. Ensure that accreditation rounds are organized at suitable intervals,
v. Coordinate rounds of analyses to ensure that analytical loads are spread and not concentrated within short periods of time,
vi. Receive data from the Organizers of the programs,
vii. Ensure the validity of accreditation recommendations,
viii. Organize and ensure the archiving of accreditation data in a suitable manner,
ix. Act as the primary locus for lodging appeals against accreditation decisions,
x. Receive recommendations from the Review Panel members and forward these recommendations to the President,
xi. Act as a conduit for feedback between analysts, or other ICCP members and the Organizers of the programs.

The composition of the re-defined Accreditation Sub-Committee consisted of a Council representative of each of the Commissions, the organizers of the three programs and an external expert. The later defined as a person with enough experience in the procedures of accreditation and not belonging to Council. The first member occupying this position was Kees Kommeren, replaced by Paddy Ranasinghe in 2014. The chair of the Sub-Committee was established to be elected among the three representatives of the Commissions being the first chair in 2006 Angeles G. Borrego (Com II), replaced by Deolinda Flores (Com I) in 2008, Magdalena Misz-Kennan (Com III) in 2016, and Sandra Rodrigues (Com III) in 2023 (Figure 4). Deolinda Flores was designated as honorary member of the Sub-Committee because of her inestimable contribution to the development of the excel database for the evaluation of the data.



Angeles G. Borrego.
Chair Ac-SubC (Com II)
2006-2008



Deolinda Flores.
Chair Ac-SubC (Com I)
2008-2016



Magdalena Misz-Kennan.
Chair Ac-SubC (Com III)
2016-2023



Sandra Rodrigues.
Chair Ac-SubC (Com III)
2023-



Kees Kommeren.
External expert Ac-SubC
2006-2014



Paddy Ranasinghe.
External expert Ac-SubC
2014-



AHV Smith.
Review Panel



Reinhold Kutzner.
Review Panel



Alan Davis.
Review Panel

Figure 4. ICCP Members who have been part of the management structures of the Accreditation Program of the ICCP.

The **Review Panel** was created to deal with appeals against a decision by the Accreditation Sub-Committee. Its principal role is to assess and to make appropriate and timely decisions relating to appeals made by individual petrographers. The members of the Review Panel are appointed by Council on recommendation of the Accreditation Sub-Committee and consist of three world-renowned organic petrographers with a thorough working knowledge of the petrographic methods being assessed by the Accreditation Sub-Committee and currently non-participant in the Accreditation Programs. Experts forming part of the review panel have been: Reinhold Kutzner, AHV Smith and Alan Davis (Figure 4).

The ICCP currently offers Accreditation in:

Single Coal Accreditation Program (SCAP). In this program, it is tested the ability of an analyst to identify and quantify the maceral groups and to identify and measure the vitrinite reflectance of a coal sample according to ISO standards (ISO 7404). The historical development of SCAP is very much linked to that of Accreditation of the ICCP as a whole since this was the first program initiated by the ICCP. The first Organizer was Aivars Depers and the first formal exercise was run in 1996 and entrusted to Kimon Christanis in 2006 (Figure 5). The close inspection of the data showed that sometimes the new applicants had large deviations from the group mean that impacted significantly the statistics and therefore a screening system for beginners was implemented since 2008.



Aivars Depers.
Organizer of SCAP
1995-2006



Kimon Christanis.
Organizer of SCAP
2006-

Figure 5. Organizers of SCAP (Single Coal Accreditation Program) of the ICCP.

Dispersed Organic Matter Vitrinite Reflectance Accreditation Program (DOMVR). In this program, the analyst is tested for the identification and reflectance measurement of vitrinite occurring as dispersed particles in rocks such as carbonaceous shales or hydrocarbon source rocks. The background for the development of this program can be found in the many round-robin exercises performed within Commission II to test precision and bias in the measurement of vitrinite reflectance in dispersed organic matter (Borrego, 2009), but more specifically in those of the Qualifying Vitrinite for Reflectance Analysis WG (Borrego et al., 2006). The first Organizer was Alan C. Cook that carried out the first formal exercise in 2006. The activities were proceeded by Angeles G. Borrego from 2010-2018 and in 2018 João Graciano Mendonça Filho became the current Organizer of the DOMVR program (Figure 6). Some specific actions had to be implemented to ensure the integrity of the program and to maintain the difficulty of the test. In 2016 it was established that individual participants from a single laboratory should receive different samples to prevent deviations of participants from a single laboratory impacting too much the group results. From this date on multiple participants from a single laboratory receive different samples. In addition, the evaluation of the data showed that some participants tended to measure particles of different origin misidentifying the indigenous vitrinite population. An indication was incorporated to the webpage and exercise instructions since 2018 to indicate that standard deviation of the vitrinite reflectance readings provided should not exceeded the value of the mean multiplied by a factor of 0.15.



Alan C. Cook.
Organizer of DOMVR
2006-2010



Angeles G. Borrego.
Organizer of DOMVR
2010-2018



João Graciano Mendonça Filho.
Organizer of DOMVR
2018-

Figure 6. Organizers of DOMVR (Dispersed Organic Matter Vitrinite Reflectance Accreditation Program).

The reference to perform the analysis was ISO 7404-5 up to 2012 and afterwards ASTM D7708-11, an outcome of the Primary Vitrinite Identification WG later named Identification of thermal maturity relevant organic matter (Hackley et al., 2015, 2020).

Coal Blends Accreditation Program (CBAP). This program examines the ability of an analyst to identify the number of coals in a blend and their petrographic characteristics such as vitrinite reflectance and maceral group composition according to ISO standards. Organic petrology is the only technique able to yield information of the individual component coals within a coal blend. The precedents for this program can be found in the exercises carried out within the Coal Blends WG created in 1995 (Davis, 2000). The first Organizer was Isabel Suárez-Ruiz who conducted the first formal exercise in 2006. Małgorzata Wojtaszek-Kalaitzidi continued the task from 2019 onwards (Figure 7).



Isabel Suárez-Ruiz.
Organizer of CBAP
2006-2019



Malgorzata Wojtaszek-Kalaitzidi.
Organizer of CBAP
2019-

Figure 7. Organizers of the CBAP (Coal Blends Accreditation Program) of the ICCP.

The participation in the Accreditation Programs

The first accreditation program (AP) dedicated to vitrinite reflectance measurements and maceral composition (SCAP) took place in 1996, and it was joined by 67 petrographers. It was preceded by two runs in 1993 and 1994 considered as pre-accreditation runs and participated by 24 and 35 petrographers, respectively (Figure 8). The number of participations gradually increased, especially with addition of the other two accreditation programs, DOMVR and CBAP, in 2006. The maximum number of participants (134) and registrations into the programs (223) was reached during the 2016-2017 round (Figure 8). After that, the number of participations gradually decreased with a provisional number of 111 participants and 179 registrations into the APs in the current 2024-2025 round. As illustrated in Figure 9, SCAP is the program most often chosen by the petrographers, followed by DOMVR; whereas few participants enrolled into the CBAP. About half of the participants of SCAP are only enrolled in this program, but it is common for the petrographers to choose more than one AP with the most popular combination being SCAP and DOMVR, followed by SCAP and CBAP. A significative number of participants registered for the three programs (Figure 9), which have increased over the years, and most of the participants in DOMVR and especially CBAP are registered in other programs.

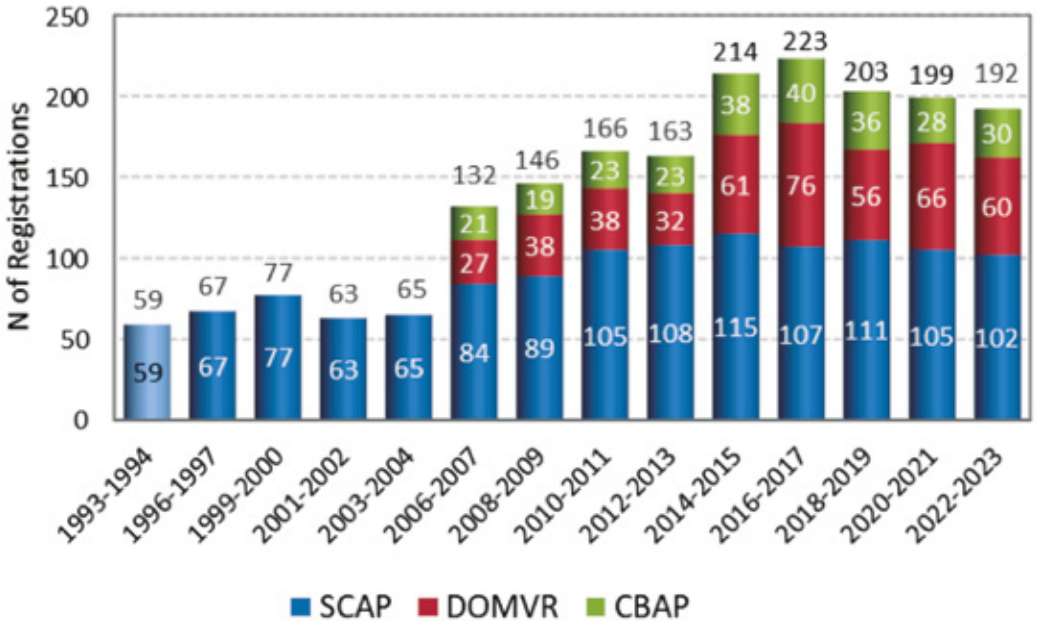

Figure 8. Number of the registrations in the three Accreditation Programs over the years including the 1993-1994 pre-accreditation round in paler color. The values given above the bars are the total number participants in each round.

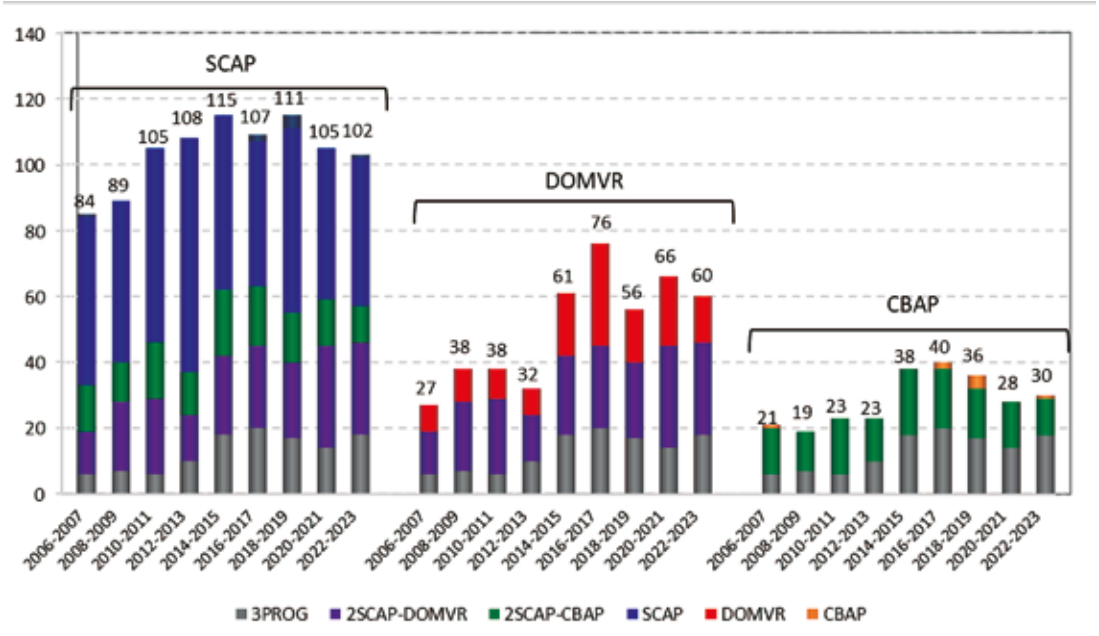

Figure 9. Number of enrolments into the different Accreditation Programs, single or combined, over the years.

The participants enrolled in ICCP APs come from different countries from all over the world (Figure 10). Most participants come from Australia and North and South America (USA and Colombia, respectively). The European participants mostly come from Germany, Poland and Portugal. Steady decrease is observed in participations from Europe, reflecting the changes in the government's policies for fossil fuels. Participants from Asia mostly come from India and Japan.

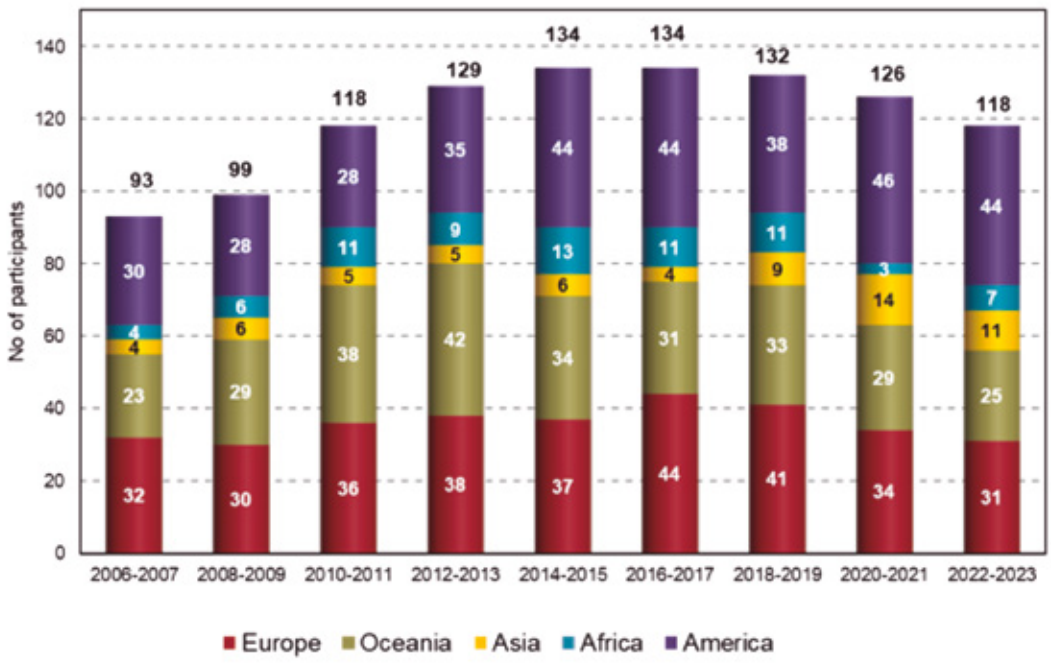

Figure 10. Geographical distribution of the participants in the ICCP Accreditation Programs (by number).

Furthermore, it is relevant to point out the number of participants associated to commercial laboratories (~60 %, as per current round) validating the significance of the ICCP Accreditation Programs for the commercial and industrial sectors, with the other ~40 % belonging to research centres in universities, governmental institutions and geological surveys. Furthermore, many of the participants are non-members of the ICCP once again attesting the importance of the APs for accredited petrographers. The share Member/Non-Member over the years has also evolved, increasing the proportion of Non-Members in the recent years **(Figure 11).**

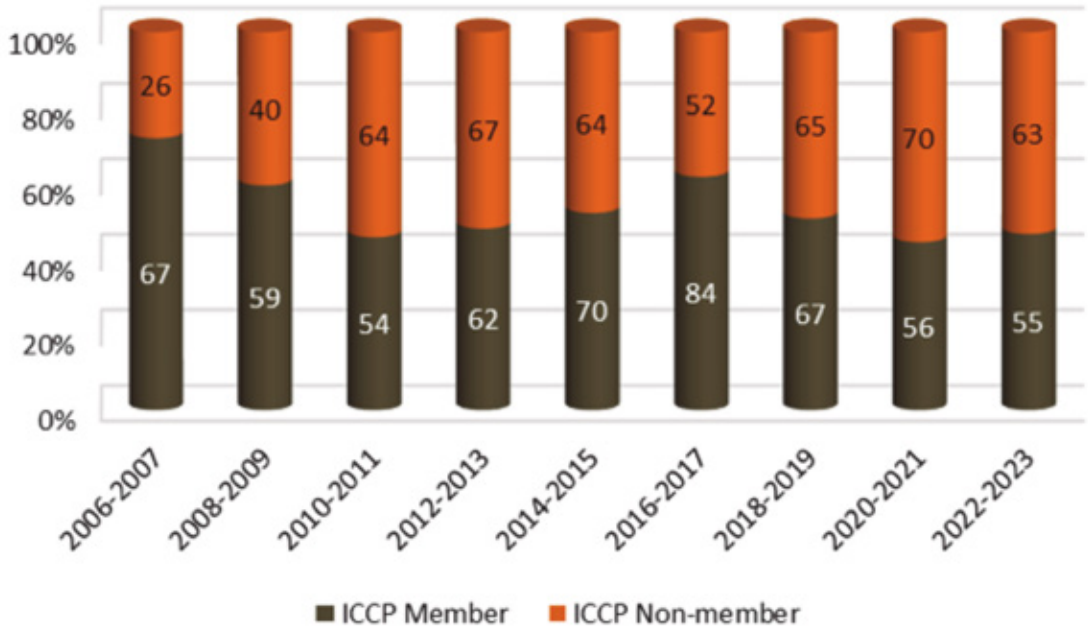

Figure 11. Share of participation between ICCP Members and Non-Members over the years.

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THE TRAINING COURSES OF THE ICCP

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Since 2009, the ICCP offers training courses on several topics of Coal and Organic Petrology to be attended by different audiences working and developing research on this topic and that are willing to improve their scientific knowledge and analytical skills. The courses offered have also a great contribution of the results obtained on the exercises carried out by the different working groups of the three Commissions of the ICCP. Below, we present a brief chronology of the decisions and steps taken to implement the first course and subsequent courses already taught until 2023.

The first steps of the ICCP Training Courses

The first discussion on the ICCP training courses was held in Council in Victoria, Canada in 2007. At the next meeting in Oviedo, Petra David, the President at that time, made a presentation concerning the establishment of a New WG to develop the organization of ICCP training courses. It was proposed that this Program will be coordinated under the auspices of the ICCP Vice-President, Lopo Vasconcelos. The course would be supported by the German Geological Society through the Teichmüller Foundation and GFZ, Potsdam, and the time frame for developing the first course would be about 1 year. It was clear that the following aspects had to be decided before the ICCP training courses as such could be offered:

- Procedures should be established to ensure that training courses represent the view of ICCP and to avoid contradictory messages.
- Practical issues had to be considered and studied, such as:
    - duration of courses (1 day, 2 days, 1 week, …);
    - range of topics to be considered (Coal Petrology, Dispersed Organic Matter, Coal Blends,…);
    - audience (graduate students, people from oil industry, people from coal industry, people from power stations, people from steel works, …);
    - money involved for teachers (money per day including/excluding expenses);
    - costs for potential participants (fee for students, and other potential participants)
    - maximum number of people (5, 10, 20, limit of microscopes or other facilities).
- In principle it was expected that the material for teaching would be prepared within the WG; contributions to the preparation of the training material of the ICCP would be acknowledged in a place of the presentation;
- proper statements of what has been contributed (e.g. content or micrographs); submission of final version if extra training material had been added by the presenter (to Vice-President and/or the WG) to have record of any teaching material used in the ICCP training presentations.
- Versions in any other language could be prepared (and people doing the translation would be properly acknowledged).
- The request for teaching a course would be addressed to the Vice-President who would be in charge of suggesting to Council people to do each teaching.
- Use of website should be ruled, for example the availability of presentations in the web as well as in which form (presentations, annotated presentations, training kits).
- Frequency of the courses and ways to suggest the organization of the courses.

It was clear that the task was enormous and the timeframe short for the number of things that should be done before the first course could be offered. Nikki Wagner accepted to be the first convenor of the WG and the first task in hands of the Vice-President was to contact potential trainers for the ICCP courses.

The first proposal for identification of trainers comprised Alan Davis, Alan Cook, Harold Smith, Barbara Kwiecinska, Manuel Lemos de Sousa and Claus Diessel, all of them emblematic names in the field of organic petrology, essentially retired from their main activities at respective universities at that time, and with a large experience and good knowledge of organic petrology in general and the ICCP as organization in particular.

It was Lopo Vasconcelos who took the initiative to contact the potential trainers and explain the objectives of the training courses and expectations. The Council at that moment often remembers his contribution to this and the nice letters written to the potential trainers. It was indeed not an easy task because we should ensure about providing balanced opportunities to the members while fulfilling the requirements of any given course in terms of availability and also affordability. In general, the response was very positive although some of the trainers had preferences to teach specific topics. It was agreed that two teachers sharing the topics would be a good option for starting and this would represent a reasonable workload for 4 days course plus one day fieldtrip. By June 2009 Claus Diessel and Alan Cook had already accepted to be the first trainers for the first course to be taught in November 2009. By this date Nikki Wagner, as convener of the WG had a first course outline proposal that was accepted by Council.

From this moment on, events moved fast: Andreas Küppers and Antje Treutler from GFZ had booked already the room in a beautiful historical building in the Telegraphenberg campus in Potsdam for 16-20th November 2009. We had a first draft of course outline, which at the end would be different from the one to be offered, the fieldtrip to brown coal open cuts in the Niederlausitz South of Berlin was organized by Claudia Niemz and her colleagues from LAOP in Lauta, the fees for attendees were established and the course was announced in the webpage (Figure 1) although still many things had to be sorted out. Again, as many times in the ICCP, the work would be done on a voluntary basis and the trainers would not receive any payment except having covered the travel and accommodation expenses.

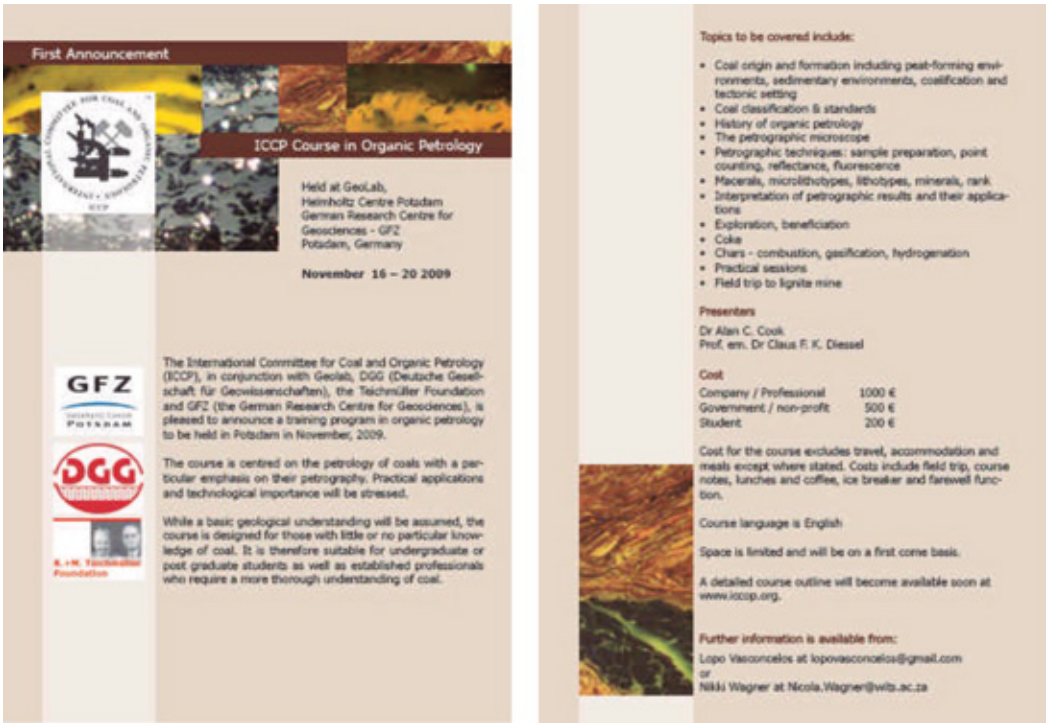


Figure 1. Announcement of the first ICCP Course in the webpage held in November 2009 at GFZ Potsdam.

At the forthcoming meeting in Gramado in September 2009, it was agreed that this first course would likely be at shortfall and that the ICCP should cover any losses (Table 1; Resolution ICCPC09/16/1). The first resolutions regarding the training activities of the ICCP are compiled in **Table 1.** Many would follow afterwards involving the organization of the subsequent courses until the 15th ICCP course held in Patras in 2023.

Table 1. First Council Resolutions regarding the implementation of the ICCP training activities.

ICCPC08/16/1: *Council recommend to establish a new working group in order to develop ICCP training courses. This will be done under the auspices of the ICCP Vice-President. Time frame for developing the first course would be about 1 year.*
ICCPC09/16/1: *In accordance with resolution ICCPC08/16/1, ICCP Council supports the training course to be held in Potsdam, Germany, noting that any shortfall in budget is likely to be the sole responsibility of ICCP.*
ICCPC09/16/2: *Council notes the large involvement of the Vice-President and the Convener for having organized the first ICCP training course and congratulates them for their work.*
ICCPC09/16/3: *Council notes the excellent acceptance of the course between the potential teachers and thanks them for their willingness to support the ICCP training activities.*
ICCPC09/16/4: *Council notes the enormous amount of work involved in teaching the 4 days intensive first ICCP course and expresses that ICCP is deeply in debt with Dr. Alan Cook and Dr. Claus Diessel for having accepted this challenge.*

The organization of the ICCP training activities involved many individuals but it would not have been possible if a combination of elements wouldn`t have occurred together:

- The presence of Andreas Küppers and Antje Treutler in Potsdam in charge of outreach and dissemination activities of GFZ and their relationship with Marlies Teichmüller Foundation and the German Geological Society;
- the relationship of all those with Petra David, the president at that time and her personal involvement attending every course held in Potsdam;
- the presence of Lopo Vasconcelos as vice-president willing to give specific content to the vice-president position and possessed of tact, delicacy and executive capacity that made him ideal to deal with the many difficulties that could have to start an initiative like this;
- the location of Potsdam, in central Europe and close to a large airport (Berlin) but also in a reasonable distance to the headquarters of Hilgers Technisches Buero **(Figure 2),** that supported nearly every ICCP training activity making available the microscope with camera and latest implemented advances for the practical session or the courses;
- the wish, experience and dedication of the trainers Alan Cook and Claus Diessel who generously took the challenge of a task that proved to be exhausting after a week **(Figure 4);** and
- overall the innocent optimism of all those involved who saw more the benefits than the difficulties. This is attested by a conversation of Alan Cook with Petra David and Angeles G. Borrego after having celebrated the first course saying “I really believed that you would never make it”, despite his key role in that success.



Figure 2. Britta Hilgers at the 2023 Meeting in Patras with a microscope as the one provided for the practical training in the ICCP courses, making an invaluable contribution to the ICCP training activities. Logo of the Fossil system of the Hilgers Technisches Buero.

The training activities have been maintained in the hands of the Vice-President and after Lopo came Henrik Petersen, Peter Crosdale and João Graciano Mendonça Filho who kept on reporting to the General Assembly of the ICCP the developments in the training program.

The celebrated ICCP Courses

The first course was well-attended by 22 persons from all five continents **(Figure 3).** The Vice-President prepared a questionnaire to get feedback from the participants and search for future topics of interest, which is still distributed in every course. Quite often the topics mentioned by the participants were not specifically related to organic petrology and here the ICCP has maintained a strong position. The topics would exclusively be linked to organic petrology in the various applications that organic petrology has, because what we transmit in the courses is the body of knowledge of the ICCP: the classifications and definitions discussed and approved in Commission I, the outcome of the working groups and the procedures developed in collective form through the many activities and round robin exercises.



Figure 3. Family photo of the 1st Organic Petrology Course November 16-20, 2009 Helmholtz Centre Potsdam.

The rush has meant that things have not developed as initially planned. The initial idea that the contents should be prepared and discussed within the WG never happened like that. The course notes were prepared by the trainers, and normally just printed few days before the starting of the course and, as we are familiar with, the trainers were changing their presentations until the last very moment. This has not decreased at all the quality of the training or the presentations as attested by the high scores that the pupils provide in the questionnaires, but simply means that the structure we initially envisaged was probably not practical at all.

Table 2. ICCP Courses: Topics, trainers, Venues and year of celebration.

Nº	Topic	Trainers	Venue	Year
1	General Organic Petrology	Alan C. Cook & Claus F.K. Diessel	Potsdam	2009
2	General Organic Petrology	Alan C. Cook & Claus F.K. Diessel	Potsdam	2010
3	Organic Petrology Gondwana Flavour	Alan C. Cook & Claus F.K. Diessel with Rosemary Falcon & Nikki Wagner	Johannesburg	2011
4	Dispersed Organic Matter	Alan C. Cook & João Graciano Mendonça Filho	Porto	2011
5	General Organic Petrology	Claus F.K. Diessel & Walter Pickel	Brisbane	2012
6	General Organic Petrology	Claus F.K. Diessel & Walter Pickel with unplanned Angeles G. Borrego & Petra David	Potsdam	2013
7	Dispersed Organic Matter	João Graciano Mendonça Filho & Angeles G. Borrego	Potsdam	2014
8	Organic Petrology for Industrial Applications	Isabel Suárez-Ruiz & Walter Pickel	Potsdam	2015
9	Organic Petrology	Walter Pickel & Angeles G. Borrego	Potsdam	2016
10	Dispersed Organic Matter. Integrating transmitted and reflected light microscopy	João Graciano Mendonça Filho & Angeles G. Borrego	Potsdam	2017
11	Organic Petrology	Walter Pickel & Stavros Kalaitzidis	Brisbane	2018
12	*Dispersed Organic Matter*	*Cancelled due to lack of microscopy facilities*	*Potsdam*	*2018*
13	Organic Petrology and its Applications	Isabel Suárez-Ruiz & Walter Pickel	Potsdam	2019
14	General Organic Petrology	Angeles G. Borrego & Stavros Kalaitzidis with Nikki Wagner	Patras	2022
15	Optical Microscopy of Dispersed Organic Matter: Facies and Maturity	Angeles G. Borrego & Carolina Fonseca with Stavros Kalaitzidis	Patras	2023

Table 2 shows the courses organized by the ICCP over the years together with the location and trainers (Figure 4). Some of the courses, as the one in Porto 2011 (Figure 5), Brisbane 2018, and Patras 2023, were organized in connection with ICCP Meetings. The one in Brisbane 2012 was in connection with the 34th International Geological Congress that was celebrated a week after, and the one in Johannesburg (May, 2011) upon request of the local organizers (Figure 6). Except for these, the stable venue was GFZ Potsdam and the ICCP will be always in debt with Antje Treutler and Andreas Küppers for offering this opportunity and pushing us to initiate this training program, which can be considered a great success of the ICCP.



Figure 4. Trainers who have participated in the various ICCP courses in different topics over the years. The ICCP greatly appreciates their effort.

After 10 years, the situation at Potsdam changed and the venue could not be secured any longer, this came together with the Pandemic COVID-19 and the difficulties to travel and, consequently, the courses were suspended for a couple of years. In 2022, with trips approaching to normality, the ICCP training activities were resumed **(Figure 6).**



Figure 5. First course on Dispersed Organic Matter (4th ICCP Course) held in Porto (2011) with Lopo Vasconcelos as responsible of the ICCP training activities presenting the course and Alan C. Cook and João Graciano Mendonça Filho as trainers

The first post-pandemic course was planned in Patras, Greece, thanks to the kind invitation of the Geology Department of the University of Patras through the initiative of Stavros Kalaitzidis, at that time Chair of Commission I. The planned trainers were Walter Pickel and Stavros Kalaitzidis. Unfortunately, this could not occur as planned due to Walter Pickel`s unexpected passing and Angeles G. Borrego taught that course together with Stavros and Nikki Wagner. The course was well-received and now, after two courses, Patras has become the new permanent venue for ICCP training activities. The ICCP really appreciates the facilities of the University of Patras and of the Department of Geology for the practical sessions **(Figure 6).**



Figure 6. Persons key on the hosting of the ICCP Courses. First row: responsible of the organization at the permanent venues GFZ Potsdam and University of Patras and second row: responsible of the organization of eventual courses at University of Porto, University of Witwatersrand, University of New South Wales and at Royal on the Park Hotel supported by Energy Resources Consulting Pty Ltd.



Figure 7. Family photo of the 15th ICCP course on Optical Microscopy of Dispersed Organic Matter: Facies and Maturity held at the University of Patras.

The training program of the ICCP is in good health. It has continued with the enormous challenge that represented replacing Alan Cook and Claus Diessel in the training activities, also to replace Walter Pickel that assumed the teaching in two of the topics that were available: General Organic Petrology and Industrial Applications. Angeles G. Borrego acted as a wild card when required teaching Dispersed Organic Matter after unexpected Alan Cook's passing and General Organic Petrology when required. So, did Carolina Fonseca in the last course on Optical Microscopy of Dispersed Organic Matter (Figure 7).

New courses were accepted at the last meeting in Patras on Carbon Materials and on Environmental Applications based on the short course already held in connection with the TSOP meeting in Patras. The teachers have been selected and the schedule will be soon provided widening the frontiers of organic petrology (Figure 8).

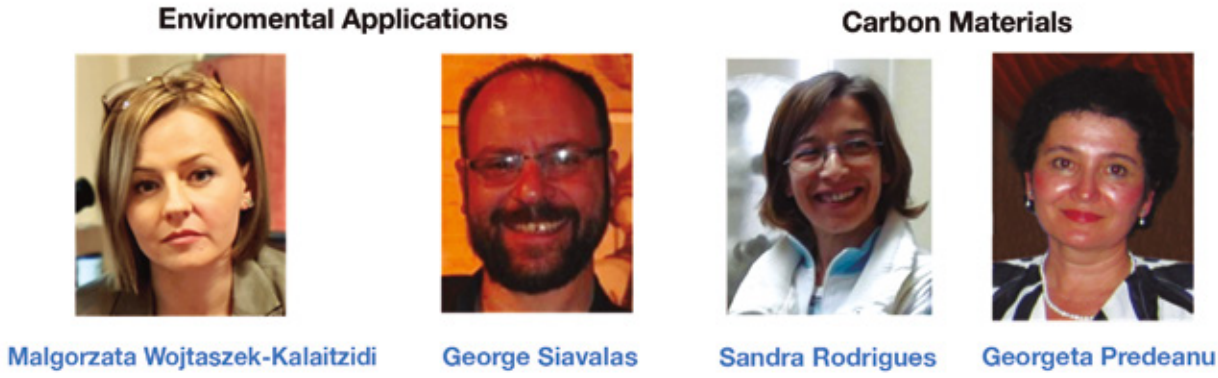


Figure 8. Trainers for the new ICCP courses incorporated to the catalogue.

The ICCP Student Travel Grant

In 2013, the implementation of a student grant to attend the ICCP courses was proposed. It was decided that before launching the call, the rules for applying should be clear. A grant sub-committee was established coordinated by Stavros Kalaitzidis as Secretary of Commission I to establish the rules for application. The grant was intended to support qualified MSc and PhD students from around the world, who were active in fields related to the topics of the ICCP (Organic Petrology). It will cover up to 1000 € of the travel and accommodation expenses to attend the course.

The subcommittee consisted of a representative of each of the three commissions (either chair of secretary) and a person external to Council. The composition of the first grant sub-committee was: Stavros Kalaitzidis, Paul Hackley, Magda Misz-Kennan and Mária Hamor-Vidó and the winners of the Grant are listed in Table 3.

Table 3. Winners of the ICCP student travel grant to attend ICCP Courses over the years.

Recipients of the Student Travel Grant	**Year**
Malgorzata Uglik (PL)	2015
Ndivhuho Nendouvhada (ZA) & Ms. Maseda Mphaphuli (ZA)	2016
Delano G. Henry (UK)	2017
Malek Radhwani (TN)	2018
Lujza Medvecka (CZ)	2019
Juan Sebastian Gomez Neita (CO)	2022



Figure 9. Some moments of relaxation during the ICCP Courses: Top left: trainers of the 3rd course in South Africa Alan C. Cook and Claus Diessel accompanied by Louise Diessel; Top right: Course dinner at the 14th ICCP Course in Patras; Bottom left: trainers of the 11th Course Stavros Kalaitzidis and Walter Pickel sharing a pool game with Angeles G. Borrego and Nikki Wagner; Bottom right: break at the 11th Course in Brisbane.

In 2023, it was decided to rename the student travel grant as Walter Pickel Student Travel Grant in recognition of his great contribution to the ICCP training activities. New students will benefit in the forthcoming courses. The courses are not only an excellent opportunity for learning and being trained but also to establish personal relationships that can be maintained over the years **(Figure 9).** With the decrease of fossil fuels utilization in countries with long tradition in organic petrology the training activities of the ICCP acquire greater importance as a reference in the field of organic petrology in general and its multiple applications.

AWARDS OF INTERNATIONAL COMMITTEE FOR COAL AND ORGANIC PETROLOGY

Maria Mastalerz[1] and Magdalena Misz-Kennan[2]

[1] Chair of the Thiessen Award Subcommittee, Indiana Geological and Survey. Indiana University, 1001 E 10th Street, Bloomington, Indiana 47405-2208, USA. [2] Chair of the Organic Petrology Award Subcommittee, University of Silesia, Faculty of Natural Sciences, Institute of Earth Sciences, ul. Będzińska 60,41 200 Sosnowiec, Poland.

The International Committee for Coal and Organic Petrology established two awards, the Reinhardt Thiessen Medal and the Organic Petrology Award, to acknowledge the achievements of researchers at different stages of their careers. The idea of the Reinhardt Thiessen Medal originated from Prof. Erich Stach and the award was established in the 1950s, whereas the Organic Petrology Award was established about 50 years later in 2004.



Reinhardt Thiessen Medal

Reinhardt Thiessen Medal is the highest award offered by ICCP. It recognizes outstanding contributions in the fields of coal and organic petrology. The Award was named after Reinhardt Thiessen (1867-1938) to honor him as a pioneering organic petrologist. Reinhardt Thiessen pioneered a thin section method to study coal in the United States and also application of spores in correlation of coal seams. He was a scientist working mainly at the United Stated Bureau of Mines, conducting research on coal, peat, and oil shale (see Figure 1).



Figure 1. Dr. Reinhardt Thiessen studying the structure of charcoal under microscope in his U.S. Bureau of Mines office. Photo taken in November, 1918.

Thiessen was one of the first in the world to relate bands in coal to a microscopic classification of coal. His publishing record on coal and his collection of about 19,000 thin-section slides of American and world coals are the legacy of his monumental work in organic petrology.

Awardees of the Reinhardt Thiessen Medal are recognized for the following aspects of their organic-petrology related research:

- Significant contribution to the advancement of any branch of organic petrology on either fundamental or applied studies (or both);
- Contribution to the utilization of petrographic studies relating to industrial activities;
- Contribution to training, education and dissemination of organic petrology science, including establishment of organic petrology laboratories in countries with less tradition of organic petrology; or
- Contribution to positioning organic petrology within other branches of science.

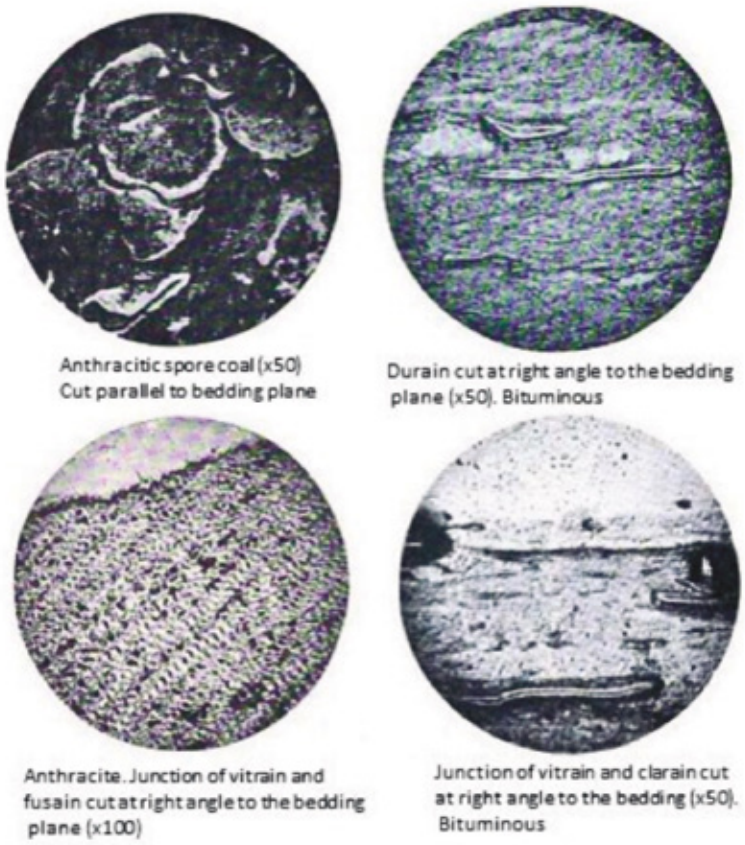


Figure 2. Microscopic images of coal by C.A. Seyler. Source: Classification of coals and the interpretation of analyses in: Analyses of British Coal and Coke (Greenwell and Elsden, fourth edition, 1924).

As of June 2024, thirty four individuals have been awarded the Thiessen Medal. The first Medalist was Dr. Clarence A. Seyler in 1956. His immense contribution of coal science included the internationally recognized Seyler Coal Chart, application of Berek's photometer and oil immersion known refractive values in measuring reflectance of polished sections. His publications include: *The Classification of Coals and the Interpretation of Analyses* (Seyler, 1907; Figure 2 is an example of microscopic images from the 4th edition of this work) *Petrography and Classification of Coal I,* II (1931;1938); *Description of Seyler's Fuel Chart* (1933) and many others. The relevance he gave to organic petrology is shown by the topic selected for his Melchett Award lecture in 1941 *Recent progress in petrology of coal* (Seyler, 1948).

Other recipients of the Thiessen Medal include distinguished individuals recognized in coal and organic petrology studies, such as Marie-Therese Mackowsky and Marlies Teichmüüller in 1971, Duncan G. Murchison in 1987, Claus F.K. Diessel in 1991, Alan Davis in 1994, Alan C. Cook in 1996, James C. Hower in 2003, and many other world-recognized organic petrologists. The most recent Medal was awarded to Maria Mastalerz in 2020 (see list of Thiessen medalists).



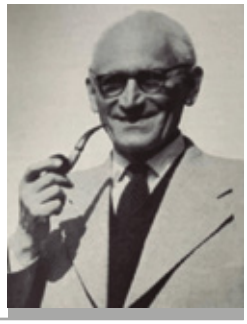
Clarence A. Seyler, UK. 1956.
Nelson Terrace Laboratories, Swansea, United Kingdom.

For the development of an internationally accepted system (Seyler Coal Chart) for the classification of coal to determine coal suitability for specific uses, for his pioneering work in organic petrology using oil immersion with a Berek photometer.



Gilbert H. Cady, USA. **1963.**
Illinois Geological Survey, USA.

For his influence on American geologists dedicated to coal geology and his impact in the personnel of coal mining industry. He worked actively in the development of a coal classification before a formal system was available. Among organic petrology he used polished surface sections of broken coal and incorporated the use of spores for correlation of coal seams.



Robert Potonié, Germany, **1964.**
Geological Survey of North-Rhine-Westphalia in Krefeld and Professor at the University of Bonn, Germany.

For his contribution to palynology revolutionizing how palynotaxonomy and nomenclature were organized and strengthening the link between palynology and organic petrology being a reference for the future development of the discipline.



Erich Stach, Germany. **1964.**
Geological Survey of North Rhine-Westphalia in Herne, later in Krefeld, Germany.

For establishing techniques key in development of organic petrology such as relief- and plane-polishing techniques, introduced polished grain mounts, coal petrographic analysis techniques, and introduced oil immersion objectives. He published the Textbook of Coal Petrology which was a reference for tens of years.



Innokentii I. Ammosov, Russia. **1967.**
Academy of Sciences of the U.S.S.R., Moscow, Russia.

For his pioneering work in establishing the equivalence between the Genetic Nomenclature of the Geological Institute of the Academy of Science of the U.S.S.R. (Moscow) and reflected light nomenclature widely used in western Europe.



Edwin Hoffmann, Germany. **1968.**
Kohlenpetrographische Rohstoffstelle der Saargruben AG, Saarbrücken, and Märkische Steinkohlen gewerkschaft, Heesen, Germany.

For being a pioneer in the field of applied coal petrology. Defined the increase in reflectance with increasing coalification which marked the beginning of reflectance measurements.



Marie-Therese Mackowsky, Germany. **1971.**
Bergbau-Forschung GmbH, Essen, Germany.

For her successful research into applied coal petrology, particularly in the area of maceral analysis, coal pyrolysis, mineral matter in coal and the assessment of coke properties from petrographic coal analyses, as well as in honour of her international reputation as university professor and as scientific expert in her field.



Marlies Teichmüller, Germany. **1971.**
Geologische Landesamt Nordrhein-Westfalen in Krefeld, Germany.

For her key influence in the development of organic petrology including the classification and definition of macerals and the impact of her work in future generations of organic petrologists.



Boris Alpern, France. **1975.**
Research Group on Fossil Fuels at the University of Orléans, France.

For his work in many aspects of organic petrology such as Nomenclature, Methods of analyses, Coke making, Coke petrography and the role of macerals and microlithotypes in coke formation, combustion, Mine outbursts, Oil shale valorization and Cleat system. His contribution to the UN-ECE Coal classification was crucial.



Raymond Noël, Belgium. **1975.**
INICHAR (Institut national des industries charbonnières) later ISSeP, Liege, Belgium.

For the petrographic characterization of all Belgian coal seams and research into the relationships of petrographic and physico-chemical parameters, extending his interest to source rocks as part of applied petrology. His achievements include the creation of a coal petrology laboratory, and a laboratory for palynologic and palyno-stratigraphic studies.



Peter Hacquebard, Canada. **1979.**
Geological Survey of Canada, Nova Scotia, Canada.

For introducing in Canada the importance of studying vitrinite components and their effect on the technological properties of coal and performing extensive regional assessment of rank in Canadian coal-bearing strata, using reflectance.



William Spackman, USA, **1984.**
Emeritus Professor at College of Earth and Mineral Sciences, Penn State University, USA.

For his work in the characterization of peat and coal deposits, and the utilization of coals of all types. In particular his influence in introducing organic petrology to U.S. steel companies to improve coke and iron making operations and his contribution to establish the Catalog of Fossil Spores and Pollen.



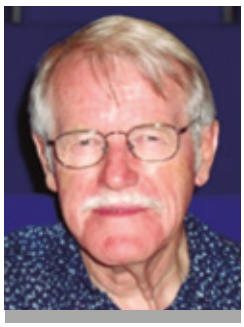
Duncan G. Murchison, UK. **1987.**
Newcastle Research Group (NRG) on Fossil Fuels and Environmental Geochemistry, Newcastle upon Tyne, United Kingdom.

For his outstanding work on the optical properties of metal oxides, ore minerals, natural and carbonised coal macerals and the impact of igneous intrusions on coal rank and sediment maturity. He carried out pivotal early work in establishing vitrinite reflectance as a front-line tool for assessing coal and sediment thermal history and is considered the father of UK organic petrology.



Harold V. Smith, UK. **1990.**
Emeritus Professor. University of Sheffield, United Kingdom.

For his contribution to coal petrology and palynology, for his many valuable contributions in industrial application of coal petrology, and for his work on the International Hadbook of Coal Petrography.



Claus F.K. Diessel, Australia. **1991.**
Emeritus Professor of the University of Newcastle, Australia.

For his outstanding work on the formation and utilization of coal, especiallly of Australian Gondwana coals.



Alex R. Cameron, Canada, **1992.**
Institute of Sedimentary and Petroleum Geology, Geological Survey of Canada, Calgary, AB, Canada.

For his pioneering petrographic investigations that revealed a heretofore unrecognized array of compositionally distinct macerals that determine coal seam characteristics and industrial coal properties and the significance of this research to science and industry.



Helmut Jacob, Germany. **1993.**
Federal Institute for Geosciences and Natural Resources, Hannover, Germany.

For his outstanding work on bitumen classification.



Alan Davis, USA. **1994.**
Emeritus Professor of Geology at Penn State University, USA.

For his research and contribution in many fields of organic petrology including the chemistry of fluorescence, promotion of automated petrographic analysis, coal hydrogenation and liquefaction residues, coalification patterns and development of anisotropy.



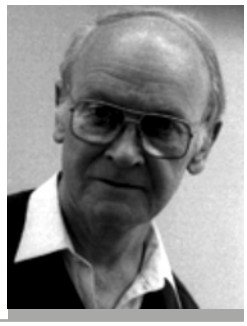
Monika Wolf, Germany. **1995.**
Prof. of the Lehrstuhl für Geologie, Geochemie und Lagerstätten des Erdöls und der Kohle RWTH Aachen, Germany.

For her outstanding work in the application of organic petrology to regional geological mapping, environmental problems and the characterization of lignites, oil shales and bituminous coals.



Alan C. Cook, Australia. **1996.**
Keiraville Konsultants Pty Ltd; 7 Dallas St., Wollongong, NSW 2500, Australia.

For his outstanding work on coal geology and coal and organic pretrology. Specially his contribution to the nomenclature of liptinite group macerals.



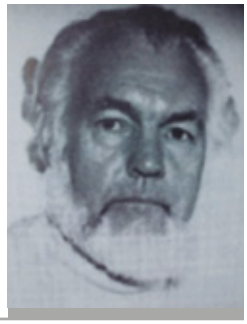
Geoffrey H. Taylor, Australia, **1997.**
Director of the Centre for Resource and Environ-mental Studies. Professor at the Australian National University & CSIRO, Australia.

For his outstanding contributions as an innovative researcher in organic petrology in the ultrafine structure of coals, cokes and carbons as revealed by electron microscopy, and the discovery of the mesophase mechanism of carbonisation.



Javier González Prado, Spain. **1998.**
Instituto de Ciencia y Tecnología del Carbono, INCAR-CSIC, Oviedo, Spain.

For his pioneering work in interpreting the composition of bituminous coal blends using the Gaussian reflectance distributions of the components. For his contribution to understanding coal oxidation and to the improvement of analytical procedures in organic petrology through automation.



Paul Robert, France, **1999.**
S.N. Elf Aquitaine. Laboratoire Géologie Boussens. 31360 Saint Martory, France.

For his contribution as an innovative research in organic petrology, especially in the establishment of a laboratory, which was highly influential in the way the science has been applied in the petroleum industry.



Ralph J. Gray, USA. **2000.**
U.S. Steel Corporation, Monroeville, Pittsburgh, USA.

For his wide-ranging contributions of successful industry-related achievements, and especially for his pioneering work relating the microscopic characteristics of coals to industrial properties, particularly in the field of coke making.



Marc Bustin, Canada. **2002.**
Department of Earth, Ocean and Atmospheric Sciences, Faculty of Science, Vancouver, BC V6T1Z4, Canada.

For his contributions as an innovative researcher in organic petrology and in applying organic petrological studies to general geology, coal geology and petroleum geology, and for his influence in developing organic petrology within Canada.



Manuel João Lemos de Sousa, Portugal. **2005.**
Prof. Department of Geology, University of Porto, After-wards Prof. of the University Fernando Pessoa, Portugal.

For his work in international standards organisations, especially ISO and UN-ECE that has enhanced the standing and reputation of ICCP. His work has concerned meta-anthracites and other high rank coals of the Iberian Peninsula where He recognised the inversion of maceral reflectivities in these very high rank coals.



James C. Hower, USA. **2003.**
University of Kentucky, Center for Applied Energy Research, 2540 Research Park Drive Lexington, KY 40511-8410, USA.

For his many contributions in the application of organic petrology to coalfield geology and in recognition of his efforts in promoting coal petrology through his editorship of the International Journal of Coal Geology and many other venues.



Fariborz Goodarzi, Canada. **2005.**
Geological Survey of Canada, 3303-33rd Street, N.W., Calgary, Alberta T2L 2A7, Canada.

For his outstanding work in the use of bitumens, chitinozans, graptolites and scolecodonts as indicators of source rock maturity and on the geochemistry of minor elements in Canadian coal deposits and the relevance of its distribution and significance for coal usage and its environmental impact.



John C. Crelling, USA. **2007.**
Department of Geology, Southern Illinois University Carbondale, IL 62901-4324, USA.

To recognize - a remarkably successful scientist who devoted his professional career to organic petrology, an exceptional mentor of students and associates and a vital contribution to the success of the ICCP.



Zuleika Correa da Silva, Brazil. **2014.**
Prof. Department of Geology. Universidade Federal do Rio Grande do Sul, Brazil.

For a fundamental and pioneering role in the dissemination of knowledge in our science through the establishment of the first coal petrographic laboratory in academia in Brazil. She was extremely active in promoting coal and organic petrology throughout Latin America and as a member of the boards of multiple geological and geochemical associations.



Walter Pickel, Australia. **2015.**
Coal & Organic Petrology Services Pty Ltd., PO Box 174, Sans Souci, NSW 2219, Australia.

For an extremely high quality of work as well as displaying integrity in his personal conduct. Considering his strong academic background, solid professionalism and substantial contribution to the work of the ICCP.



Kuili Jin, P.R.China. **2017.**
Professor of Coal and Organic Petrology. Key Laboratory of Coal Resources China University of Mining and Technology-Beijing, China.

For being a founder of modern organic petrology research in China, with innovative publications in both Chinese journals and international journals. His work includes fundamental studies of coal/organic petrology, coal-bearing sedimen-tology, oil and gas geology, as well as classification of organic matter, coal metamorphism, new techniques in coal/organic petrology, and the application of organic petrology to both coal utilization and petroleum industries.



Reinhard F. Sachsenhofer, Austria, **2018.**
Institut für Geowissenschaften, Geologie und Lagerstättenlehre, Montanuniversität Leoben 8700 Leoben, Austria.

For his contribution to the utilization of organic petrology in basin analysis, (unconventional) hydrocarbon systems, source rocks and coal research. He also applied concepts of organic petrology together with palynology and organic geochemistry to decipher changes in paleo-vegetation and climate.



Maria Mastalerz, USA. **2020.**
Indiana Geological Survey Indiana University, 611 North Walnut Grove,Bloomington, Indiana 47405-2208, USA.

For her research on coal geology and organic petrology and geochemistry of hydrocarbon source rocks. Much of her research has concentrated on coalbed methane potential together with the petrology and geochemistry of hydrocarbon source rocks. One technique that she has used very effectively has been micro-FTIR.

The Reinhardt Thiessen Medal consists nowadays of a bronze medal and a certificate. Previously, as recorded by Davis (1998), it was made up of coal and consisted of a finely ground mixture of anthracite, semianthracite and hard pitch as binder briquetted under high pressure to produce a green cast that was further calcined at 900 °C. The production was carried out at Bergbau Forschung GmbH. The recipients are selected by the Thiessen Award Committee typically consisting of the five most recent medallists. Applications for the Award are called every two years.

Members submitting a nomination should provide:

- A detailed CV including bibliography
- A supporting letter of sufficient detail to provide the basis for a laudation
- Submission of candidate's most important publications (preferably in pdf format) is required. Translations of publications in some languages may be requested.



Organic Petrology Award

The Organic Petrology Award was established by the International Committee for Coal and Organic Petrology to acknowledge the contribution of petrologists to coal and organic petrology research. The Award was established during the 55th ICCP Meeting in Utrecht in 2003 and is aimed at petrologists at the intermediate stage of their career and restricted to applicants under 50 years of age. It consists of a bronze medal and the Organic Petrology Award certificate.

Various aspects of coal and organic petrology are taken into account, e.g. the origin of coal, oil and gas, alteration during coalification/maturation, application to industry (e.g. combustion, coke making, hydrogenation), mining safety, self-heating, environment, carbon materials and many others. The contribution of petrologists is shown in the publication of books, reports and scientific papers in international journals of high impact and significance, co-working with industry, teaching the next generation of organic petrologists, and presentation of research works during international meetings. The recipients of the Organic Petrology Award since its creation are shown in listed below.



Maria Mastalerz, Recipient of the **2004** Organic Petrology Award with the President A.C. Cook Indiana Geological Survey Indiana University, USA.

For her research in many aspects of coal geology and petrology, including electron microprobe examination of coal and the in situ organic geochemical characterization of macerals, the petrology and chemistry of Indiana coals and their combustion by-products and her relevant contributions to coalbed methane and carbon dioxide sequestration research, as well as for her dedication to her students.



Isabel Suárez-Ruiz, Recipient of the **2006** Organic Petrology Award with the President A.C. Cook. Instituto de Ciencia y Tecnología del Carbono, INCAR-CSIC, Oviedo Spain.

For outstanding research on the structure of vitrinite, the behaviour of perhydrous coals and coal pyrolysis. The studies on the characteristics of Spanish coals, in particular the Carboniferous coals from the Asturian Basins and from the central part of Spain and more recently recently on the petrology of carbons and Fly-ashes.



Angeles G. Borrego, Recipient of the **2008** Organic Petrology Award with the President P. David and Vice-president L. Vasconcelos. Instituto de Ciencia y Tecnología del Carbono, INCAR-CSIC, Oviedo Spain.

For the contribution to combustion and pyrolysis of macerals, the study of oil shales, dispersed organic matter and organic geochemistry and the strong support shown in both professional development of students and to the professional bodies which service the organic petrology community.



João Graciano Mendonça Filho, Recipient of the **2012** Organic Petrology Award with the President P. David and the General Secretary A.G. Borrego. Laboratório de Palinofácies & Fácies Orgânica (LAFO), Departamento de Geologia, Instituto de Geociências, Universidade Federal do Rio de Janeiro, Rio de Janeiro, Brazil.

For his leadership in Brazil in the field of the organic petrology and geochemistry related to Oil Exploration, including Petroleum Geochemistry, Palynofacies and Organic Facies, and Environmental Organic Geochemistry. His engagement in teaching, dissemination and promoting organic petrology.



Magdalena Misz-Kennan, Recipient of the **2014** Organic Petrology Award with the President P. David and the General Secretary A.G. Borrego. University of Silesia, Faculty of Natural Sciences, Institute of Earth Sciences, Sosnowiec, Poland.

For her her contribution to organic petrology and geochemistry of coal, including but not limited to areas such as coal combustion by-products, coal combustion, and spontaneous coal combustion. She has also contributed significantly to the application of organic petrology in technological processes, and the understanding of the role of organic matter in the environment.



Paul C. Hackley, Recipient of the **2019** Organic Petrology Award with the President A.G. Borrego. U.S. Geological Survey, Reston, Virginia, USA.

For his outstanding contribution in relation to shale gas and his effort in setting up the first comprehensive Standard for work with DOM (ASTM D7708) combined with the enthusiasm in which he approaches challenges in the field of organic petrology.



Jolanta Kus, Recipient of the **2021** Organic Petrology Award with the President A.G. Borrego and the General Secretary P. Hackley. BGR. Hannover, Germany.

For her contribution to various aspects of coal and organic petrology, sedimentary basins, sedimentology, tectonics, geological mapping and geological processes, exploration, field geology and minerals.



Stavros Kalaitzidis, Recipient of the **2023** Organic Petrology Award with the President A.G. Borrego and the Chair of the Organic Petrology Award M. Misz-Kennan. Laboratory of GeoEnergy, Department of Geology, University of Patras, Greece.

For his research on geology, ore geology (metallic minerals), organic petrology, source rock evaluation, ore modelling and resource estimation, environmental impacts of mining, environmental applications of raw materials including coals, and their industrial.

The Award is given every two years to a petrologist selected by the Organic Petrology Award Committee based on submitted nominations that include a letter of nomination accompanied by any documents supporting the nomination, e.g. available or access to CV, web-based profile, list of publications, etc. The Organic Petrology Award Committee consists of the last five Awardees available. The Chair of the Subcommittee Dr. Magdalena Misz-Kennan.

Acknowledgement

The photos of the awardees have been compiled from the records of the awards available in internet, the obituaries in some cases, the record of the ICCP directory and the ICCP Newsletter. The photo of E. Hoffmann is courtesy of Eckart Hoffmann and Jolanta Kus.

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Kus J., 2021 receiving Organic Petrology Award from President of ICCP Angeles Borrego and Vice-President Paul Hackley during the ICCP Meeting in Patras 2023. **https://www.iccop.org/documents/iccp-news-no-87.pdf/**

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Seyler, C.A., 1907. The Classification of Coals and the Interpretation of Analyses. In Analyses of British coals and coke (Compiled by A. Greenwell and J. Vincent Elsden) 1-15. The Chichester Press, London.

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Suárez-Ruiz, I., 2006 Organic Petrology Award being presented to Isabel Suárez Ruiz by ICCP President Alan Cook **(https://www.iccop.org/documents/iccp-news-39.pdf/).**

THE CONTRIBUTION OF ICCP TO STANDARDS FOR ORGANIC PETROGRAPHIC ANALYSES

Angeles G. Borrego

Instituto de Ciencia y Tecnología del Carbono (INCAR-CSIC)
Francisco Pintado Fe 26, 33011 Oviedo.

This contribution is very much based on the one I prepared as keynote for the 2019 Meeting held in The Hague. At that moment the chair of the organizing committee George Siavalas was planning a couple of keynotes for the opening session and one was assigned to the president (at that time myself). The topic selected was highlight the contribution of the ICCP to the norms of petrographic analysis, relevant in a context in which the other speakers Hemmo Bosscher from Shell and Martin Hulsebosch from the Town Hall were talking about the relevance of having a petrologist on board for an oil company and how a local government (The Hague) can be engaged with the energy transition, respectively. When compiling the contribution of the ICCP to the preparation of standards I did not know that I myself would be involved in this task that materialized with the attendance as ICCP representative to the ISO TC27 coal and coke meeting in Delft in 2023 (Figure 1).

Contribution to the ISO 7404 standards for petrographic analysis of coals



Anybody having a close look to the ISO standards for coal petrographic analyses and knowing the analytical procedures described in the ICCP handbook would realize that the ISO 7404 standards for vocabulary, sample preparation, maceral and microlithotype analyses and vitrinite reflectance measurements, are entirely based on the ICCP methods and procedures described in the handbook (ICCP, 1963) and also described in organic petrology textbooks such as Stach et al. (1982) and Taylor et al., (1998) authored by ICCP members. From the very beginning the founder members of the ICCP realized that harmonizing the nomenclature was a key issue, indeed this was the reason of creating the ICCP that was acknowledged at the 3rd Carboniferous Congress for Stratigraphy and Geology held in Heerlen (The Netherlands) in 1951. On the initiative of the President (R. Potonie), the ICCP established a Nomenclature Sub-committee to deal with the preparation of a glossary of terms that should meet twice a year. The first outcome of this Sub-committee was the ICCP Handbook published in 1957. The nomenclature of coal macerals observed using reflected light and oil immersion objectives was named as Stopes-Heerlen system.

Figure 1. Family photo of the ISO/TC 27 Coal and Coke group held in Delft 2023 with attendance of an ICCP representative.

The first Chair of the Nomenclature Sub-committee was M. Legraye (Belgium), who was later replaced by G.W. Fenton (U.K.), E. Stach and M. Teichmüller (Germany) successively, with R. Noël as Secretary in the period until the publication of the 2nd edition of the Handbook (Table 1). The second edition of the Handbook involved significant revision, new terms were added and a second part dealing with Methods of Analysis was included. Relevant for the ISO standards were the definitions of the three maceral groups and 2 macerals of the vitrinite (telinite and collinite), 4 macerals of the liptinite (sporinite, resinite, cutinite and alginite) and 4 of the inertinite (fusinite, semifusinite, sclerotinite and micrinite). Further macerals of the vitrinite (vitrodetrinite and collinite submacerals), inertinite (macrinite and inertodetrinite) and liptinite (liptodetrinite) were added in the 1st supplement (ICCP, 1971) and also new liptinite macerals (bituminite and suberinite) in the 2nd supplement (ICCP, 1975). All the microlithotype terms were also included in the 2nd edition of the Handbook. This means that by 1975 all the terms for microlithotypes and macerals forming part of the ICCP-Stopes-Heerlen system were already defined and published. These were the terms included in the ISO 7404-1 devoted to vocabulary which was first published in 1984 (Table 2).

Table 1. Composition of the Nomenclature Sub-Committee and Analysis Sub-Committee participating in the 2nd Edition of the Handbook (ICCP, 1963). In bold the persons acting as Chairs (C) or Secretaries (S) in the period.

Nomenclature Sub-committee		**Analysis Subcommittee**	
Alpern B (FR)	**Noël R (BE) S**	Alpern B (FR)	Noël R (BE)
Ammosov I (RU)	Parks BC (US)	Berry W (US)	Smith AHV (UK)
Asai K (JP)	Potonie R (DE)	Bogoliubova II(RU)	Spackman W (US)
Cady GH (US)	Schopf JM (US)	Brocades-Zaalberg H (HO)	Taylor GH (AU)
Chandra D (UK)	Seyler CA (UK)	Chandra D (UK)	Thompson RR (US)
Dijkstra SJ (HO)	Smith AHV (UK)	Dath P. (BE)	
Duparque A. (FR)	Spackmann W (US)	Grand'ry EH (BE)	
Fenton GW (UK) C2	**Stach E (DE) C3**	Harrison JH (US)	
Grand'ry EH (BE)	Taylor GH (AU)	**Hevia-Rodriguez V (ES) S**	
Hacquebard PA (CA)	**Teichmüller M (DE) C4**	Karmasin von K (DE)	
Hevia-Rodriguez V (ES)	Thompson RR (US)	Lensch G. (DE)	
Kosanke RM (US)	Timofeev PP (RU)	**Mackowsky M-Th (DE) C**	
Legraye M (BE) C1	Waltz IE (RU)	Mukherjee BCh (IN)	
Mackowsky M-Th (DE)	Yablokov (RU	Murchison DC (UK)	
Mukherjee BCh (IN)		Nahuys J (BR)	

The Part II of the Handbook was the outcome of the Analysis Commission created in 1955, which was chaired by M.-Th. Mackowsky (Germany), being the Secretary V. Hevia (Spain). In the 2nd Edition of the Handbook there were sections for: Recommendations for the preparation of polished surfaces of lump and particulate samples, maceral analysis of particulate samples, microlithotype analysis of particulate samples, determination of Rank by vitrinite reflectance measurements and analysis of blends of coals of different rank (ICCP, 1963). In the successive supplement of 1971 further details for combined maceral and microlithotype analysis and mineral distribution were added and the 1975 supplement also included fluorescence microscopy and fluorescence photometry (ICCP, 1971, 1975). Out of these methods the sample preparation procedures (ISO 7404-2), the maceral analysis (ISO 7404-3), the microlithotype analysis (ISO 7404-4) and the vitrinite reflectance analysis comprising measurement of random and maximum reflectance and analysis of coal blends (ISO 7404-5) became ISO standard procedures for the petrographic analysis of coals. Table 2 shows the various standards and updates for the petrographic analysis of coals of ISO and ASTM.

Table 2. Existing standards produced by ISO (International Organization for Standardization) and ASTM International (founded as the American Society for Testing and Materials) dealing with the petrographic analysis of coals and their updates.

ISO	1st	2nd	3rd	4th	ASTM	1st	Nº Updates
ISO 7404-1	1984	1994		2016	**ASTM D121**	2004	10
ISO 7404-2	1985		2009		**ASTM D2797**	1999	11
ISO 7404-3	1984	1994	2009		**ASTM D2799**	1999	10
ISO 7404-4	1988			2017			
ISO 7404-5	1984	1994	2009		**ASTM D2798**	1999	11

In the first edition of the ISO 7404 standards appeared between 1984 and 1988, the ICCP methods of analysis as described in the Handbook (ICCP, 1963, 1971, 1975) and also summarized in Stach et al (1982) and Taylor et al. (1988) were included without discrepancies. This consistency was due to the obstinacy of many ICCP members who were part of the ISO Technical Committee 27 devoted to coal and coke and specifically the Sub-Committee 5 engaged with the Methods of Analysis. Some of them in the early times were B. Alpern (CERCHAR, FR), R. Nöel (INCHAR, BE), M.Th. Mackowsky (Bergbau Forschung, DE), H. Smith (NCB, UK), V. Hevia (INCAR, ES), G.H. Cady (ISGS, US), to mention just a few. The first version and the revision of some of the standards (parts 1, 3 and 5) made use throughout the text of the Stopes-Heerlen nomenclature of the ICCP, whereas the last updates in 2009 and 2016 make use of the ICCP System-1994 (ICCP 1998, 2001, Sykorova et al. 2005; Pickel et al., 2017). In the most recent revision of the standards (2016 and 2017) W. Pickel was chairing the WG 14 devoted to coal petrographic analysis, which was key to ensure that the ICCP System-1994 was considered. He was also regularly reporting within the standardization WG of the ICCP.

The ASTM international also produced standards for petrographic analysis of coals. The first version dates back to 1999 and since then they have been updated no less than 10 times. The most recent versions also included ICCP System-1994 nomenclature. Both set of standards produce results which are worldwide comparable. To mention some of the differences regarding sample preparation the top grinding size is larger in ISO 7404-2 standard than in ASTM D2797 (<1 mm vs. <850 μm-20 mesh). The binder should not have chemical reaction with the coal or immersion oil, it should have good penetration of pores and cracks and should easily wet and

held secure the coal particles and it should have a marked contrast with the coal particles under reflected light and oil immersion observation conditions. The ISO 7404-2 standard is more specific regarding binder temperature that should be less than 100 °C, preferably 60 °C, for liquid binder and less than 120 °C for solid binder, whereas no further specifications are included in ASTM D2797. An ICCP working group was created to test the effect of temperature when using solid powder, which was convened by Dave Pearson. The outcome of this WG contributed to the specification about solid binder in the 2009 update of ISO 7404-2. The final polishing top size it is specified as 0.05 μm in most of the examples provided in both standards, although 0.1 μm is accepted in one of the polishing combinations listed in the ASTM standard. This topic is particularly relevant because the finer the abrasive size, the brighter the polished surface (Borrego, 2017) and therefore the vitrinite reflectance results would only be comparable if the samples have been polished under the conditions specified by the standard. Nowadays the use of Ion Milling Sputtering for the study of microporosity in unconventional gas and oil plays make particularly necessary to specify that this procedure does produce brighter surfaces which are not appropriate for standard vitrinite reflectance measurement (Sanei and Ardakani, 2016; Grobe et al., 2017). Regarding desiccation prior to analysis 15 h is stated in the ISO 7404-2 standard unless evidences of unaffecting whereas the ASTM D2797 standard incorporates that in the vitrinite reflectance range 0.6-1.7 % desiccation is not required.

The standards for maceral analysis (ISO 7404-3 and ASTM D2799) consider the use of a mechanical stage which is moved at regular intervals for counting. Both use the ICCP classification of macerals (ICCP-System 1994), although the ASTM standard considers the possibility of incorporating terms as pseudovitrinite, which are not accepted in the ICCP Classification. In both standards is stressed that the results are provided on volume percent. They are counted including minerals or on a minerals-free-basis and mineral matter can be also calculated using the Parr formula from the ash and sulphur content by weight obtained by other standards. Regarding the decisions when boundary situations occur, the ISO standard is more specific in guiding the decisions-taking and incorporates the procedures described in the ICCP handbook (ICCP, 1963, Stach et al., 1982 and Taylor et al., 1998). The number of points to be counted is 500 in the case of ISO and 1000 in ASTM in two different pellets. The expression that calculates the theoretic standard deviation associated to this type of analysis is shown in Figure 2, where it can be seen that the benefit in precision of doubling the number of points from 500 to 1000 is relatively small.

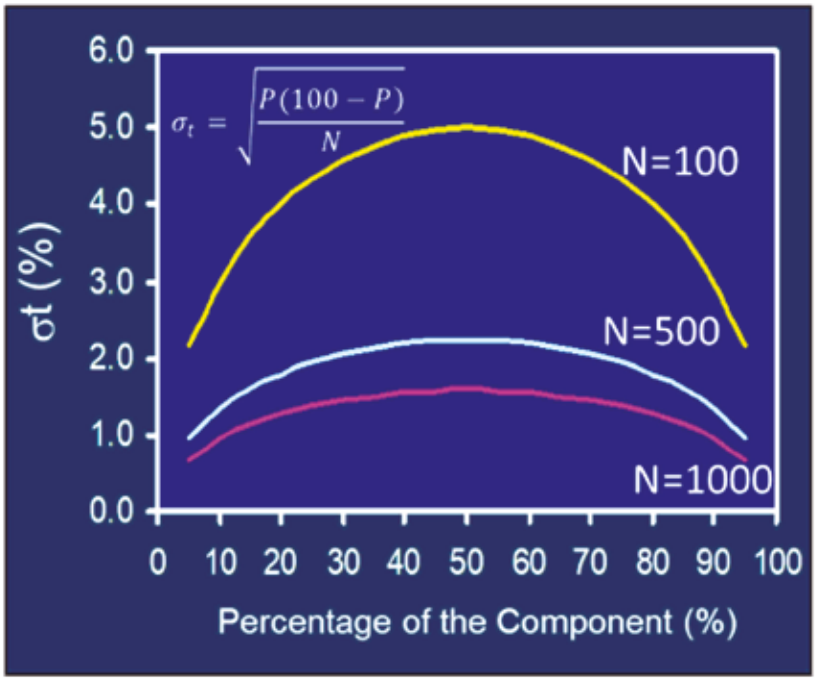

Figure 2. Theoretic standard deviation (σt) calculated for the maceral analysis of coal where P is the percentage of a given component and N the number of points counted in the test. This is used to establish the repeatability Interval as Ir=2√2*σt (ISO 7404-3).

The reproducibility standard deviation stated in the ASTM standard are based on a round robin on 12 vitrinite-rich (>57 %) coals of different rank analysed by 8 analysts and it ranged from 1.7 to 3.9 depending on the coal. The ISO standard states that the reproducibility standard deviation is 1.5-2.0 times higher than the theoretic standard deviation (σt). The results of the Single Coal Accreditation Program (SCAP) of the ICCP which is running since 1993 first under the leadership of Aivars Depers and nowadays under Kimon Christanis guidance shows that the reproducibility standard deviations tend to be higher than the 1.5-2.0*σt and this is so mainly for the inertinite-rich coals and for relatively high rank coals where the contrast between macerals is not so high (Figure 3). The results of SCAP are very robust since the participants in SCAP have been maintained about 100 over the years **(Accreditation | ICCP (iccop.org)).**

The standard for microlithotypes analysis (ISO7404-4) is entirely based on the description of the procedures which is published in the ICCP handbook (1963) and Stach et al. (1982), Taylor et al. (1998). In all these publications some confusion exists on how to apply the so called "5 % rule" in which according to Taylor et al., (1998) and Stach et al. (1982) a 5 % impurity is allowed in the microlithotypes (corresponding to one intersection in the Kötter graticule used to perform the analysis) but this is not clearly stated in the ICCP handbook and the accompanying table illustrating the text is not in agreement with the text.

The standards for vitrinite reflectance measurement (ISO 7404-5 and ASTM D2798) are also based on the procedures described in the ICCP handbook and are currently being updated to incorporate the new illumination systems. The current version of ISO 7404-5 states that the number of readings to be taken ranges from 50 for single coals to 1000 depending on the complexity of the blend. The most extended use is to measure 100 readings. This is also the case in the SCAP Accreditation Program of the ICCP, which determines the ability of an analyst to perform random vitrinite reflectance measurements and has produced robust results over the years. The ASTM D2798 standard also requires 100 readings for vitrinite reflectance results.

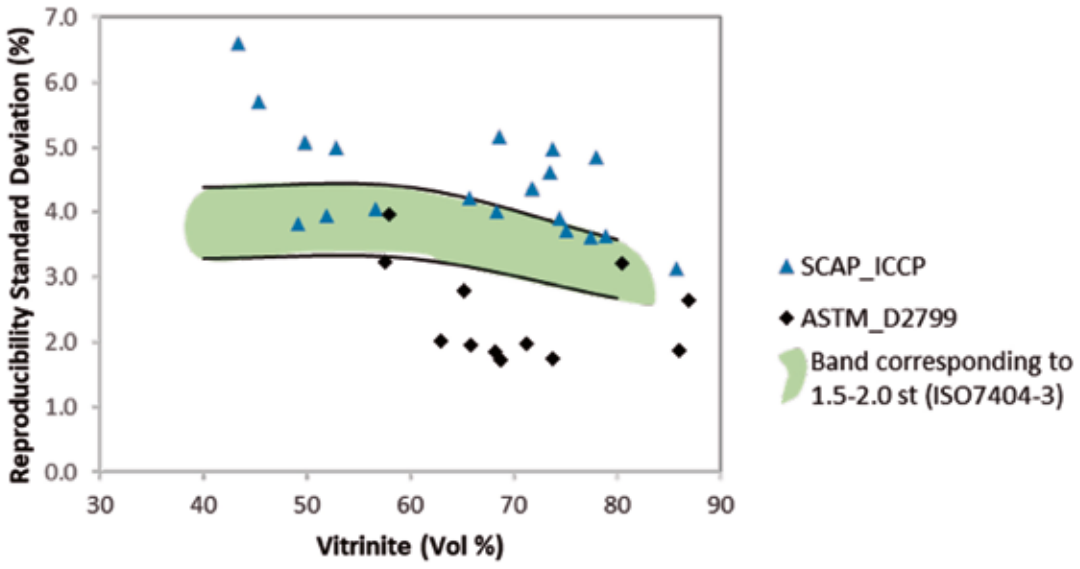

Figure 3. Reproducibility standard deviation derived from data up to 2010 of SCAP_ICCP program (over 100 results per sample counting 500 points), of ASTM (based on 1000 points and 8 analysts) and band indicating 1.5-2.0 times the theoretic standard deviation.

The repeatability limit stated by ISO 7404-5 is 0.06 % considering that the standard deviation of a single coal is 0.02 %. The reproducibility standard deviation is stated to be 0.03 %, which gives a reproducibility interval of 0.085 %. Both repeatability and reproducibility intervals are higher in ISO 7404-5 than in ASTM D2798 standard where these intervals go down to 0.02 % and 0.06 %, respectively.

The experience in SCAP program shows that whereas an 0.03 % reproducibility standard deviation occurs, a more realistic average value is 0.04 % (Figure 4), considering that the standard deviation tends to grow with the

rank as it does the mean value. The values for vitrinite-rich and vitrinite-lean coals move in a similar range and therefore this does not appear to be a critical aspect impacting the reproducibility standard deviation for vitrinite reflectance.

The second version of ISO 7404-5 standard published in 1994 incorporated guidelines to determine the number of points for the analysis of coal blends depending on the scatter of readings in the blend: If 98 % of the range of readings was within 0.4 %, 100 points were enough, rising to 500 if the range was 0.4-0.8 % and to 1000 for a greater than 0.8 % range. A WG was established in 2014 convened by Ashok K. Singh and Joan Esterle to work in the optimization of number of readings when analysing coal blends. The Coal Blends WG has been successfully working with 250 readings to determine both the vitrinite reflectance of the blend and the proportion of vitrinites in the blend (Davis, 2000) and this is the number of points requested to be measured in the Coal Blends Accreditation Program **(Coal Blends Accreditation Program | ICCP (iccop.org))** coordinated first by Isabel Suárez-Ruiz and nowadays by Malgorzata Wojtaszek-Kalaitzidi. The preliminary outcome of the WG testing the convergence of vitrinite reflectance in coal blends points to values around 250 points even for complex coal blends as stated in the Minutes of the last Meeting in Patras based on the results presented by Peter Crosdale (ICCPNews 87, 2023).

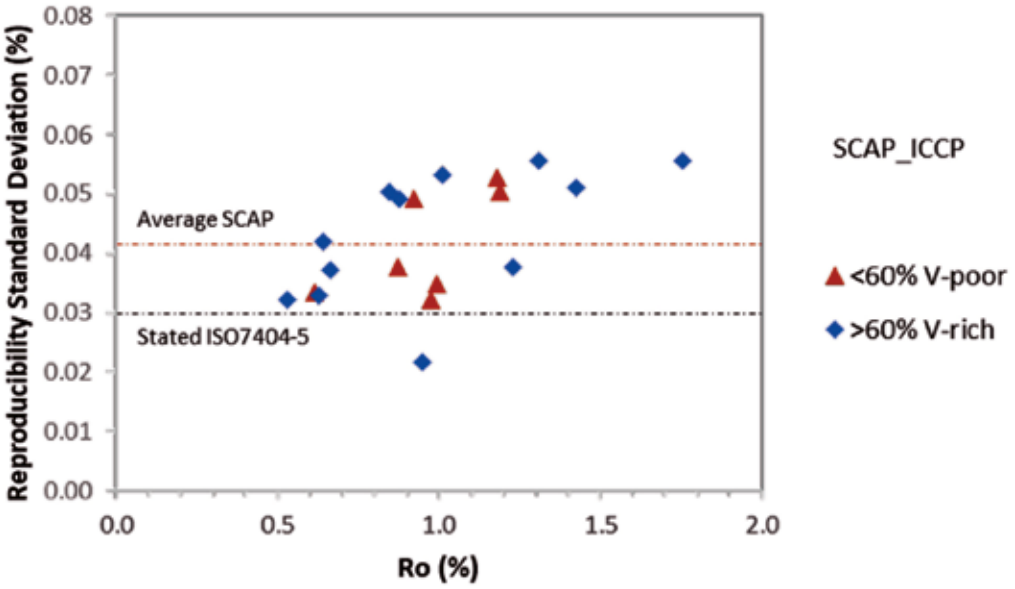

Figure 4. Reproducibility standard deviation derived from data up to 2010 of SCAP_ICCP program and average group standard deviation. Value stated in ISO 7404-5 standard for reproducibility standard deviation=0.03 %.

In 2023 the formal relationships between ISO and ICCP, which were once attempted under Alan Cook presidency, were re-established. The contact person will be the President of the ICCP in duty and the Convenor of the standardization WG, at the time of writing this document Stavros Kalaitzidis and Angeles G. Borrego, respectively. The revision of the ISO 7404 standards is on-going and ISO TC27/SC5/WG14 receives the input of the ICCP conveyed from the Standardization WG.

Contribution to the ASTM standard for Microscopical Determination of the Reflectance of Vitrinite Dispersed in Sedimentary Rocks (D7708-11)

The development of the ASTM standard for microscopical determination of the reflectance of vitrinite dispersed in sedimentary rocks was first established in 2011 thanks to the effort of Paul Hackley as convenor of the WG Identification of Primary Vitrinite. The WG initiated in 2008 as a follow up of the activities of the Qualifying vitrinite for reflectance analysis WG (Convened by Angeles G. Borrego), which worked on the impact of quality of vitrinite

surface on the scatter of reflectance analysis (Borrego et al., 2006). The main outcome of this group was that the quality of the surface introduced a minimum scatter in comparison with the identification of the indigenous vitrinite population, which was the main reason for the scatter. Therefore, the need to have specific guidelines for the identification of vitrinite in sedimentary rocks other than coal. Before having this standard, the reference was always the corresponding standards for the measurement of vitrinite in coals (ISO7404-5 and ASTM D2798). The results of the round robins carried out to check the application of the standard (ASTM D05-1037) have been published in Hackley et al. (2015) devoted to identification and measurement of primary vitrinite in source rocks of different maturity and Hackley et al. (2020) devoted to measurement the reflectance of bitumen and improvement of agreement, both well-received by the scientific community and highly cited papers.

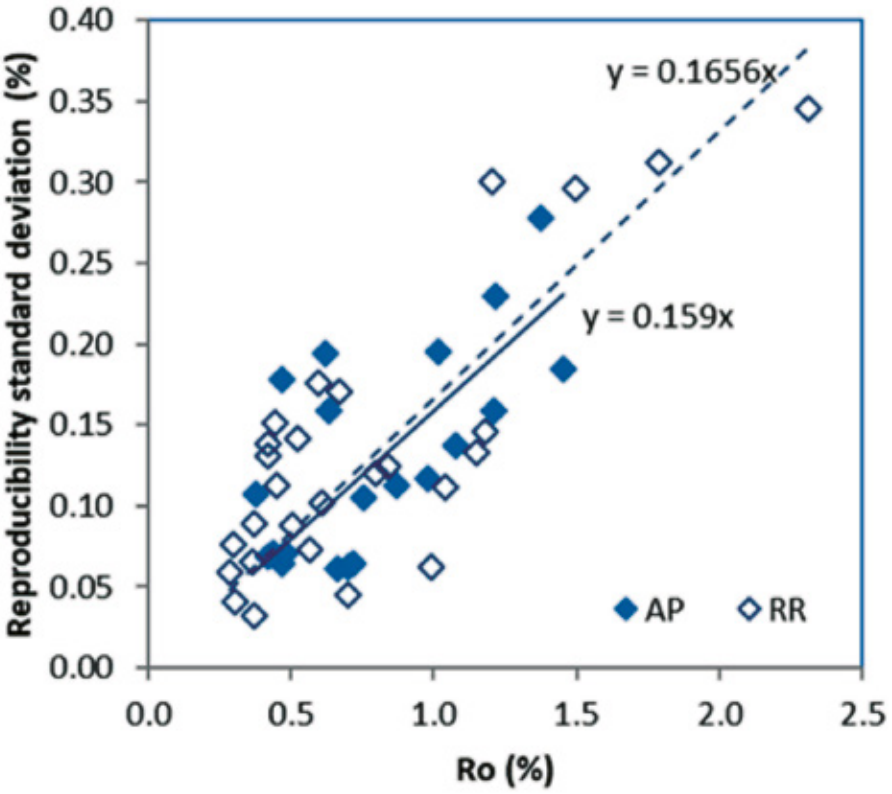

Figure 5. Reproducibility standard deviation derived from DOMVR_ICCP data up to 2018 (AP) and from Round Robin exercises run in Commission II (RR) over the years and compiled in Borrego (2009).

The DOMVR accreditation program first organized by Alan C. Cook, followed by Angeles G. Borrego and nowadays by João Graciano Mendonça Filho makes use of this standard as reference for the analytical procedures. The Reproducibility Standard Deviation in DOMVR determinations is significantly higher than that observed for coal (Borrego, 2009) and this is so for many round robins carried out over the years in Commission II of the ICCP and also for the DOMVR Accreditation Program (Figure 5). The complexity of indigenous vitrinite identification in dispersed organic matter has been largely recognized, but additional efforts are required in order to provide meaningful results. This led to the incorporation of a limit in the standard deviation of a single vitrinite population that should not be larger than 0.15 times the value of the mean. The factor 0.15 is a compromise derived to the slope of the trend-line of the many samples analysed between 2006-2018 in DOMVR AP and it is intended to invite the analyst to refuse other particles not corresponding to the indigenous vitrinite when performing the analysis.

Contribution to the ECE-UN and ISO 11760 for the Classification of Coals

The contribution of the ICCP to the development of a coal classification based nearly entirely in petrographic parameters is greatly in debt with the tireless work of Boris Alpern, Manuel Lemos de Sousa and Marie-Therese Mackowsky in the early times. The development of such classification was reviewed in the 50th Commemorative Book edited by Lemos de Sousa in 1998 (Lemos de Sousa et al., 1998). Traditionally the classification of coals has been developed by each country and the limits established are not disinterested, as they aim to enhance the value of the own resources in the context of international trade. Different international organizations have had interest in establishing an international classification system applicable to any coal worldwide. The Economic Commission for Europe of the United Nations (ECE-UN) published a first classification for Hard Coals in 1956 and for Brown Coals in 1957 but they were based on proximate analysis and gross calorific value both bulk chemical parameters. The ICCP established a Coal Classification WG, which was active between 1976 and 1991 and was successively convened by M. Kosina, N. Kaye, B. Alpern and M. Lemos de Sousa. The WG has as main objective develop a coal classification system for geological purposes (based on grade, type and rank) and advise the ECE-UN about establishing an internationally applicable coal classification system. At the ECE-UN group the representatives from France, Italy, Belgium, European Economic Community, South Africa, Spain were all ICCP members and therefore familiar with the concepts of organic petrology. The classification was finally approved in 1995 (Figure 6).

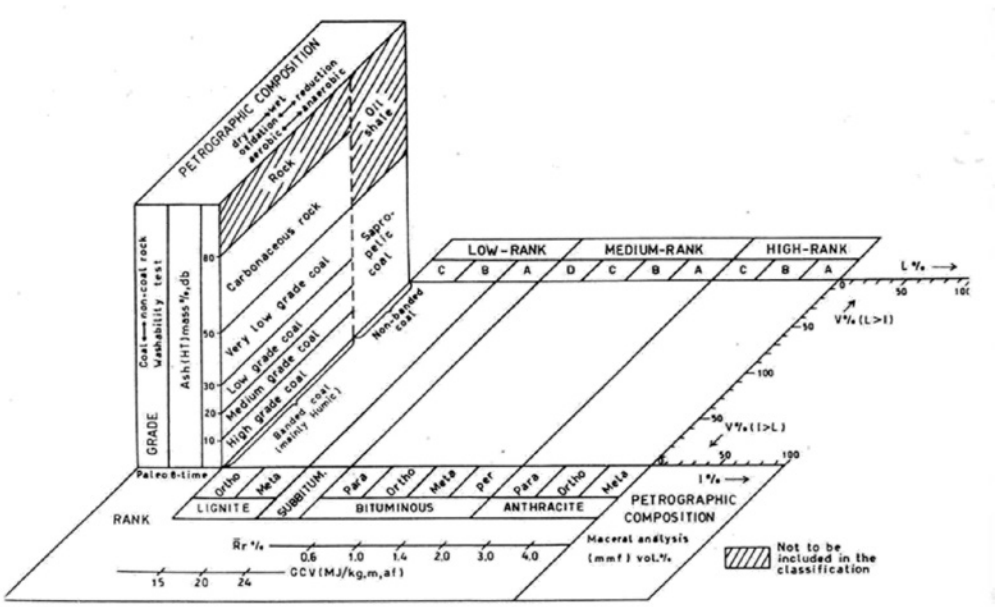

Figure 6. General version of the ECE-UN classification of in seam coals (1995) as published in Lemos de Sousa et al., (1998).

The principles of ECE-UN system are similar to those adopted by ISO Classification in which major discussion was around if the system would be applicable just for geological purposes or also for trade. In the ISO 11760 Classification the classes are established on a wider rank interval using vitrinite reflectance (Figure 7), the maceral composition is simplified and referred to vitrinite content and the concept of grade is replaced by ash content. The classification was first published in 2005 and in this period M. Lemos de Sousa, Alan C. Cook and A. Davis were key in the acceptance of the system.

Contribution to the Analysis of Metalurgical Coke Texture.

A working group dealing with carbonization has been active officially since the ICCP adopted its actual configuration into three commissions in 1983 in Oviedo. In the minutes of Commission III of that meeting it is reported that discussions on behaviour of reactive inertinite upon carbonization were held and the focus was to find test and procedures that could relate coke strength with different aspects of coal and coke petrology.

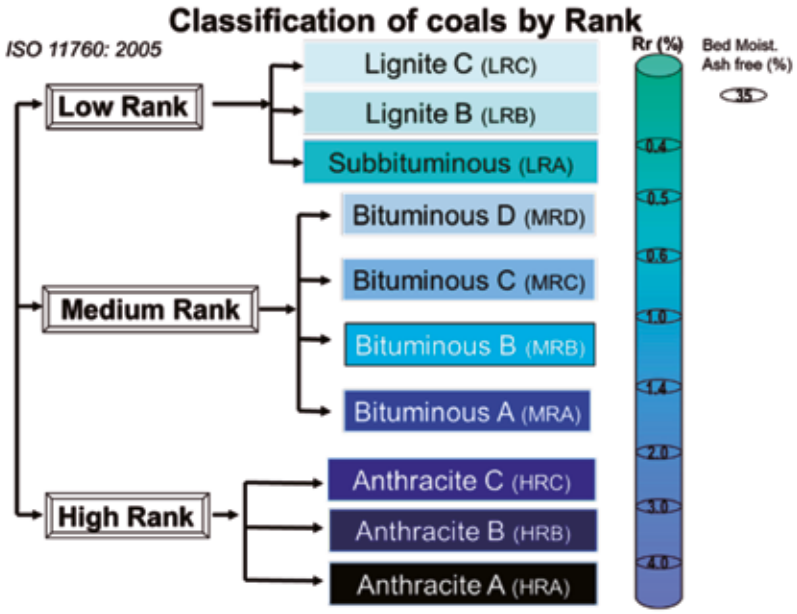

Figure 7. Reflectance limits for the classes in the classification of coals ISO 11760.

For many years Round Robin exercises were conducted on individual coals cokefied at large scale ovens in the Centre de Pyrolyse de Marienau (Forbach, France), the objectives were to relate the properties of the parent coal with the coke quality parameters and the coke optical properties. This was the period when the WG was leaded by Denis Vogt. Soon we realized that the scope of the topic was too broad to be accomplished within a WG. It has happened a number of times within the ICCP that the interest on a given problem lead us to extend the scope and objectives of the WGs well beyond what can be accomplished with ring analysis or joint discussion on a given topic (i.e. Thermal Indices WG, Coalbed methane-CO_2 sequestration WG, etc.). Indeed, a new WG was created to deal specifically with the reactivity of inertinite which was leaded by Krystyna Kruszewska and was active until 1995. When Raphael Javier took over the convenorship of the carbonization WG in 1994, the WG focused on the reproducibility of coke texture analysis and the WG was renamed to coke petrography. The initial coke petrographic texture classification applied was that used by U. S. Steel (Gray and Devanney, 1986), which is also the one used in the ASTM D5061 standard for the microscopical determination of the textural components of metallurgical coke. There is also a standard for sample preparation for coke petrographic analysis (ASTM D3997).

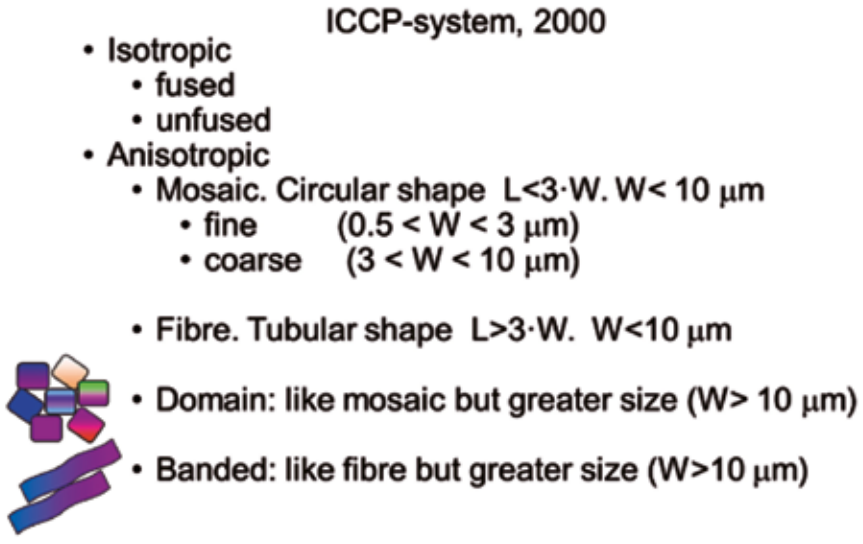

Figure 8. ICCP-system for the classification of coke matrix optical texture as used in 2000 when Raphael Javier left the convenorship of the Coke petrography WG.

The reproducibility obtained in the ring analyses applying this classification system was quite low and the WG embarked in a simplification of the system to improve agreement while maintaining its applicability. The last accepted classification at the time Raphael Javier was leaving the WG in 2000 is shown in **Figure 8,** although the reproducibility results were not satisfactory enough. With the advent of the digital era, and the facility to share microscopy images, the WG focused on the identification of microscopy images under the convenorship of Heike Liszio first and later Malgorzata Wojtaszek-Kalaitzidi. This produced closer results and higher agreement. Different adaptations of this system are currently used in the carbon materials WG (Predeanu et al., 2015, 2024).

At the meeting in Potsdam in 2015 Dave and Richard Pearson presented a summary of the outcome of a recently held Coke Petrography meeting, in Duisburg, November 12-13 2014. This included the possibilities of coke reflectance and bireflectance to be related to coke properties as alternative or in addition to optical texture. At that time, ASTM Committee D05 on Coal and Coke was working on the development of a coke standard based on reflectance measurement, which has not been formally established. On the precision and bias of birreflectance measurements have also been working the Structural Order WG (Pusz et al., 2014). The input of the ICCP to the update of ASTM coke standards is done in an informal way through the members who are part of the national committees (i.e. Canada and USA).

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THE MEMORY OF THE ICCP: THE ARCHIVES, THE NEWSLETTER, THE WEBPAGE

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In this chapter, the memory of the ICCP in the form of archives and the ways to maintain informed the membership and the general audience about ICCP activities using the Newsletter and webpage is briefly reviewed.

The archives

The ICCP archives have had an eventful life. The first informal keeper of the archives was D.G. Murchison at the University of Newcastle upon Tyne (UK). Records of the meetings, reports of the WG activities and other relevant files were compiled over the years and maintained in the same location where copies of the Handbook were available.

The files were transferred to Aachen in the custody of Monika Wolf in 1993 and the General Secretary (Zuleika Correa da Silva) travelled to Aachen to organize the Archives. In 1996 the copies of the Handbook were transferred to the Headquarters of the Dutch Geological Survey in Heerlen (The Netherlands) and two years later also the Archives were moved from Aachen to Heerlen and kept in the custody of Willem Fermont.

The decade between 1993 and 1998 was a period of high mobility for the archives following changes in the departments where they were maintained. In 1998, the archives were moved to the University of Porto. Between 1998 and 2004 the archives were in charge of Manuel João Lemos de Sousa and since 2005 the responsibility of this ICCP patrimony moved to Deolinda Flores **(dflores@fc.up.pt).** An agreement was signed between the then Department of Geology, Faculty of Sciences, University of Porto, and the ICCP to host the ICCP archives. At present, this documentary heritage, which is the institutional memory of the ICCP, has been organized and catalogued and each document is kept in a folder, in archives boxes **(Figure 1).** The list of the documents that make it are published in the ICCP website. To support and respond to the historical information needs of ICCP members, the documents that have been requested have already been digitized. However, in order to make this collection and the content of its documents more widely known, it is intended to digitize the entire document collection and upload it in the ICCP website for better dissemination and sharing of this documentary heritage, which is labelled according to the categories listed in Table 1.



Figure 1. View of the ICCP archives at the Faculty of Sciences of the University of Porto.

Table 1. Categories of the documents existing in the archives (in brackets number of entries).

Documents source	**Categories**
Alan Davis (75)	ICCP News
Boris Alpern (10)	ICCP Publications
Harold Smith (127)	Reports of Commissions
William Spackman (101)	Membership Directories
Monika Wolf (159)	ICCP Photos, including family photos (14) as well as Directory photos (provided by Peter Crosdale, 3 zip files)
James Hower (6)	Miscellaneous (19)
Slides from Harold Smith (204)	

The Newsletter

The first newsletter with Eva Wolff-Fischer (Bergbau-Forschung GmbH) and Hans Hagemann (RWTH Aachen) as editor in chief and responsible for the layout respectively, was issued in March 1989. Initially two issues were produced a year, one containing a summary of the minutes of the meeting and another one with varied contributions and the announcement of the forthcoming meeting. Previously and still for a while full minutes were distributed to the members of each Commission containing the reports of the WG activities presented at the Meetings.

In 1993, A new editor in-chief was elected, Monika Wolf (RWTH Aachen), and regional coordinators were appointed to foster the promotion of the Newsletter and the compilation of contents. The first issue with a new layout was the number 7.

As stated in the first issue produced by Peter Crosdale in 2000 “Monika Wolf served the ICCP in the role of editor in an exemplary fashion for 9 years. During this time, she produced 16 ICCP news issues, amongst other activities” (ICCPNews 22). With a change of editor, the format of ICCP News also underwent some changes. The use of many more graphics was encouraged and no limitation of colour images was established. A colour version was available through the webpage and a black and white printed version was received by postal mail. Another significant change was the production of 3 issues per year.

Following Monica Wolf’s reflections in her final report as Editor, “at the beginning the editor position was a quite special position since it was not part of the Council”. In the revision of statutes approved in 1991 (ICCPNews 5, 1991), the Editor position was incorporated to the Council and the election procedure was established to be similar to that of the treasurer, being possible to hold the position as far as the Council considers it appropriate. In recent times and because this has been the desire of the last Editors, the position is open for candidates every four years as the other officers.

In 2015, Nikki Wagner from South Africa took over the position as Editor (ICCPNews 63, 2015), maintaining some of the sections which were very popular, such as “Known your Coal petrologist” and introducing the new members. The inclusion of extended abstracts documenting MSc and PhD dissertations / theses in organic petrology provides a useful platform in capturing recent student research. The newsletter is an important forum to report on ICCP meetings, WG activities, to request for samples, and is a useful location to place advertisements related to organic petrology. In a disseminated global world, and differing to the ICCP website and social media

pages, the newsletter provides for a community space, recording memories of ICCP meetings and field trips - the important work and social sides of the ICCP. It is a privilege to be re-elected Editor of the ICCP News (and to thus serve on Council), and I look forward to compiling informative and entertaining newsletters based on content provided by our community - the content from our members is what makes the newsletter.

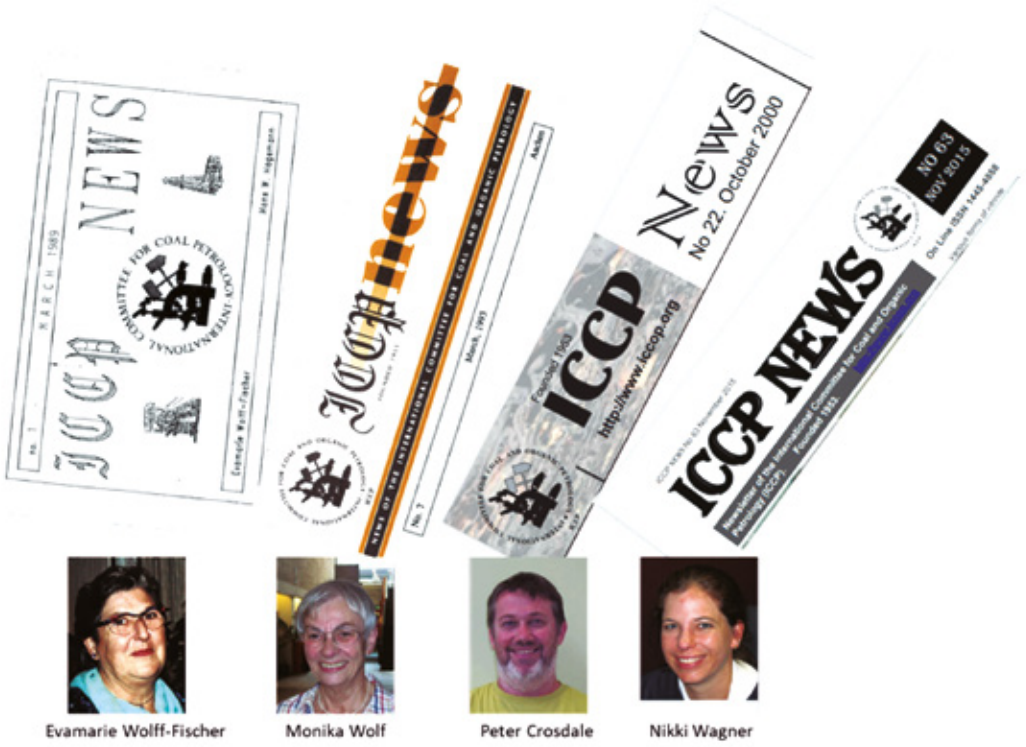

Figure 2. Editors of the ICCP Newsletter over the years and change in appearance of the front page.

Website

The ICCP incorporated to the New Technologies at the beginning of the Century and in 2001 a Council resolution notes with approval the performance of the Website operated by Dr. Pearson and records the thanks to him and Pearson Coal Petrography staff for their work (*Council Resolution* ICCPC01/10/1 in ICCPNews 23, 2001). This was the first location of the ICCP website and D. Pearson was responsible for it. Very soon after the creation of the website the ICCP realized that to incorporate information to the webpage and keep it updated was a titanic task. Already in 2003, the Council minutes record the need of modifying the webpage and a draft proposal was made by Dirk Prinz at the Budapest meeting in 2004 (ICCPNews 33, 2004). This proposal comprised: Front page, Logo, buttons on left, with sub-pages for each Commission. It was agreed to go ahead with the revision along the lines proposed by D. Prinz. The Chairs of the Commissions will take the lead in revising the Commission pages and the General Secretary will take the lead for the general sections. This general structure of responsibilities is maintained up to now.

The effective migration of the webpage from Canada to Germany occurred in 2006 and Dirk Prinz was the new web master as stated in the ICCP News 39, 2006. Warm thanks were given to Dave Pearson (Figure 3) for the years of hosting the webpage and for pleasing every request made to him to facilitate the migration.

The new webpage entered in partial operation in 2006, with the restricted part for the membership being completely implemented in 2007. The main developer was Ralph Delzepich (Figure 3) from RWTH Aachen University. At the Meeting in Oviedo three persons were appointed among the recently incorporated members to assist the General Secretary in the update of the following webpage information: Taissa Rêgo Menezes, Igor Viegas and Dongyong Li.



Figure 3. Left: Happy Hour during the Meeting in Sosnoviec, Poland, 2013 in which the last webmaster (Stavros Kalaitzidis, Greece; first from the left) share a drink with the first webmaster (Dave and Jen Pearson from Pearson Coal Petrography, Canada); Right: Luncheon at the Meeting in Oviedo, 2008; From Left: Ralph Delzepich and Dirk Prinz, responsible for the Layout of the ICCP web page and webmaster, respectively, during the time the webpage was host in RWTH Aachen).

As part of the reports of the General Secretary to the General Assembly, the update information of the webpage was included (i.e. ICCPNews 48, 2009 and ICCPNews 51, 2010): i) announcement of accreditation rounds and continue updating of accredited petrographers list, ii) continue release of newsletters and news; iii) update of future and past meetings, iv) update of awards including awardees, v) update of officers, vi) update of Commissions information, vii) increase the level of implementation of the secure part of the web. viii) announcement of the ICCP Training Activities and updating information including report of the first training course; ix) Implementation of a subpage with information about the ICCP Archives; x) making available the information about the ICCP fees structure and the application form for becoming ICCP Member; xi) providing information about institutional members with logo.

In 2012 a proposal was received from Ralph Delzepich and presented to the General Assembly by the President Petra David to modify the layout of the web page to make it simpler and accord with new trends in webpage layouts (ICCPNews 54, 2012). Some of the functionalities of the new webpage would incorporate online registration for ICCP Accreditation Programs and membership. The new layout was launched in 2015 and it is essentially the one that you can now see **(https://www.iccop.org/).** The web page continues to be hosted by Rich Pearson, but maintained by Silktech in Greece since 2015. The web master at the moment is Stavros Kalaitzidis, but gradually the responsibility is handled to the young generation of ICCP members.

The amount of uploaded information in our webpage is significant with 81 pages covering various topics, courses and meetings, 56 pages of Working Groups with close to 600 documents available to all members, with the total amount of Users reaching more than 400. At this stage SilkTech is setting up the online payment platform, which will optimize the management system of our ICCP Treasurer, while the next challenge is to create the ICCP Image Database.

Nowadays the ICCP has incorporated also to the social media with accounts on Facebook, LinkedIn and Instagram thanks to Sandra Rodrigues.

THE MEMBERSHIP OF THE ICCP

Paul C. Hackley

ICCP General Secretary. U.S. Geological Survey, Reston, Virginia, USA.

The membership records of the ICCP are kept in several places: the Editor has files from which the Newsletter is distributed; the Treasurer has files from which are distributed the dues notices; and the webmaster has files which are used to allow access to members-only areas of the ICCP webpages. It is from the files associated to the webpage access, the 'portal extract', that the General Secretary has compiled this examination of the current membership of the ICCP.

If we're counting everyone who is on the role books, then our current membership is 206 persons (not all of whom are paying dues). This is in comparison to the 268 members counted by the ICCP at its 50th anniversary in 1998 (although not all of them were paying dues either, as recounted by M.J. Lemos de Sousa). This is many, many more than the 14 members counted at the inception of the ICCP-so, from the long view perspective, the organization seems to be on the right track.

Although the decline in membership from 1998 to the present-day is disappointing, it is also not unexpected. Many associations and scholarly societies are witnessing a drop in membership, for a variety of reasons. Our sister organization, the Society for Organic Petrology (TSOP), has also experienced a recent decline in membership from a peak of about 225 in 2010 to about 150 today. And, despite the decline in total membership numbers since 1998, the ICCP seems to be experiencing a recent growth spurt, with 22 new members joining since the 2022 meeting. Many of these newly recruited members are coming in via the periodic ICCP course offerings or from the accreditation programs. That is, the attendees of the courses and the participants in the accreditation programs are incentivized to join the ICCP either for the reduction in participation costs, or simply because of learning about the breadth and scope of ICCP activities via attendance at the course or via participation in accreditation.

Where is the Membership?

As has been true for many years now, most of the ICCP membership is European (about 41 %), concentrated in Poland (17) and in Germany (18) (Figure 1).

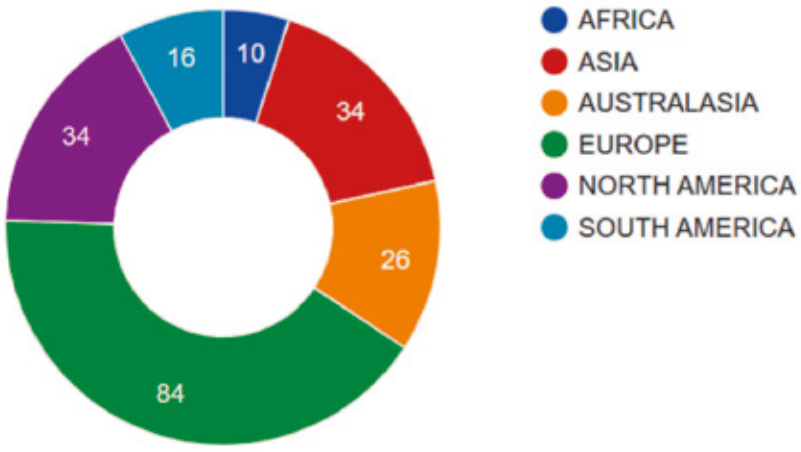

Figure 1. Membership in ICCP according to regions. Compiled by Angeles Borrego, August 2023.

Other countries in Europe hosting ICCP members include Austria (2), Bulgaria (2), Croatia (1), Czech Republic (3), Denmark (3), France (3), Greece (7), Hungary (4), Portugal (9), Romania (4), Serbia (2), Spain (3), The Netherlands (2), Turkey (4), and the United Kingdom (3) (Table 1). Behind Europe, Asia hosts about 34 ICCP members in India (15), China (5), Indonesia (1), Iraq (1), Japan (3), Korea (1), Malaysia (1), Mongolia (3), and Russia (1). North America hosts about 34 ICCP members in the USA (24) and Canada (8). Australia (24) and New Zealand (2) host about 13 % of ICCP membership whereas about 16 members are from South America including Argentina (2), Brazil (9), Chile (1), Colombia (4), and Mexico (2). Last, about 5 % of ICCP members are in Africa including Egypt (1), Mozambique (1), and South Africa (8).

Where is the Active and Future Membership?

Judging by the make-up of the current Council and leadership amongst the working groups in the commissions, the active membership roughly parallels the distribution of the overall membership, except for leadership from Asia. This is an area where the ICCP will do well to cultivate its new members and future leaders, as it is the primary growth area, geographically, for traditional applications of organic petrology in the fossil fuel sector.

Table 1. ICCP membership by country. Compiled by Angeles Borrego, August 2023.

Argentina	2	Denmark	3	Malaysia	1	Russian Federation	1
Australia	24	Egypt	1	México	2	Serbia	2
Austria	2	France	3	Mongolia	3	South Africa	8
Brazil	9	Germany	18	Mozambique	1	Spain	3
Bulgaria	2	Greece	7	New Zealand	2	The Netherlands	2
Canada	9	Hungary	4	P.R. China	5	Turkey	5
Chile	1	India	18	Poland	18	United Kingdom	3
Colombia	4	Indonesia	1	Portugal	10	USA	26
Croatia	1	Iraq	1	Republic of Korea	1		
Czech Republic	4	Japan	3	Romania	4		

There are currently 105 male members and 101 female members, which is a nice balance between genders, especially considering the early days of the ICCP when the organization was dominantly comprised of men. The current Council and working group convenors are also nicely balanced between men and women, suggesting that the feminist movements of the 20th and 21st centuries are well-embodied in the ICCP organization.

There are currently 127 associate members and 78 full members. In the opinion of the writer, this is a distinction without difference, except that only full members can vote in elections for the executive committee offices (President, Vice President, General Secretary, Treasurer, and Editor). ICCP members become 'associate' members upon entrance to the organization and only become 'full' members by demonstrating their expertise in organic petrology through long-standing participation in ICCP activities with a minimum of five years-experience in organic petrology. The sponsorship of a full member is necessary for an associate member to apply for full membership, and full membership is necessary to be elected to the ICCP Council. While the distinction

between full and associate members may have been relevant in the early days of the ICCP, it now seems less useful. Back in the early days, it could serve as means to recognize the 'experts' versus the 'up and comers', i.e., to recognize the contributions and stature of those who were long-time contributors to the organization. Nowadays, in a time of declining membership, it makes more sense (at least to the author) to drop this imaginary distinction, allowing more flexibility in the appointment of new leaders. In my own experience, I was asked to apply to full membership after participation in only 3 ICCP meetings (although I did have the requisite 5 years-experience in organic petrology). Dropping the distinction between full and associate members would accelerate new members to positions of leadership and help to bring fresh ideas which will keep our organization relevant and adaptable to the rapidly changing environment of organic petrology applications.

Regarding membership distribution amongst the commissions, there are 167 members of Commission I, 159 members of Commission II, and 130 members of Commission III. Ninety-two ICCP members belong to all 3 commissions, whereas 66 members belong to 2 commissions, and 48 belong to only a single commission. Of those 48, 12 belong only to Commission I, 20 belong only to Commission II, and 16 belong only to Commission III. As a final thought, I have observed that new applicants to the ICCP membership are about evenly divided between interest in a particular commission (because they are already advanced in their career and so have a biased interest in a particular aspect of organic petrology) and those inquiring minds with a broad general interest who apply to membership in all 3 commissions. Let's hope that the new members keep coming, and, with them, the fresh ideas for keeping organic petrology investigation relevant and fruitful in a rapidly changing global society.

Chapter 3

QUESTIONS STILL OPEN

STANDARDISATION EFFORTS IN FLUORESCENCE MICROSCOPY

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The ICCP here celebrates its 75th Anniversary and commemorates its rich history and legacy. The present contribution is to memorialise this event and to describe the milestones of standardisation in fluorescence microscopy within the ICCP.

ICCP activities in the field of fluorescence microscopy were initiated in 1965 during the XVIII Meeting of the Nomenclature Sub-Committee in Budapest (Hungary). In the **Brown Coal Group** chaired by Dr. B. Alpern, challenges with luminescence measurements on macerals in soft brown coals (former classification of lignite) were identified and discussed. As reported by Dr. L. Soós, the issues included the duration of measurement for luminescence intensity, suitable standards (e.g., fluorescing glass filter such as Schott GG 17), excitation source, filters, specimen thickness, and the use of fluorochrome. Dr. L. Soós and Dr. H. Jacob (Figure 1) prepared an initial method description for determination of the luminescence intensity of brown coal macerals, which was then introduced into the lexicon.

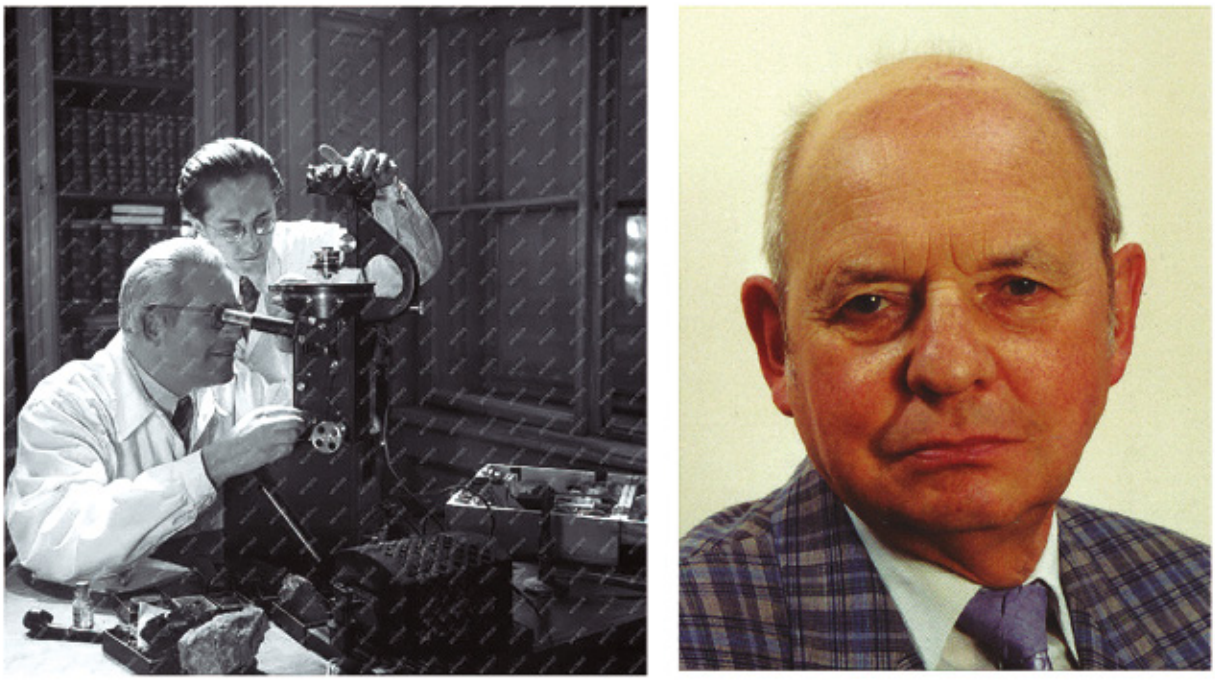
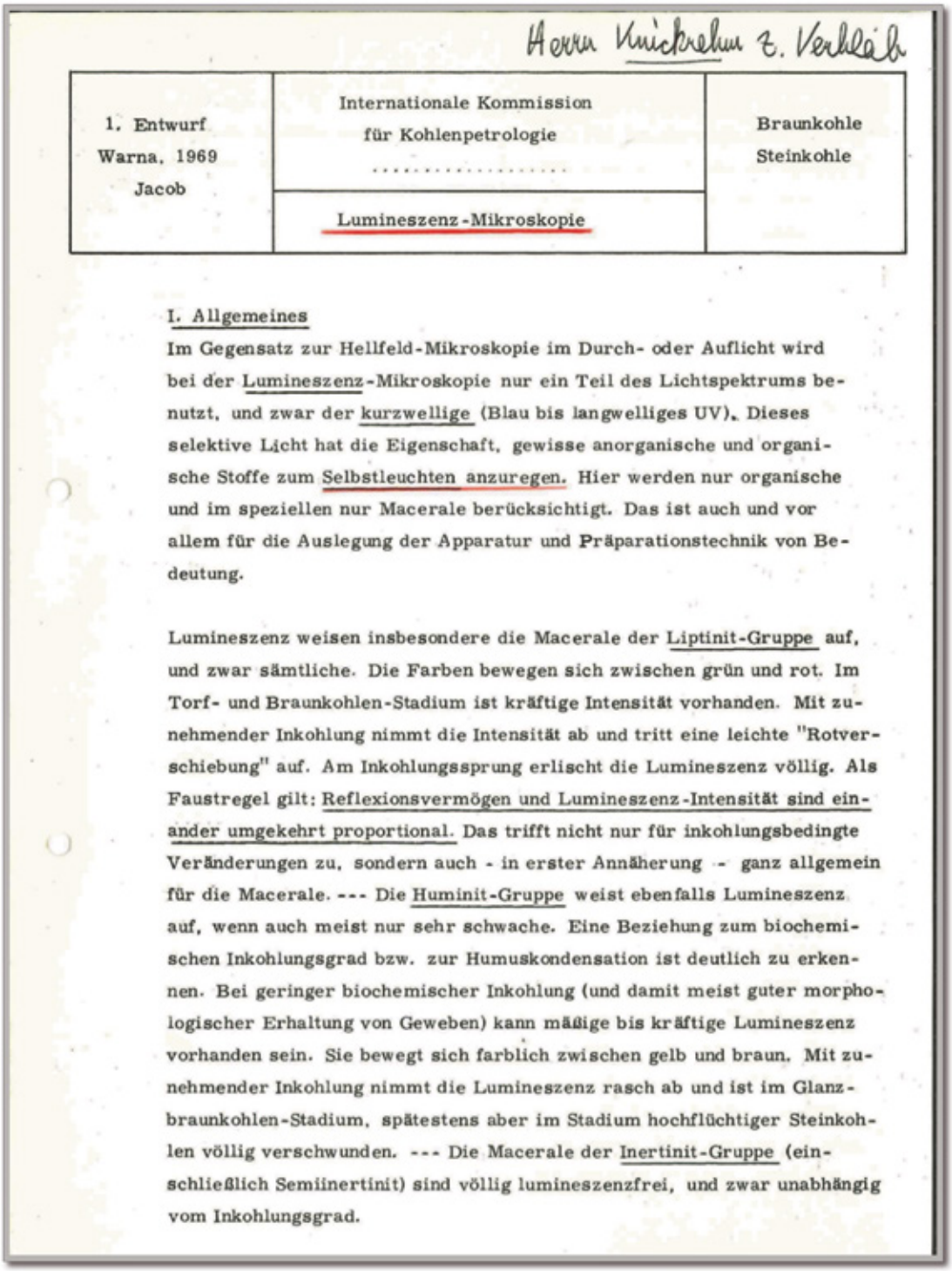


Figure 1. Left - Dr. László Soós (1920-1995) (in the back) and Prof. Dr. Elemér Szádeczky-Kardoss (10.09.1903 - 23.08.1984) (in the front) in 1952 at the Department of Mineral and Rock Sciences of the Eötvös Loránd University, Budapest, Hungary. Image courtesy of Hungarian National TV Archive and Dr. Mária Hámor-Vidó. Right - Helmut Jacob (1920–2014). Image courtesy of his wife Annemarie Jacob and his son Wolfram Jacob. Further information in Kus et al. (2014).

Subsequently, Dr. H. Jacob prepared a first draft of *Luminescence-Microscopy,* which was presented and revised from 1968 to 1970 during ICCP meetings in Essen (Germany), Varna (Bulgaria), and Liège (Belgium) shown in Figure 2.



Herrn Knickrehm z. Verbleib

1. Entwurf Warna, 1969 Jacob	Internationale Kommission für Kohlenpetrologie ..... Lumineszenz-Mikroskopie	Braunkohle Steinkohle

I. Allgemeines

Im Gegensatz zur Hellfeld-Mikroskopie im Durch- oder Auflicht wird bei der Lumineszenz-Mikroskopie nur ein Teil des Lichtspektrums benutzt, und zwar der kurzwellige (Blau bis langwelliges UV). Dieses selektive Licht hat die Eigenschaft, gewisse anorganische und organische Stoffe zum Selbstleuchten anzuregen. Hier werden nur organische und im speziellen nur Macerale berücksichtigt. Das ist auch und vor allem für die Auslegung der Apparatur und Präparationstechnik von Bedeutung.

Lumineszenz weisen insbesondere die Macerale der Liptinit-Gruppe auf, und zwar sämtliche. Die Farben bewegen sich zwischen grün und rot. Im Torf- und Braunkohlen-Stadium ist kräftige Intensität vorhanden. Mit zunehmender Inkohlung nimmt die Intensität ab und tritt eine leichte "Rotverschiebung" auf. Am Inkohlungssprung erlischt die Lumineszenz völlig. Als Faustregel gilt: Reflexionsvermögen und Lumineszenz-Intensität sind einander umgekehrt proportional. Das trifft nicht nur für inkohlungsbedingte Veränderungen zu, sondern auch - in erster Annäherung - ganz allgemein für die Macerale. --- Die Huminit-Gruppe weist ebenfalls Lumineszenz auf, wenn auch meist nur sehr schwache. Eine Beziehung zum biochemischen Inkohlungsgrad bzw. zur Humuskondensation ist deutlich zu erkennen. Bei geringer biochemischer Inkohlung (und damit meist guter morphologischer Erhaltung von Geweben) kann mäßige bis kräftige Lumineszenz vorhanden sein. Sie bewegt sich farblich zwischen gelb und braun. Mit zunehmender Inkohlung nimmt die Lumineszenz rasch ab und ist im Glanzbraunkohlen-Stadium, spätestens aber im Stadium hochflüchtiger Steinkohlen völlig verschwunden. --- Die Macerale der Inertinit-Gruppe (einschließlich Semiinertinit) sind völlig lumineszenzfrei, und zwar unabhängig vom Inkohlungsgrad.

Figure 2. Second draft of *Luminescence-Microscopy* (In German: *Lumineszenz-Mikroskopie)* presented by Dr. H. Jacob in 1969 at the ICCP Meeting in Varna (Bulgaria). Image courtesy of Federal Institute for Geosciences and Natural Resources (BGR), Hannover (Germany).

The draft embraced information on fluorescence colour, fluorescence microscope setup, preparation steps, photography preparation, and fluorescence photometry. A new **Fluorescence-Photometry Working Group (WG)** was established in 1972, convened by Dr. H. Jacob. Members of the WG included Dr. B. Alpern (France), Dr. L.I. Bogoliubova (former U.S.S.R), Dr. M. Correia (France), Dr. P. van Gijzel (The Netherlands), Dr. H.W. Hagemann (former B.R.D.), Dr. W. Homann (former B.R.D.), Somers (Belgium), Dr. L. Soós (Hungary), and Dr. M. Teichmüller (former B.R.D.). The WG was commissioned to describe and to standardise polychromatic and monochromatic fluorescence measurements. In 1972, a first draft of *Fluorescence-Photometry* (later known as *Fluorescence Microscopy and Fluorescence Photometry)* was prepared and presented, including guidelines for quantitative monochromatic fluorescence measurements. For the first time, fluorescence standards of diverse fluorescence intensity (uranyl glass with dissimilar thicknesses of 1-3 mm) were mentioned. Secondly, efforts toward standardisation of polychromatic fluorescence measurement were made by Dr. P. van Gijzel, who showed that spectral maxima and the fading effect, were closely related to coal rank. Further, monochromatic and polychromatic fluorescence analysis of sporomorphs in polished whole rock pellets and kerogen concentrates were reported during the 1973 ICCP Meeting by Dr. W. Homann, with marked differences noted in the spectral properties of the different sample types. According to Homann, fluorescence intensity change and fading times were to be disregarded as a measure of coalification, as the values were dependent on the location of measurement and the wall thickness of individual sporomorphs. On the other hand, polychromatic fluorescence analysis showed that spectral maxima correlated directly with coalification degree, showing a red-shift toward longer wavelengths with increasing coalification. Other parameters such as Q_{max} (quotient of emission intensity at 650 and intensity at 500 nm) and full width at half maximum (width of any intensity distribution at half the maximum intensity) supported these results.

In kerogen concentrates, polychromatic fluorescence analysis showed a slight increase in fluorescence intensity relative to the whole rock. Following revisions, a third draft with an updated title *Fluorescence Microscopy and Fluorescence Photometry* was presented during the 1974 ICCP Meeting in Krefeld (Germany), which was accepted in 1975 and incorporated into the ICCP Handbook (2nd supplement; ICCP, 1975). The final and accepted draft included methodology for monochromatic and polychromatic fluorescence photometry.

Subsequent to the restructuring of ICCP activities into commissions, a new Quantitative Fluorescence Microscope-Photometrical Techniques WG was established during the 1979 ICCP Meeting in Urbana (USA) and convened by Dr. P. van Gijzel **(Figure 3).**

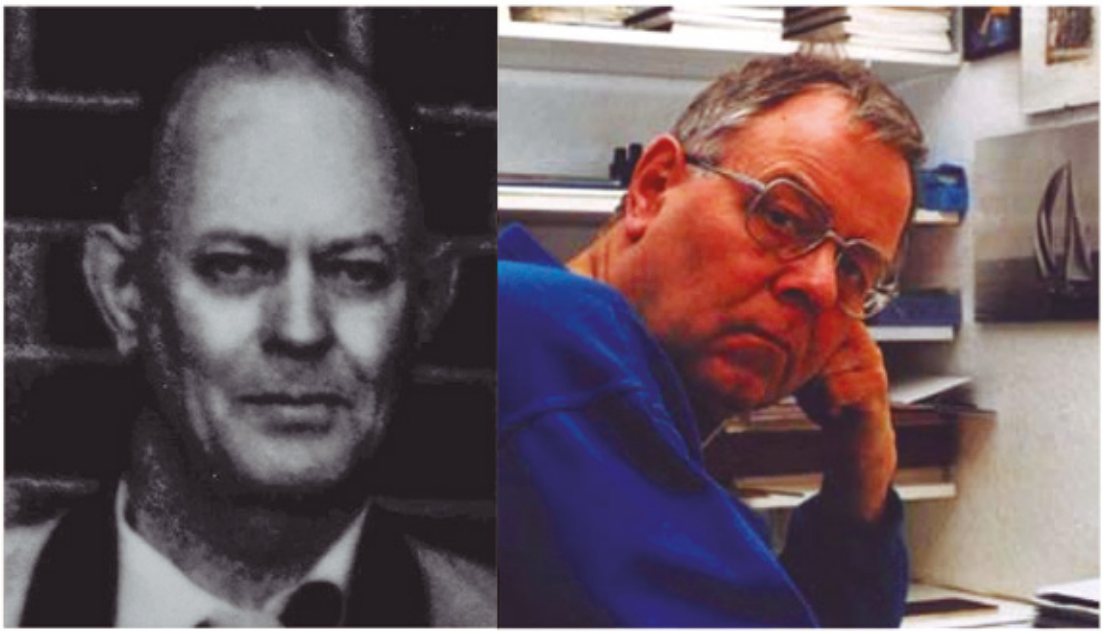


Figure 3. Left - Dr. Pieter van Gijzel (1928–1994). Image courtesy of Dr. John R. Castaño. From TSOP (The Society for Organic Petrology) Newsletter 11 (3/4), December 1994 (TSOP, 1994). Right - Dr. Karl Ottenjann (1931–2011). From ICCP Newsletter 54, July 2012 (ICCP, 2012).

The aims of the new WG were to select a standard lamp for calibration purposes, standardisation of microscope techniques, and investigation for the possibility of a measuring technique. The activities of the WG began with a questionnaire on fluorescence microscope-photometry, followed by discussion on determination of microscope correction factors, the use of computer systems, standardisation of fluorescence intensity and spectral fluorescence measurement, and standardisation of measuring procedures and parameters. A 1st round robin exercise (a ring-sample analysis) planned in 1980 was predated by the 1980 ICCP Meeting in Ostrava (in the former Czechoslovakia), which included discussion on the use of adequate fluorescence standards. The 1981, 1982, and 1983 ICCP meetings in Pau (France), Porto (Portugal), and Oviedo (Spain), respectively, brought further discussion on a standard lamp for spectral fluorescence measurement to be used for the delayed 1st round robin exercise. Efforts were made to prepare a G.E.C. lamp of known spectral signature (The General Electric Co. Ltd., England) and the Zeiss Zonax System programme for measurements of spectral fluorescence. Convenor Dr. P. van Gijzel noted that Velapoldi (an expert at the U.S. Bureau of Standards) had reported no suitable fluorescence standard reference material was available, although quinine sulphate dehydrate with a restricted spectral response could perhaps suffice (Velapoldi and Mielenz, 1980). Dr. J.G. Prado (Spain) suggested the application of uranyl glass fibres as an internal standard *sensu* Velapoldi et al. (1975) for monochromatic fluorescence intensity measurements. Together with Dr. M. Wolf, Dr. B. Alpern suggested to interface the Zeiss computer with the Leitz measuring system and to provide a central control of correction factors for members with the same set of standard glasses. From the above, it is apparent that a consensus had been reached among the WG Members that before round robin exercises were conducted, equipment differences between individual laboratories had to be eliminated. This evidently required adequate calibration standards. Other equipment-related issues included production of fluorescence intensities of adequate strength for measurement, background alteration, and the spectral sensitivity of equipment. The 1st round robin exercise was further deferred as Dr. P. van Gijzel announced his retirement as Convenor of the WG.

In 1984, Dr. K. Ottenjann (Figure 3) took leadership of standardisation efforts within the renamed **Standardization of Fluorescence Measurement WG** and a questionnaire designed to assess methodology was disseminated. Summarising, the Convenor stated that by this point a preferred method was determination of spectral distribution followed by monochromatic fluorescence intensity measurements *sensu* Dr. H. Jacob. Emission intensity was measured at 546 nm in relation to Jacob's uranyl glass. The preferred excitation wavelength was long wave UV (340–380 nm) followed by blue–violet (~380–500 nm). In contrast to applied corrections for background and spectral sensitivity of the equipment, WG members seldom corrected their spectral data for fluorescence alteration. In 1985, round robin exercises examined clear plexi-glasses and a torbanite sample from Britain. A first draft on measurement of monochromatic fluorescence intensity was circulated for discussion and amendments, which were presented at the 1986 ICCP Meeting in High Melton/Doncaster (UK). These documents replaced the former draft from 1975, *Fluorescence Microscopy and Fluorescence Photometry* (ICCP, 1975). Activities in the **Standardization of Fluorescence Microscopy WG** were shifted in 1987 at the ICCP Meeting in Beijing (China) toward evaluation of uranium oxide glass standard in relation to monochromatic fluorescence intensity measurements. Within the round robin exercise of that year, participants performed fluorescence measurements on megasporinite, microsporinite, and on vitrinite of Upper Carboniferous age (upper Westphalian C, Loki coal seam) in a polished block. The Convener suggested the use of field stops and photometer stops *sensu* Dr. H. Jacob to restrict the volume of detected fluorescence emission and to apply high numerical aperture (NA) lenses (e.g., NA of 0.90 for 50 × magnification). Although adherence to instructions for measurement in the round robin was generally lacking, the replies allowed Dr. K. Ottenjann to draw conclusions on the sources of measurement difficulty and to reconsider some steps for the exercise. Major difficulties were the mode of measurement (Faltermeier mode with use of field stop for illumination and measurement, and common mode with photomultiplier stop and larger field stop), the use of appropriate fluorescence standards (too high fluorescence intensity relative to measurement objects), and microscope fitting and software (suitable fittings, interchangeable illumination).

Elucidation of the necessary optical properties for an adequate monochromatic fluorescence intensity standard continued in 1988. Objects of study included uranyl glass *sensu* Dr. H. Jacob, coloured plexi-glass, a Schott BaSF2 glass, and calibrated light emitting diodes. Properties of a suitable standard included: emission from 350 to 550 nm with intensity similar to that of organic matter; a flat-shaped emission spectrum with high intensity between 500 to 700 nm; constant ratio of emission intensity to excitation power; constant intensity and spectral distribution properties during prolonged excitation; and alteration resistance to radiation of illumination and oil immersion.

Dr. K. Ottenjann and the WG members prepared a draft on Determination of Fluorescence Intensity in 1988, designated as *Part I: Determination of Intensity of Fluorescence Microscopy and Fluorescence Photometry* method, which was later to be adapted into the ICCP Handbook (ICCP, 1993). Following revision carried out within the WG, the draft was sent to Prof. Dr. D. Murchison, for remarks and comments. The WG began then to work on the modification of *Part II: Determination of Spectral Distribution of the Fluorescence Microscopy and Fluorescence Photometry* method in 1990. During the 1990 ICCP Meeting in Wollongong (Australia), a draft of Part II was presented, which was prepared for publication in 1991. Despite efforts of ICCP members and experts from the commercial microscopy industry, it was not possible to eliminate the effect of strong fluorescence intensity of reference materials in relation to the fluorescence intensity of sedimentary organic matter. Therefore, selection of a suitable fluorescence standard for determination of spectral distribution could not be achieved at that time.

At the 1991 ICCP Meeting in Porto Alegre (Brazil), and following remarks and comments, the Convenor presented yet again a newly revised draft of *Part I: Determination of Fluorescence Intensity.* In 1992, Dr. K. Ottenjann selected a subcommittee to test the final draft of Part II: Determination of Spectral Distribution, including Dr. C. Thompson-Rizer, Dr. R. Lin, Dr. W. Kalkreuth, Dr. J. Quick, and Dr. J. Thompson. Dr. S. Bend (Figure 4) became the new Convenor of the WG due to travel restrictions of Dr. K. Ottenjann. Following the subcommittee test in 1994, the final draft of Part II was modified by Dr. J. Quick, Dr. S. Bend, and others and sent to Dr. K. Ottenjann for comments and approval. In addition, filter block tests were conducted at five laboratories using fluorescence microbeads to obtain corresponding fluorescence profiles. It was not until 1995 that the final draft of *Part II: Determination of Spectral Distribution* was circulated to the Members of Commission I for final revision. At the 1996 ICCP Meeting in Heerlen (The Netherlands), Part II was accepted for publication in the new edition of the Handbook. It was the last action of the **Standardization of Fluorescence Measurement WG.**

Although a standardised test method for spectral fluorescence measurement was then not yet formally established, the first spectral fluorescence measurements were performed in 1994 by the Thermal Indices WG in Commission II convened by Dr. B. Pradier (Figure 4) The WG was established in 1992 at the University Park, Pennsylvania, (USA). The aim of the WG was to review and verify correlations, comparabilities, and limitations of various thermal indices i.e., vitrinite reflectance, fluorescence, thermal alteration index, Rock-Eval, volatile matter, elemental composition) at different rank levels. Dr. J.T. Senftle as Chair of Commission II favoured and initiated the establishment of the WG to integrate organic petrological and organic geochemical data. Participants of the WG were among others Dipl. -Ing. A. Vieth-Redemann, MSc. C.V. Araujo, Dr. W. Kalkreuth, Dr. Á. Gomez Borrego, Dr. W. Kalkreuth, Dr. H. Hagemann, Dr. H., Hufnagel, Dr. A.C. Kochen, Dr. J. Koch, Dr. J., Kuili, Dr. F., Laggoun-Defarge, Dr. J. Newmann, Dr. H.I. Petersen, Dr. D. Spanic, Dr. L. Stasiuk, Dr. I. Suárez-Ruiz, Dr. C. Thompson-Rizer, Dr. M. Mastalerz, Dr. J. Wang, Dr. R. Wilkins, Dr. B. Ligouis, Dr. M. Misz, Dr. W. Hiltmann, Dr. P. David, Dr. M. Hámor-Vidó, Dr. L. Gurba, Dr. H. Lo, Dr. J. Newmann, Dr. S.M. Barbanti, Dr. A.C. Macedo, Dr. V.C. Condé, MSc. M. Marques, Dr. W. Pickel, Prof. Dr. D. Flores, Dr. P. Gonçalves, Dr. H. Volk, A. Balke, Dr. B. Cardott, Dr. P. Hackley, Dr. J.C. Hower, Dr. K. Marcio, Dr. J. Kus, Prof. Dr. J.G. Mendonça Filho, MSc. P. Ranasinghe, MSc. J.O. Mendonça, Prof. Dr. R. Littke, MSc., T.R. Menezes, Dr. N. Moore, Dr. I.V. Souza, Dr. R.B.A. das Chagas, Dr. F.S. Da Silva, Dr. K. Reimer.



Figure 4. Left - Dr. Stephan Bend. Image courtesy of Prof. Dr. Rosa Menéndez. Right - Dr. Bernard Pradier (September 1985, Orléans, France), modified from the ICCP 50th Commemorative Book (Lemos de Sousa, 1998). Image courtesy of Dr. Ángeles G. Borrego.

In 1994, a 1st round robin exercise on carbonate-rich Toarcian Posidonia Shale, Paris Basin, France, was performed with ICCP-acquired calibrated excitation lamps (quartz-iodine lamps of Halostar type 35W-6V) illuminating a parallel-sided plane opalin glass (Pradier, 1994).

The lamps were distributed by Dipl. -Ing. A. Vieth-Redemann, while the source rock material was provided by Dr. B. Pradier and distributed by Dr. W. Kalkreuth. In the following year, calibration of spectral fluorescence measurements on Toarcian Posidonia Shale samples were discussed and relevant data was provided by Dr. R. Baranger on behalf of the Convenor. Results of the 1st round robin exercise were discussed in 1996 during the ICCP Meeting in Heerlen (The Netherlands), revealing that spectral fluorescence measurements of Tasmanites showed excellent agreement in fluorescence intensities and derived fluorescence parameters such as λ_{max} (wavelength of maximum fluorescence intensity), Q_{max}, and colorimetric values (Araujo et al., 1998). A subsequent round robin exercise (2nd) on 4–5 samples (Posidonia Shale, Toarcian, Paris basin, France) was performed under new Convenor Dipl. -Ing. A. Vieth-Redemann **(Figure 5)** with the aim to improve reproducibility of spectral fluorescence measurements.



Figure 5. Left – Dipl. -Ing. Angelika Vieth-Redemann at the 2003 55th ICCP Meeting in Utrecht (The Netherlands). Image courtesy of Dr. Jolanta Kus. Right - MSc. Carla Araujo. Image courtesy of MSc. Carla Araujo.

This 2nd exercise showed good agreement for samples having an estimated vitrinite reflectance (VR_o %) range from 0.4–0.9 %. However, at higher thermal maturities difficulties in obtaining comparable emission spectra were encountered. Therefore, the focus was shifted to samples with higher maturity to resolve difficulties of reproducibility. A new set of samples of Australian torbanite was supplied by Dr. A. Hutton. At the 1999 ICCP Meeting in Bucharest (Romania), Dipl. -Ing. A. Vieth-Redemann resigned and was replaced by MSc. C. Araujo **(Figure 5),** who commenced a new (3rd) round robin exercise on two pairs of samples (Australian torbanite and coal from the same seam) prepared and provided by Dr. A. Hutton.

During the 2000 ICCP Meeting in Rio de Janeiro (Brazil), the Convenor presented reproducible results on λ_{max} and vitrinite reflectance (VR_o) acquired from two participants only. In the following year, the Convenor could acquire only one additional set of participant results. Similarly, the 4th round robin exercise was run in 2002 on a sample of Alpha torbanite and performed by four labs (Araujo et al., 2003). This exercise showed significant discrepancies of λ_{max}, and FAMM (Fluorescence Alteration of Multiple Macerals) data, in contrast to date from organic geochemical analyses. It was clear by then that the objectives of the WG as proposed by Dr. J.T. Senftle (which had encompassed the establishment of correlations among the available organic petrology- and organic geochemistry-related thermal indices) were not accomplished, and rather that the WG had focussed primarily on spectral fluorescence measurements.

During the 2003 ICCP Meeting in Utrecht (The Netherlands), the Convenor prepared a 5th round robin exercise to estimate the thermal maturity of a sample with type II organic matter (Irati shale, São Mateus do Sul, Paraná state, Brazil). In general, poor agreement was obtained for sporinite spectral fluorescence and VRr as presented at the 2004 ICCP Meeting in Budapest (Hungary). In an attempt to work around difficulties in the reproducibility of spectral data related from type II kerogen, the 6th round robin exercise in 2005 used samples of Posidonia shale and Asturias carbonaceous shale which had been previously examined by the Qualifying Vitrinite for DOM Reflectance Analysis WG. Spectral fluorescence measurements were performed on sporinite and alginite with good correlation obtained for λ_{max} and Q_{max}. However, correlation of the spectral parameters to VR_o was challenging, especially for Posidonia shale. In the subsequent years 2007–2008, a 7th round robin exercise was performed on samples from the Neuquén Basin, Argentina. Good agreement was found for spectral fluorescence data from participants who had recently calibrated their equipment with the ICCP lamp whereas poorer correlation was observed for VR_o values. During the 2010 ICCP Meeting in Belgrade (Serbia), the Convenor presented correction functions and spectral fluorescence measurements on a maturation series from the Toarcian of the Paris Basin. It was clear that the correction functions were different from using microscopes with different spectrometers. The Convener tested the influence of different spectrometers (photomultiplier and CCD detector) on Toarcian telalginite (Paris Basin, France) and revealed that calibrated emission spectra showed good correlation and

that the ICCP calibration lamp had not changed its radiance properties. In the last (8th) round robin exercise, the Convenor tested *Tasmanites* in three Devonian marine shale samples (Huron Member of the Ohio Shale, Appalachian Basin, USA) provided by Dr. P.C. Hackley. The results presented at the 2011 ICCP Meeting in Beijing (China) showed that the group mean VR_o value was correlated to λ_{max} for the lowest maturity sample. However, λ_{max} in the two higher maturity samples suggested higher maturation than shown by measured VR_o (Araujo et al., 2014). The last round robin exercise suggested that standardisation of spectral fluorescence measurements is essential and should be encouraged within ICCP.

ICCP efforts to promote and encourage the standardisation of fluorescence microspectrometry were picked up by Dr. Ángeles G. Borrego **(Figure 6),** who raised the need to focus on correction functions at a presentation during the 2014 68th ICCP Meeting in Kolkata (India), given within the scope of a possible **Correction Function for Fluorescence Lamp WG.** Evaluation of artifacts created during calibration of the ICCP standard lamps 3 and 2B and purchase of new calibration lamp were major requirements to be considered. In the subsequent year, Dr. Ángeles G. Borrego revealed a difference in the emission spectra of ICCP lamps 3 and 2B, measured by both the same and different spectrometers, and over the time span of 5 years. At the 2017 ICCP Meeting in Bucharest and in subsequent meetings, Dr. Ángeles G. Borrego showed a search for different calibration standards such as the green 2941B007 standard or a halogen lamp. Similarly, at the 2023 ICCP Meeting in Patras (Greece), Dr. J. Kus presented the use of a certified reference material (BAM–F012) for validation of the emission wavelength intensity and accuracy and for calibration of the photometric responsivity. Dr. J. Kus based her presentation on spectral data acquired from *Tasmanites* in marine Devonian shale samples from the Huron Member of the Ohio Shale in the Appalachian Basin, USA, provided by Dr. P.C. Hackley.



Figure 6. Dr. Ángeles G. Borrego, the ICCP President at the 2017 69th ICCP Meeting in Bucharest (Romania). Image courtesy of Dr. Jolanta Kus.

In summary, the past and current activities carried out in the WGs of the ICCP display an abundance of relevant information and multiple analyses to standardise monochromatic and polychromatic fluorescence microspectrometry methods. The process of method standardisation, which involved development of new technical standards and their implementation, is currently at an advanced stage but still requires update and further work. The methods for monochromatic and polychromatic microspectrometry designed as *Part I: Determination of Intensity of Fluorescence Microscopy and Fluorescence Photometry* (ICCP; 1993) and *Part II: Determination of Spectral Distribution of Fluorescence Microscopy and Fluorescence Photometry* (approved in 1996) are outdated and require: (1) an update and implementation of new microscope fittings, (2) completion of

new light sources for incident white light and UV light, (3) specification of applied fluorescence filter blocks, and (4) validation of new fluorescence standards replacing the outdated Jacob's uranyl glass (for monochromatic fluorescence intensity measurements) and the ICCP fluorescence standard lamps (for polychromatic spectral fluorescence measurements). These efforts could be well-placed within the possible **Correction Function for Fluorescence Lamp WG.** New efforts should focus on the use of advanced fluorescence spectrometers, search for new developments for fluorescence intensity standards in other scientific disciplines, e.g., forensics, and on the successful implementation of state-of-the-art equipment and standards in future round robin exercises.

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BITUMINITE-BITUMEN-MIGRA BITUMEN

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Solid bitumen (SB) is the only organic matter found in sedimentary strata throughout the geological age, from Proterozoic to Tertiary. It comprises amorphous and polycondensed hydrocarbon molecules commonly dispersed in hydrocarbon sources and reservoir rocks.

Solid bitumen occupies pore spaces, cavities, intergranular spaces, fractures, and veins (Robert, 1988) and is considered "organic matter that has migrated from its source" (Curiale, 1986). It is from fine primary macerals similar to vitro-detrinite and liptodetrinite and can only be recognized in whole-rock samples (Jacob, 1989).

Solid bitumens form due to the thermal maturation of liptinite and plankton. Due to the high protein content of plankton, those associated with plankton are richer in sulfur and nitrogen than organic matter derived from terrestrial plants (Hunt, 1978). Solid bitumen can also be a by-product of the cracking of petroleum liquids, hydrocarbon fractionation during secondary migration, biodegradation during diagenesis (Klubov, 1993), or it can form during early catagenesis due to the early generation of a heteroatomic organic pase (Kirste et al., 1989; Riediger, 1993; Machel et al., 1995) from sulphur-rich kerogen (Powell and Snowdon, 1983; Powell, 1984).

Three types of solid bitumens are recognized microscopically: the dispersed primary, reservoired, and migra-bitumens. Those occurring in petroleum and gaseous hydrocarbon source rocks are strata-bound bitumens best identified by microscopic analysis of polish samples. The objectives of this study are the following: a) to describe the origin, mode of occurrence, and association with the enclosing mineral matrix of these three bitumen types; b) to use the reflectance of solid bitumen in a deviated wellbore to show that hydrocarbon generation is possible when Rock-Eval pyrolysis data predicted otherwise; and c) to clarify the confusion caused by the use of different terminologies for 'bitumen' by organic petrographers and petroleum geochemists.

Methodology

Optical Equipment for Reflected Light Microscopy. Organic petrology of SB is carried out on polished samples using both reflected white and fluorescent light. Reflectance (% BR_o) and fluorescence properties (spectral parameters: λmax, Green (GQ), Red/Green (R/GQ), and Blue/Green (G/BQ) quotients), are measured according to the recommendations of ISO 7404-2 and ISO 7404- 5 (2009); ASTM D7708-14 (2014). Reflected light Zeiss Axio Image II microscope systems are equipped with fluorescent light sources for the reflectance measurements. Fluorescence microscopy of liptinites determined using ultraviolet G 365 nm excitation with a 420 nm barrier filter and Red/green quotient (Q = relative intensity at 650 nm/relative intensity at 500 nm) is carried out under standard conditions (filters: excitation 450-490, beam splitter 510, barrier 420 nm).

Rock-Eval analyses. A Rock-Eval 6 ® (Vinci Technologies, France) instrument (Lafargue, 1998) is used to determine total organic carbon (TOC, wt %), T_{max} (°C), and the amount of hydrocarbon released (mg HC/g Rock) as measured under the S1 and S2 peaks. The total mass of hydrocarbon released from each sample is kept below 4 mg to avoid saturation of the FID detector. Simultaneously, the amount of CO and CO_2 released during pyrolysis and oxidation was measured to quantify the portion of oxygen-containing organic matter (S3 peak; mg CO_2/g Rock) and refractory inert carbon (residual carbon; RC wt %), respectively.

Maturation and transformation of liptinite to solid bitumen

Maturation of liptinites results in the formation of the hydrogen-rich bituminous matrix (cf. matrix bituminite) and primary hydrocarbon in the source rock. The primary hydrocarbons often migrate into available free space within the source rock and form fluorescing exsudatinite in immature-marginally mature source rocks and transform to bitumen after the first maturation jump (onset of the oil window) (Potter, 1998; Goodarzi et al., 1987a; 2019a and b; Hackley et al., 2018; Mastalerz et al., 2018; Sanei, 2020). Solid bitumen assumes the shape of the space or pore it occupies; the size can, therefore, vary from a micrometer to a meter depending on the mode of origin or emplacement Potter, 1998). Maturation and transformation of liptinite to solid bitumen can also occur by forming transitional macerals, bituminite, and matrix bitumen.

Bituminite. Bituminite is a characteristic maceral of marine and lacustrine oil shales and oil source rocks (Teichmüller and Ottenjann, 1977; Glikson, 1984; Cook and Sherwood, 1991, Goodarzi et al., 1987a-b. , 2019a-b). Bituminite is mostly associated with alginite and liptodetrinite, sometimes also with fish remains (Teichmüller and Ottenjann, 1977; Cook and Sherwood, 1991; Goodarzi et al., 1987a-b, 2019a-b). There is a genetic relationship between alginite and bituminite (Gormly and Mukhopadhyay, 1983; Goodarzi et al., 1987a-b).

Layers of pure bituminite are found in some very rich oil-source rocks (e.g., Kimmeridge Shale of the North Sea and the Triassic Fish Shale of Seefeld, Tyrol). bituminite constitutes 10 to 40 % of the oil shales In the Toolebuc Formation of the Eromanga Basin (Australia) (Cook and Sherwood, 1991) and has a close association with calcite (Glikson, 1984). Bituminite is a characteristic maceral of sapropel coal. It forms a matrix for other liptinite macerals (especially alginite) and the macerals of the inertinite group (Goodarzi et al., 1987a-b, Goodarzi and Gentzis, 1918).

Bituminite is often associated with abundant framboidal pyrite, indicating of bacterial reworking (sulphate reduction) of the digestible organic matter (Teichmüller and Ottenjann, 1977; Glikson, 1984; Cook and Sherwood, 1991).

Bituminite is formed from the degradation of OMs, such as algae, bacterial bodies, faunal plankton, and fish, under anoxic and suboxic conditions (Powell et al., 1982; Cook, 1982; Goodarzi, 1987a; Pickel *et. al,* 2017). The unicellular, eukaryotic phytoplankton (Coccoliths) are also a source of bituminite in marine sediment, which were extensively degraded by anaerobic bacteria (Cook and Sherwood, 1991). In general, abundant coccoliths remain, and planktonic foraminifera indicates oxygenated surface water in oil shale. However, the high concentrations of organic matter and pyrite in the same oil shales containing bituminite an indication of sapropelic and highly anoxic conditions at the sediment surface and the remnant of microbial mats lying at or below the redox boundary (Cook and Sherwood, 1991).

Bituminite is a by-product of liptinite macerals' thermal decomposition (catagenesis) and is a secondary maceral (Teichmüller, 1982; Goodarzi et al., 1987a-b). Bacterial and chemical decomposition of animal, planktonic, or bacterial lipids is also the source of bituminite (Teichmüller, 1982; Snowdon et al., 1986). Unlike most other macerals, Bituminite is generally defined by a lack of definite morphology (Teichmüller, 1975). It is autochthonous and often forms a groundmass in hydrogen-rich energy deposits (matrix bituminite). It may fluoresce weakly, but the fluorescence intensity increases with exposure, similar to the asphaltic bitumen, gilsonite (Teichmüller, 1975; Goodarzi et al., 2019a). It is the major constituent of sapropelic coals (Teichmüller, 1982; Goodarzi and Gentzis, 2018).

Bituminite is classified broadly into three groups: Bituminite I, which is a by-product of the decomposition of alginite (Teichmüller and Wolf, 1977; Teichmüller, 1982; Gormly and Mukhopadhyay, 1983; Goodarzi et al., 1987b, Stasiuk, and Goodarzi, 1988; Stasiuk and Osadetz, 1993; Stasiuk et al., 1990; Hackley, et al., 2018). Bituminite II is formed due to bacterial and chemical alteration of plant lipids, mostly from phyto and zooplankton (Teichmüller and Wolf, 1977; Gormly and Mukhopadhyay, 1983; Snowdon et al., 1986). Bituminite III is a biochemical decomposition product of liptinite in terrestrial plants and humic materials (Teichmüller and Ottenjann, 1977; Gormly and Mukhopadhyay, 1983; Snowdon et al., 1986).

Matrix bituminite. Matrix bituminite is the dominant form of bitumen in source rock and occurs within the mainly porous inorganic/mineral matrix. Its size ranges from very fine to fine-grained (<1 μm-4 μm), and it is characterized by low reflectance (% BR_o) and a weak yellow-brown to brown-red fluorescence (Goodarzi et al., 1987a, Kondla et al., 2017, Hackley et al., 2018). Viewed at high magnification under SEM, matrix bituminite

occurs as intergranular pore-filling bitumen in calcareous (coccolith remnants) and argillaceous-rich matrix (Kondla et al., 2017). Matrix bitumen mostly accumulates in micropore spaces between individual plate-like kaolinite crystals (Kondla et al., 2017; Hackley et al., 2018; Wood et al., 2018).

Solid bitumen reflectance as a maturation index

Solid bitumens (SB) are dominant organic matter forms in marine sediment and source rock (Curiale, 1986). SB generally has shades of grey and irregular shapes and often conforms to the shape of the void or space it occupies. The higher-maturity SB (Curiale, 1986) has a flat, smooth surface and uniform reflectance. The reflectance of SB was used as a maturation parameter by Jacob (1985), from which vitrinite reflectance (% VR_o) equivalent value could be calculated:

% VR_o - eq = (0.618 x % BR_o) + 0.4

This formula used in numerous studies to determine maturation trend in marine succession worldwide (Bertrand, 1990 and 1993; Gentzis, 1991; Riediger et al., 1991 and Riediger, 1993; Landis and Castaño, 1995; Gentzis and Goodarzi, 1990; Bertrand and Malo, 2001; Schoenherr et al., 2007; Petersen et al., 2013; Mählmann and Le Bayon, 2016; Liu et al., 2017; Kondla et al, 2017; Hackley et al., 2018; Wood et al., 2018). However, Equations developed by Jacob (1989) are mostly applicable to migrabitumen and that of Schoenherr et al. (2007) to the reservoir bitumen. Only those developed by (Riediger, 1993; Landis and Castaño (1995), Potter (1998), and Liu et al. (2017) are used and applicable to the strata-bound SB (in situ). Solid bitumen often has multiple populations in sedimentary strata with various morphology and % BR_o (Gentzis and Goodarzi, 1990; Mastalerz et al., 2018; Goodarzi et al., 2019b). Therefore, choosing the correct % BR_o population of SB as an indicator of thermal maturity is difficult. It requires a detailed study of their association with the precursor liptinitic macerals in the same sample, their morphology, and optical texture (Hackley and Lewan, 2018; Mastalerz et al., 2018; Abarghani et al., 2019).

Abarghani et al. (2019) found two SB populations in the Lower Paleozoic marine sedimentary strata of the Bakken Formation in the Williston Basin. A lower maturity (% BR_o = 0.2-0.30), SB, which is soft, is associated with a partially degraded liptinite group, and higher maturity (% BR_o = 0.3-0.42), which is more angular and homogenous (Figure 1).

They treated the first group as strata-bound SB using Liu et al. (2017) equation (VR_o-eq= 0.5992×BR_o+0.3987) and % VR_o-eq calculated as < 0.80 % and % VR_o-eq second group was determined using several published empirical equations (Jacob, 1989; Riediger, 1993; Landis and Castaño, 1995) as reservoir SB, with % VR_o-eq higher than 0.80 % (Figure 1).

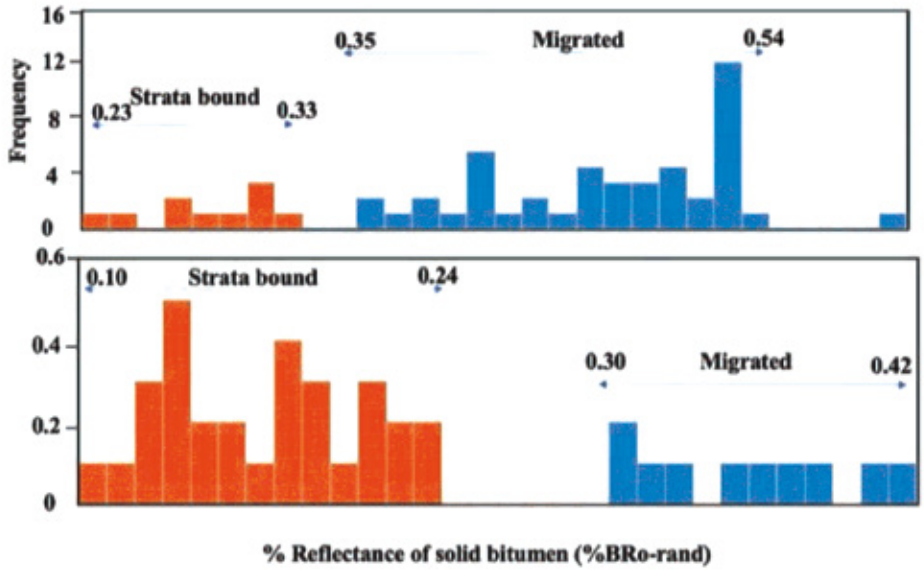


Figure 1. Reflectance of SB in the samples from well #3, at a depth of 1829m and well #5, at a depth of 2265m (after Abarghani et al., 2019).

There are three types of SBs in sedimentary strata: (1) dispersed primary SB (DPSB), (2) Reservoir bitumens (RSB), and (3) migrated (migra) bitumen (MSB). The reflectance of these three types of SBs is not directly comparable since they represent different physic-chemical/geological processes. In general, reservoir and migrated (migra) SB is a by-product of strata-bound SB.

Dispersed primary Solid Bitumen (DPSB). The DPSB are found in a wide range of sedimentary rocks, such as those in the Arctic of Canada (Gentzis, 1991) and the Upper Devonian-Carboniferous of the Liard Basin, Northern British Columbia -southern Northwest Territories, Canada (Potter, 1998). In general, the genesis of dispersed bitumens is viewed as a consequence of the thermal maturation of primary organic matter, occurring within organic-rich source rock at various stages of maturity and according to kerogen type (Curiale, 1986; Landis and Castaño, 1995; Hackley and Cardott, 2016; Potter, 1998; Cardott et al., 2015; Hackley et al., 2018; Mastalerz et al., 2018). The DPSB form in situ after the first maturation jump as by-products of the thermal alteration of liptinites (kerogens type III-IV) (Goodarzi et al., 1987a; Gentzis, 1991; Potter, 1998; Hackley et al., 2018; Mastalerz et al., 2018), and remain in the source rocks deposited in marine environments (Hosseininejad Mohebati, 2016). In a continental setting, the DPSB forms from a variety of sources, such as liptinite from terrestrial plants, freshwater algae, and bacteria (Goodarzi, 1987a-b; Potter, 1998; Hackley et al., 2018; Mastalerz et al., 2018). The terrestrial source rocks were deposited in lake basins, mires, fluvial systems, and lagoons from the Late Precambrian to the Tertiary Hutton et al.,1980; Goodarzi et al., 1987a, 2019a; Mastalerz et al., 2018) and include cannel coals and boghead coals that were deposited in stagnant, oxygen-depleted waters. The precursors to DPSB are primary organic components mostly composed of vascular plant resins and waxes, pollen grains, spores, cuticles, and cork derived from terrestrial and freshwater plants. In lacustrine oil shales that were deposited in fresh- and brackish waters (Suarez Ruiz et al., 2012; Goodarzi et al., 1987a, 2019a), DPSB can also form from algal and aquatic plant components as well as bacterial biomass and variable amounts of higher plant remains and biochemically altered primary material (bituminite).

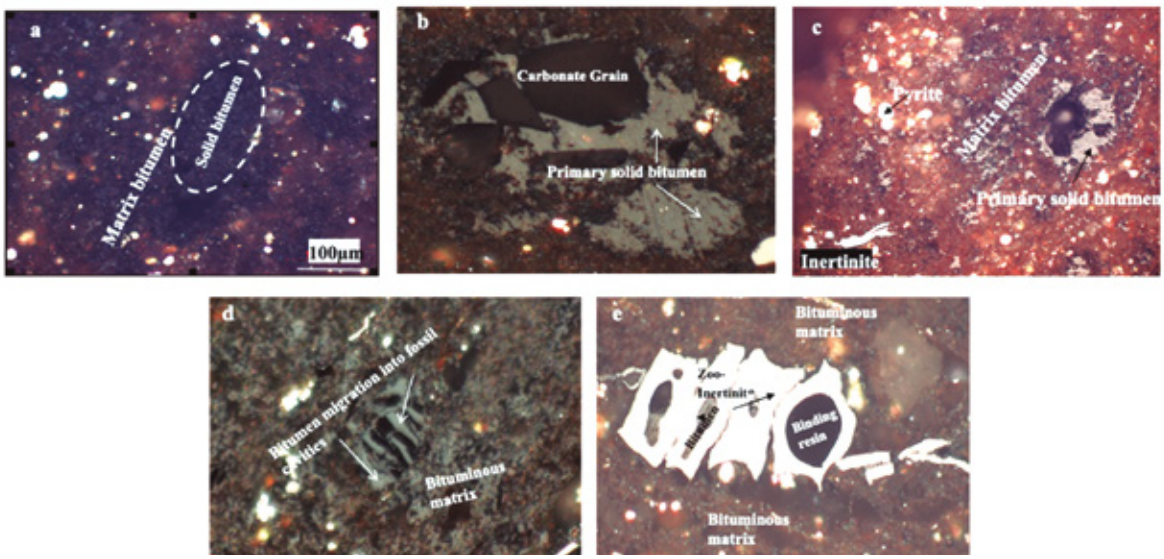


Figure 2. Variation of DPSB, a) low maturity bitumen particle; b) primary bitumen filling the empty spaces between carbonate grains and bituminous matrix; c), a higher maturity bitumen. Micro-migration of DPSB; d) SB filling cavities of microfossil (foraminifera); e) brownish grey bitumen migrated from the brown bituminous matrix into cavities of the zoo-inertinite, grey bitumen fills some of the cavities of the zoo-inertinite, one of the cavity is filled with binding resin (black filling).

The marine source rocks that contain DPSB are deposited in a marine environment with a high influx of organic matter, such as algae, unicellular planktonic organisms, and dinoflagellates with minor input by terrestrial OM. Marine sediment requires a combination of good preservation and rapid sediment accumulation rates to maintain a high concentration of organic matter to produce hydrocarbon (Hunt, 1978; Hosseininejad Mohebati, 2016). Such conditions occur in large, shallow epicontinental seas and deep, anoxic oceanic basins. For example, a prominent marine hydrocarbon source rock in the Western Canada Sedimentary Basin, the Second White Specks Formation of the late Cenomanian-early Turonian age, is host to DPSB and was deposited in a shallow Tethys-like Sea (Williams and Stelck 1975, Leckie et al., 1990 and Blakey, 2015).

DPSB is the dominant organic matter in the marine strata, such as the Nordegg Formation. This marine rock is an organic-rich, fossiliferous, calcareous mudstone of the Early Jurassic Age occurring in north-eastern British Columbia to west-central Alberta (Riediger, 1993; Kondla et al., 2017). There is no vitrinite generally, but there is an abundance of the strata bound-solid bitumens, finely dispersed in the sedimentary matrix with the matrix bitumen. The matrix bitumen is nanopore-filling and amorphous within the rock matrix, and it is concentrated in larger pores associated with mineral grains and zoo-inertinite (Figure 2e).

The DPSB is abundant in this marine source rock. The organic matrix may be composed almost entirely of SB (Figure 2d). Under white light, the SB appears brownish grey to dark grey, is vacuole-filled (Figure 2a-b), sometimes showing desiccation cracks, and is soft since it is often scratched from the polishing process (Figure 3a).

Reflectance and color vary between the matrix bitumen and the concentrated, larger-pore-filling SB, with the matrix bitumen generally appearing darker grey and having lower reflectance (Figure 3b). Under fluorescent light, evidence for more than one generation of bitumen is obvious. Some SBs are thermally matured and show no fluorescence while others show dark orange to dull brown fluorescence indicating that the latter are of lower maturity.

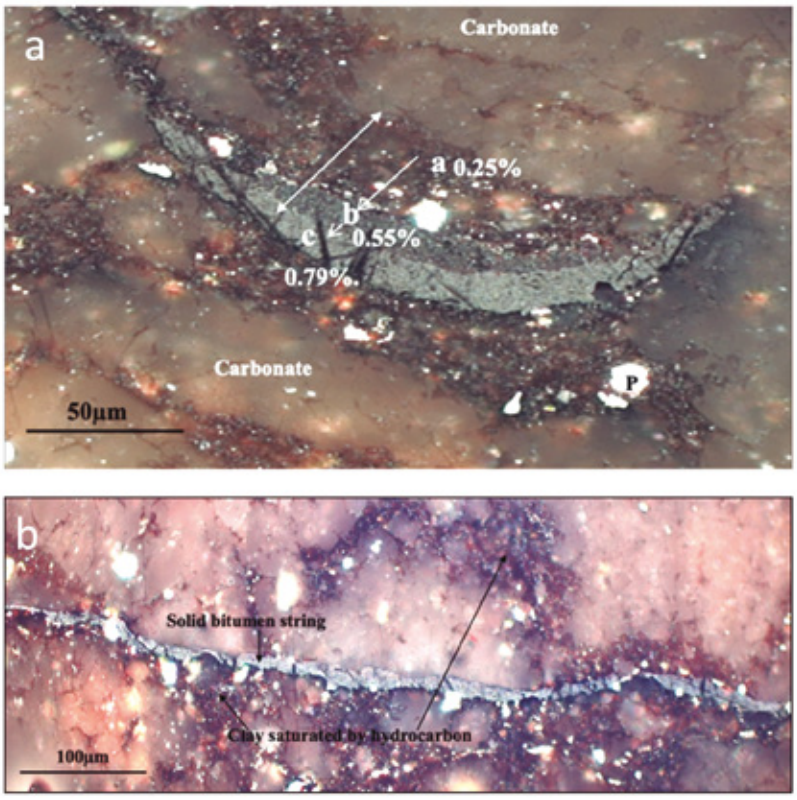


Figure 3. a) The three-phases hydrocarbon in inter grain of carbonate. Indicating of transportation/migration of hydrocarbon by water that deposited (a) clay and hydrocarbon (brown granular containing pyrite (p), and b-c, two phases of bitumen, a soft granular bitumen (dark grey) mixed with clay and a harder light grey cleaner fraction. The light grey bitumen shows sign of dissipation and volume reduction, possibly due to degasification; b) Typical strata bound solid bitumen string associated with the granular bituminous clay association and filling the pores/ fracture between carbonate particles.

There are four types of DPSB based on morphological, optical and genetic characteristics, i.e., differences in morphology, reflectance, fluorescence properties, and affiliation with other organic components, also all are part of same maturation process, but may have different origin (Sanei, 2020).

Direct comparison of reflectance of DPSB and vitrinite. Few regional studies include vitrinite and DPSB maturities in the same stratigraphic intervals from the same locations (Gentzis, 1991; Potter et al., 1993; Landis and Castaño, 1995; Potter, 1998).

One of the most detailed studies of SB maturation as related to vitrinite reflectance was by (Potter, 1998) on the Devonian to Upper Cretaceous strata in the Laird basin, Northern British Columbia. Potter classified SBs into two types: indigenous (primary) and migrated (secondary). This study is important since it examined primary SB (PSB) in vitrinite strata.

The reflectance of primary SB (% BR_o) is essential for hydrocarbon generation and determination of thermal maturity. Because DPSB are generated within the source rock due to the organic maturation of primary or secondary macerals, transport and reworking or recycling factors commonly affect population variance and the reliability of maturation parameters such as % VR_o of dispersed vitrinite. Additional advantages to using BR_o reflectance to determine the thermal maturity of hydrocarbon source rocks are significantly broader stratigraphic (Cambrian to recent) and paleogeographic (non-marine and marine) applications.

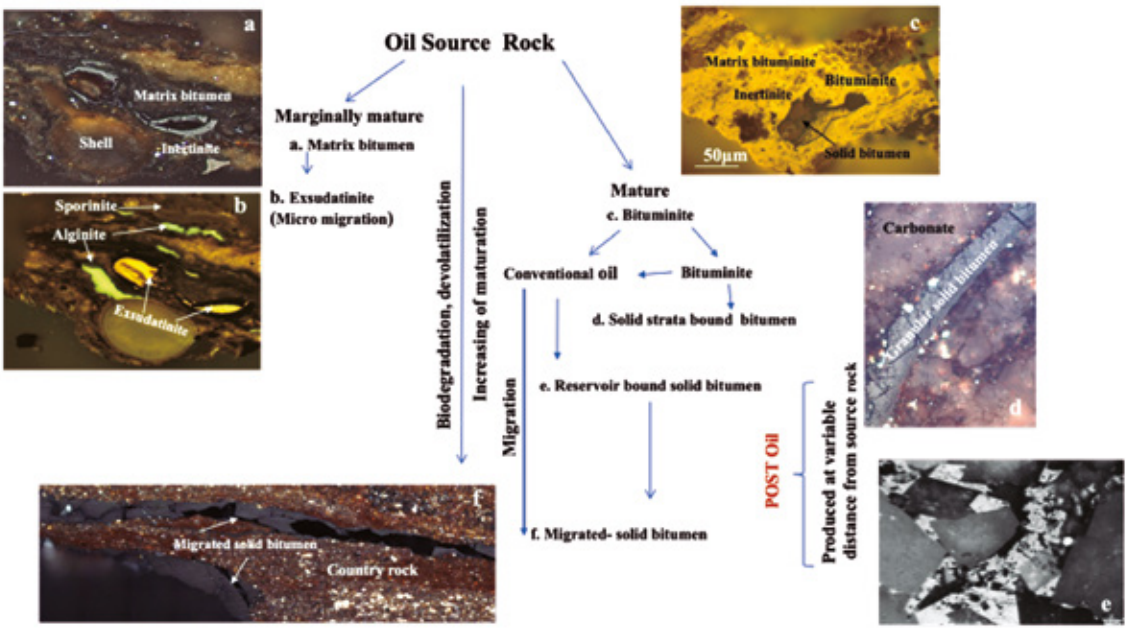


Figure 4. Bitumen in geological strata.

The generation of bitumen from hydrogen-rich precursor during maturation is a continuous process, with successive generation and decomposition of generated bitumen with increasing maturity **(Figure 4).** The hydrogen-rich organic material initially generates bituminite-matrix bituminite, including bacterial by-products. The by-product of thermal maturity of hydrogen-rich OMs resulting in a clay-rich environment is dispersed and absorbed by the clay matrix and forms matrix-bituminize, and in some cases by the porous organic matrix, such as the liptinite-rich coal, resulting in suppression of vitrinite reflectance (Goodarzi et al.,1994, Gentzis and Goodarzi, 1994).

Reservoir solid bitumen (RSB). The solid reservoir bitumens are morphologically diverse and very complex but provide information about the nature of their precursor hydrocarbon. They are often end products of the physiochemical and geological processes that caused their formation. Reservoir SB cannot be used as a maturation indicator.

There are studies regarding reservoirs bitumen in conventional vertical boreholes such as (Riediger, 1993; Stasiuk, 1998; Potter, 1998; Suarez-Ruiz et al., 2012; Cardott et al., 2015; Sanei et al., 2015; Hackley and Cardott 2016; Xiong et al., 2016; Kondla et al., 2017) In the general determination of nature of SB and whether it is primary or secondary is very important in study and assessment of unconventional shale and tight hydrocarbon play Wood et al., 2018).

According to Potter (1998), the secondary (migrated) SBs are non-fluorescent and reflect highly. They are homogeneous with well-defined, commonly linear or sharp margins because they fill the same pores and fractures occupied by mineral grain and commonly coat the crystal's faces. They also occur within the organic-mineral matrix of shales within the shaly interstices of silty shales and the inter-crystalline porosity of siltstones. They are related by reflectance to the other Indigenous bitumens but have a reflectance an order of magnitude higher than them. They are by-products of an early generation formed through polycondensation reactions in hydrocarbons generated during late diagenesis or early catagenesis (Gentzis, 1991).

The significant differences between the DPSB and migrated RSB are:

a. Reservoir SBs are cavities, crack, and fissure fillers and have no association with their pre-curser macerals.
b. The RSB rarely shows granular optical texture, except when subjected to high temperature (Goodarzi et al., 2018).

The RSB in horizonal well. Little information has been published about reservoir SB in horizontal boreholes. Many of the formations in horizontal boreholes are either reservoirs or hybrid (not true source rocks) and mostly do not contain vitrinite for VRo measurements. However, the greatest challenge for organic petrologists is the presence of multiple populations of SB in the same formation or even in specific intervals within the formation, which can often complicate the relationship among the various SB types (Gentzis, 1991; Gentzis and Goodarzi, 1990). Solid bitumens are morphologically diverse and very complex but provide information about the nature of their precursor hydrocarbon. They are often end products of the physiochemical and geological processes that occurred, resulting in their formation. In the absence of primary vitrinite, determining the thermal maturity based solely on SB reflectance must be done very carefully and in conjunction with other maturity indicators, such as Rock-Eval pyrolysis (using the Reservoir method), GC-MS data of saturate and aromatic fractions, or isotopic analysis of these fractions. Another complicating factor is that SB can often be misidentified as vitrinite in early mature rocks (Wei et al., 2016).

Many horizontal wells drilled in the last decade in the Permian basin, west Texas, are hybrid plays (reservoir-source rocks). Since the majority of the formations are devoid of primary vitrinite but contain SB, the correct identification of the latter and the use of its reflectance to determine the level of thermal maturity has become important. This study will focus on one such well. For confidentiality reasons, the well location and county are not provided; only the drilling path of the horizontal section and vertical sections' drilling paths will be provided.

The horizontal well targeted the top section of the Permian Wolfcamp A Formation (Figure 5). The vertical section drilled through the Clearfork, Lower Spraberry (not shown), and Dean Sandstone. The horizontal target interval was at 8885 ft, just above Wolfcamp A, situated at 8963 ft. The underlying Wolfcamp B is located at 9269 ft. The total length of the well (vertical plus horizontal sections) is almost 1.5 miles. The well was fractured and stimulated.

When the well was drilled, the company sent several drill cuttings samples for TOC and Rock-Eval pyrolysis analysis. Based on the pyrolysis data, the laboratory informed the operator that the organic matter was immature and that the well would not produce any liquid hydrocarbons. No organic petrographic analysis was performed at that time. Following this, a field geologist submitted eight (8) cutting samples to Core Laboratories for a second opinion. The TOC/RE 6 pyrolysis data (Table 1) were similar to the suite provided by the original laboratory. However, organic petrology of the un-extracted cuttings samples using white and UV-reflected light (fluorescence) told a different story. The predominant type of organic matter is SB; the R_o values range from about 0.25 % to almost 0.50 %, depending on population and depth. Three different populations of SB were identified in most of the samples (Figure 6). Population 1 bitumen has low Ro of ~0.25 % (Figure 6a), population 2 bitumen has R_o in the 0.39-0.52 % range (Figure 6 b-d), while population 3 bitumen has Ro in the 0.64-0.70 % range (Figure 6e). However, a fourth SB population was rare, had a spherical shape, and was encountered only in the Lower Spraberry at 8385 ft (Figure 6f). It was deposited around carbonate grains with a BR_o of 0.63 %. Primary vitrinite (gas-prone Type III kerogen) was present in small amounts (Table 1) and had VR_o ran of 0.60 to 0.70 %. UV

light excitations showed the presence of oil-prone unicellular marine Tasmanites telalginite having golden-yellow fluorescence color and minor quantities of amorphous liptinite Type II **(Figure 5).**

Table 1. Rock-Eval pyrolysis/TOC and reflectance data (bitumen and vitrinite-equivalent) of Permian formations encountered in the deviated well, showing the horizontal target interval.

Formation	Depth (feet)	BRo%	VRo%	Tmaax	TOC	S1	S2	Hi	Oi
Clearfork	7233	0.44	0.67	428	5.61	1.95	31.7	566	2
Lower Spraberry	8385	0.39	0.64	415	0.46	1.57	2.4	519	22
Lower Spraberry	8523	0.39	0.64	430	5.58	2.06	31.4	563	2
Dean Sand	8650	0.4	0.65	430	3.85	1.65	23	597	2
Horizontal Target	8885	0.48	0.7	430	10.16	2.81	60.2	592	0.1
Wolfcamp A	8963	0.52	0.72	433	5.24	0.06	28.1	537	0.6
Wolfcamp B	9241	0.48	0.7	437	5.88	2.32	27.2	463	0.7
Lower Wolfcamp Basinal	9369	0.49	0.7	433	6.75	2.69	31.9	473	0.1

T_{max} in ºC; TOC in wt %; S1 and S2 in mg HC/g rock; HI in mg HC/g TOC; OI in mg CO_2/g TOC

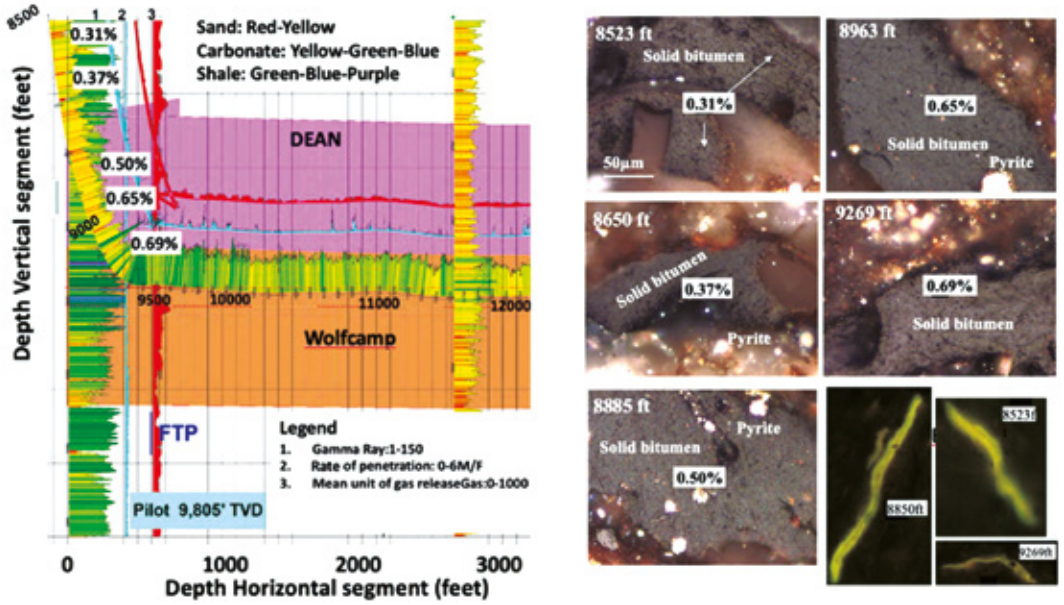


Figure 5. Trajectory of the deviated section and of the horizontal well drilled in the Wolfcamp Formation, Permian Basin. The photomicrographs show the types of solid bitumen encountered at various depths and their reflectance values and well as the fluorescence color of the liptinites.

The VR_o-eq derived from the second SB population ranged from 0.64-0.70 %, which agrees closely with the measured VR_o, which ranged from 0.60-0.69 %. For the horizontal target interval at 8885 ft in particular, the T_{max} of the un-extracted sample was 430 ºC, which equates to VR of 0.58 % using the Jarvie et al. (2007) equation developed for marine kerogen Type II in the Mississippian Barnett Shale, and also to 0.56 % using the Devonian Duvernay Shale model Wüst et al., 2013), and to 0.64 % using the Second White Specks model Furmann et al., 2016). The latter model may be more appropriate because the Mesozoic shale contains vitrinite, and the pyrolysis T_{max} was corrected based on true vitrinite.

Thus, it was concluded that the organic matter of the targeted formation was mature (not immature as suggested by the initial pyrolysis data) and in the early stage of the oil window. The presence of oil-prone liptinite Type II of algal origin also supported the conclusion that this well will produce liquid hydrocarbons when properly stimulated.

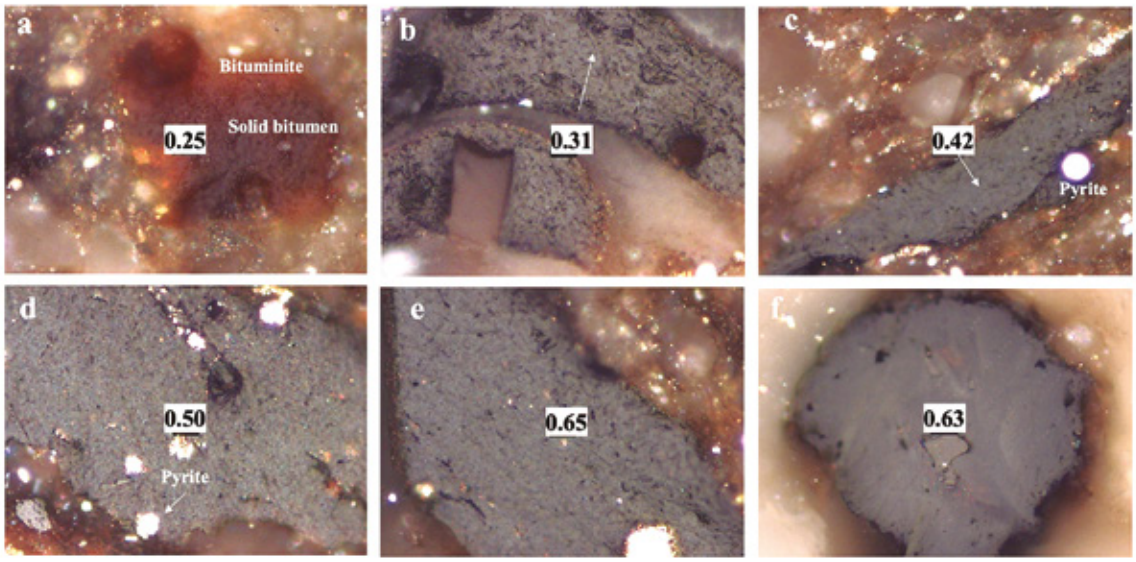


Figure 6. Variation of RSB from a horizontal well in Martin County, Permian Basin, west Texas. transformation of matrix bituminite to brown SB, occurs at 0.24 % BR_o (a); SB is soft and greyish brown, with 0.31 % BR_o; SB become increasingly harder and more concentrated with increasing of BR_o from 0.42 % to 0.65 %.

The well was subsequently fracture-stimulated. During the first week of production, this well-produced 54 bbl of oil/day and significant volumes of fracture fluid. After the well gave almost all of its fracture fluid, production inclined a few weeks later to 400-500 bbl oil/day from the Wolfcamp A and kept increasing to 900 bbl oil/day in the following months. The operator decided to place a choke to reduce the flow, and the well still produced 200 bbl of oil/day after seven months of production through artificial lift. The cumulative volume after seven months was 85,000 barrels of oil, which is a decent volume considering the initial assessment that this well could not produce any liquids. Public records show that the well-produced 1448 bbls of oil in June 2019. The above shows how important it is to perform organic petrologic analysis and combine the data with other analyses such as fluorescence of liptinite macerals and Rock-Eval pyrolysis.

Migra (migrated) solid bitumens (MSB). Migra bitumens are solid veins of bitumen up to many meters in thickness. They are often found due to faulted and fractured reservoir rock (Goodarzi and Williams, 1986), around springs, pools, and asphalt lakes (Abraham, 1945; Goodarzi, 1985; Goodarzi and Williams, 1986; Goodarzi and Stasiuk, 1991; Cardott, 1991; Cardott et al., 2015; Hackley et al., 1918; Mastalerz et al., 2018).

A typical vein-filling bitumen is found in the Albert mine intruding Albert oil shale, New Brunswick, Canada (Goodarzi et al., 2019a). Various veins of thick bitumen are found in Albert oil shale due to the migration of hydrocarbons due to an episode of continuous deformation that produced micro-fractures and cracks (Figure 7).

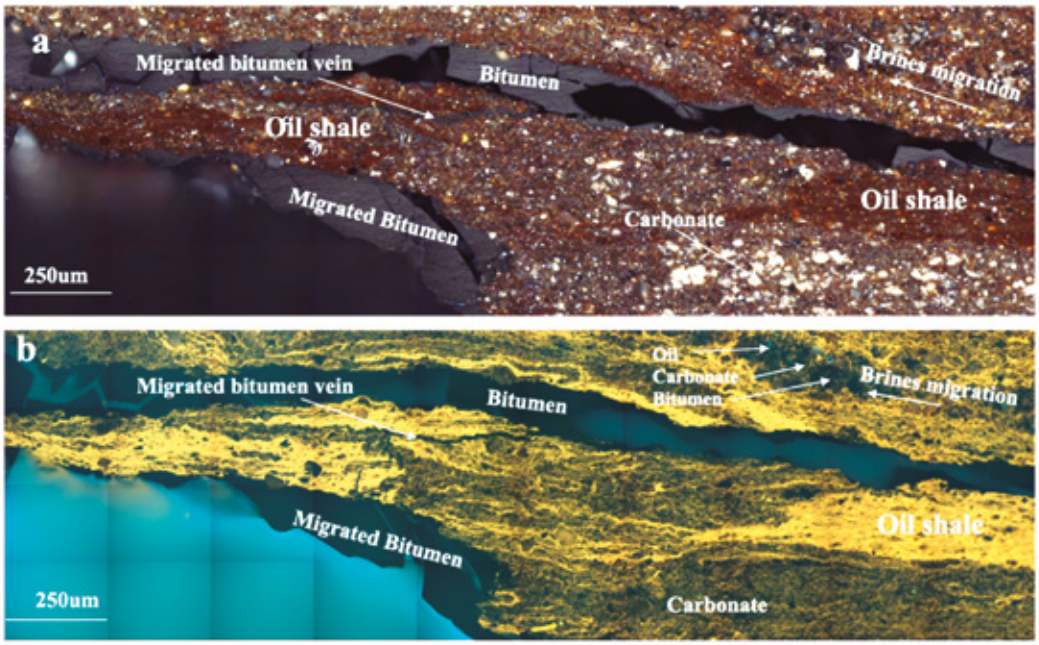


Figure 7. Migrated bitumen vein in Albert oil shale in Albert Mine location, (a) reflected white light; (b) fluorescent light and oil immersion.

Jacob (1975) classified SBs migrated into the sedimentary rocks based on their reflectance, which allows comparison to other kerogen types and their use as thermal maturity indicators. Migra bitumens are classified based on geochemistry, fusibility, and solubility in organic solvents with increasing thermal alteration (Abraham, 1945; Hobson and Tiratsoo, 1975; Curiale, 1986; Goodarzi et al., 2019a). In general, SBs that are derived from the alteration of crude oils (Abraham, 1945) can be separated into the following broad groups:

a) Soluble bitumen can be grouped into asphalts, fusible, and asphaltites, which are fusible with difficulty. Asphalts are very fluid and mobile, sticky solids, whereas asphaltites are soft and mobile.
b) The insoluble bitumens and pyrobitumens are hard and brittle.

Crude oil alterations are known to occur due to thermal alteration, deasphalting, biodegradation, water washing, evaporation, and weathering/oxidation (Rogers et al., 1974; King et al., 1963) documented an increase in aromaticity and carbon content from asphalt to pyrobitumen. Winter and Williams (1969) and Bailey et al. (1973) demonstrated the influence of biodegradation of crude oil and found that the altered crudes from Western Canada followed similar alteration to those obtained by in-vitro biodegradation. Biodegradation also affects crude oil composition, as documented for the Alberta crude and heavy oil from the Athabasca basin (Deroo et al., 1974). Evaporation can affect all low-boiling components of crude and lead to their depletion (Reed, 1977). Weathering/oxidation results in the loss of saturate and aromatic hydrocarbons with a concomitant increase in asphaltenes (Dickey and Hunt, 1972).

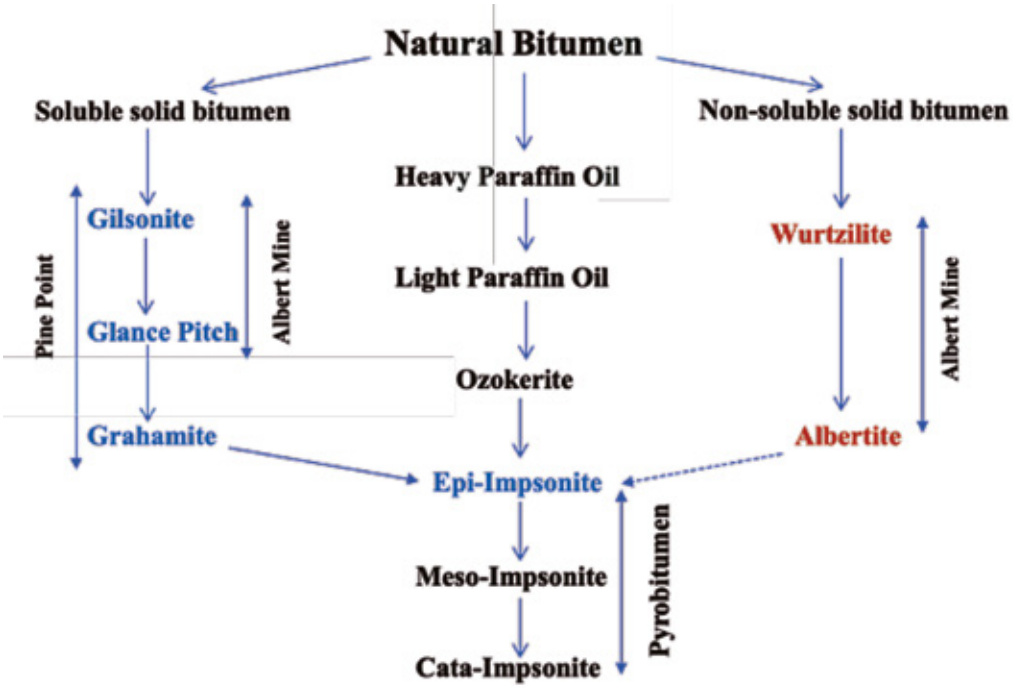
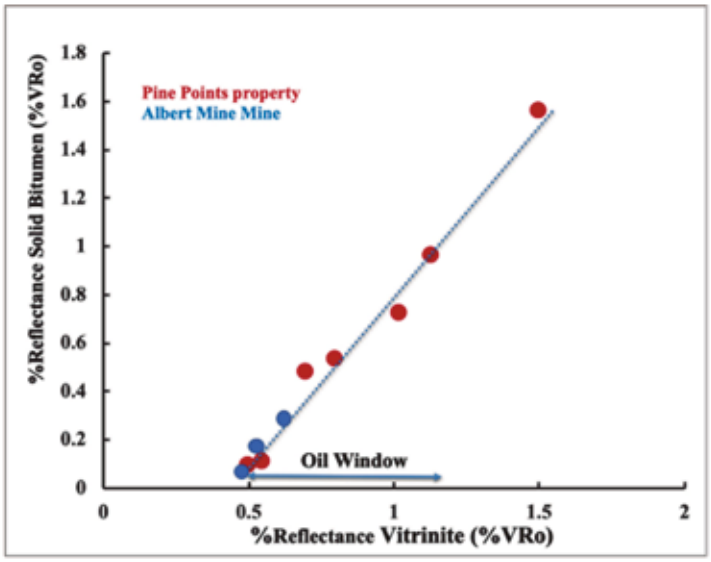


Figure 8. Modified classification of migra-bitumen based on the early version of (Goodarzi and Macqueen (1991) and Jacob (1985) and bitumen species found in Pine Point, Northwest Territories (blue), and Albert Mine, New-Brunswick (red). Solid bitumens in Pine Point, North Territories and those associated with Albert oil shale New Brunswick Canada were studied by Goodarzi and Macqueen, 1990 and Goodarzi et al., 2019a.

Goodarzi and Macqueen (1990) modified Jacob's (1975) classification of SB based on optical properties and divided bitumen into three groups: soluble asphaltene-rich, non-soluble naphthene-rich, and ozokerite (Figure 8).

Pine Point. Solid bitumen in Pine Point lead-zinc property, Northwest Territories, Canada, is located on the south shore of Great Slave Lake and occurs in the carbonate barrier complex of the Middle Devonian age (Skall, 1975). There are six varieties of SB originating from a single source facies (bituminous shale) on or in proximity to the property (Goodarzi and Macqueen,1990). Low maturity (% BR_o=soluble (asphaltic)) SB are the most abundant forms compared to the more mature SB. Solid bitumens in the Pine Point properties consist of gilsonite, glance pitch, grahamite, wurtzilite albertite, and epi-impsonite (Figures 9,10).

An example of a migrated SB is the Alberta mine in New Brunswick, Canada (Figure 9). The migrated SB veins are in contact with Albert oil shale. Solid migra-bitumen emplaced in Albert shale due to the tectonic activities, breaching of a deep reservoir, and migration of oil to the immature oil shale deposit (Goodarzi et al, 2019a), similar to exposure of oil pools in Athabasca sand, Canada, and Iranian natural asphaltic spring Goodarzi and Williams, 1981) and vein and fissure-filling bitumens associated with the oil shale of the Unita basin, USA (Hunt et al., 1996). SBS in Albert Mine consist of soluble asphaltene, gilsonite, glance pitch (Figure 12a-c), and non-soluble naphthene-rich wurtzilite and Albertite bitumens (Figure 12d-e). (Figure 9d-e).



	Type of Bitumen	Pine Point	Albert Mine
1	Gilsonite	0.09	0.06
2	Glance pitch	0.11	0.17
3	Albertite	0.48	0.29
4	Grahamite	0.53	
5	Epi-impsonite	0.72	
6	Epi-impsonite	0.96	
7	Epi-impsonite	1.56	

Figure 9. Variation of reflectance for SB (% BR_o) and vitrinite (%VR_o), (after Jacob, 1975), data points are from (Goodarzi and Macqueen, 1990 and Goodarzi et al, 2019b).

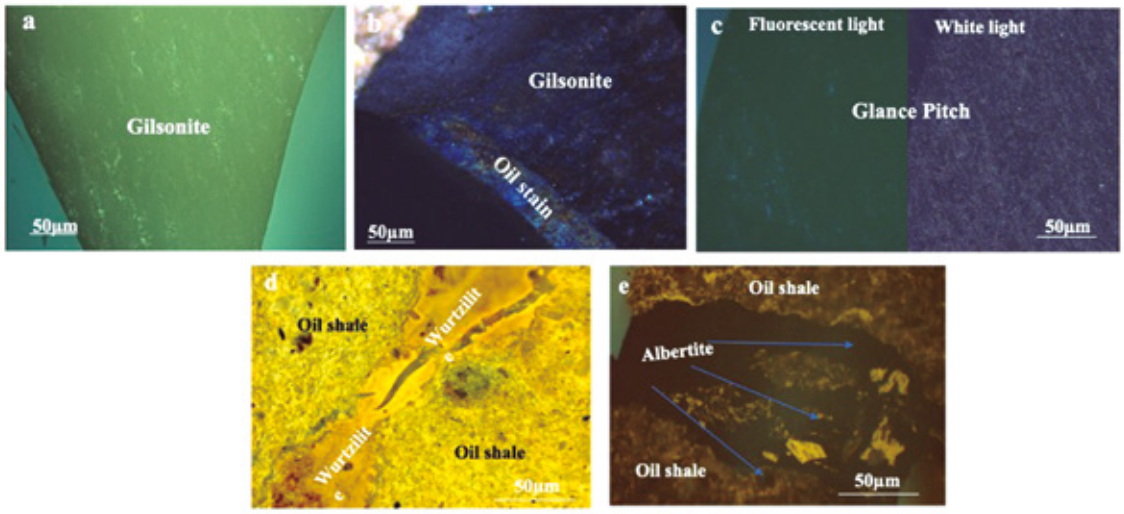


Figure 10. a-c, a-d), Soluble type of SB in Albert mine includes gilsonite (a, b) which is fluorescing and showing a soft, grooved surface, and is "oil" stained and Glance pitch (c) showing a granular surface under white light and is weakly fluorescent and contains blue hydrocarbon droplets under fluorescent light; d-e) The non-soluble SBs in Albert mine consists of, (i) strongly fluorescing wurtzilite and (ii), non-fluorescing Albertite bitumens. Albertite is intruding into yellow fluorescing oil shale and carrying angular organic rich oil shale xenolith into weakly fluorescing organic depleted oil shale matrix.

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INFLUENCE OF GEOLOGY ON THE THERMAL MATURITY OF GRAPTOLITE-A REVIEW

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Introduction

In hydrocarbon exploration, the standard optical techniques used for assessing thermal maturity include measurements of vitrinite reflectance (Bostick, 1979; Teichmüller and Teichmüller, 1982; Suárez-Ruiz et al., 2012), fluorescence and reflectance of bitumen, sporinite and marine algae (Teichmüller and Durand 1983; Goodarzi and Williams 1985; Mastalerz et al., 2018; Hackley et al., 2018), palynomorph color (TAI) and conodont alteration index (CAI) (Batten, 1981; Epstein et al., 1977; Legall et al., 1981).

Besides CAI, TAI, and acritarchs, only petrographic techniques using graptolite, chitinozoa, and scolecodonts exist for determining the thermal maturity of Lower Paleozoic rocks because pre-Upper Silurian rocks generally do not contain vitrinite or spores making it challenging to assess the thermal maturity of their organic matter using standard optical methods (Goodarzi, 1984, 1986).

Lower Paleozoic Ordovician-Devonian sediments do contain structured marine-derived organic matter, including algae, chitinozoa, graptolites, and scolecodonts, together with amorphous material and bitumen (Goodarzi, 1984; Goodarzi and Huggins, 1987; Inan et al., 2016; Synott et al., 2018), which can be used for thermal maturity determinations. Graptolites are organic fossils found in early Paleozoic sediments (Ordovician—Devonian) (Moore et al., 1952). Their optical properties show systematic changes with the maturity of the host rocks (Goodarzi and Norford, 1989; Link et al., 1990; Petersen et al., 2013; Luo et al., 2016, 2017, 2018). Graptolite reflectance measures thermal maturity in Lower Paleozoic rocks (Clausen and Teichmüller, 1982; Goodarzi, 1984, Goodarzi and Norford 1985, 1989; Goodarzi et al., 1985; Kemp et al., 1985; Bertrand and Heroux, 1987; Link et al., 1990; Petersen et al., 2013; Luo et al., 2016, 2017, 2018).

An accurate assessment of thermal maturity in organic rich rocks could help to understand processes of hydrocarbon generation and exploration, loss of organic matter associated toxic elements, and migration and mineralization of critical metals (e.g., Sanei et al., 2014; Bian et al., 2021). Elevated thermal maturity may lead to the decomposition of organic macro compounds and further contribute to loss of efficacy in some proxies such as T_{max} (maximum temperature in potential hydrocarbon), C_{29} steranes maturity parameters, pristane/phytane, and organic carbon isotopes (e.g., Peters et al., 2005). These effects are more prevalent in lower Paleozoic strata. In contrast to organic geochemistry, measurements of graptolite reflectance could minimize these effects since it builds up the evaluation criteria from a more macroscopic view. Herein, we present a systematic introduction of factors for modification of graptolites including lithology, weathering and oxidation, thermal metamorphism, unconformity, and burial depths.

Morphology of Graptolite

Graptolites are colonial marine invertebrates classified as the Class Graptolithina (Phylum Hemichordata (Clarkson, 1981) and have been used since the 19th Century for biostratigraphy and correlation of shale facies. The graptolite rhabdosome (skeleton of a colony, Figures 1, 2 and 3) consists of:

1. thecae - compartments once occupied by zooids.
2. apertures - the external openings of each tube in the skeleton.
3. common canal - the cavity around the virgula into which thecae open.
4. virgula - a continuous central structure that extends as a spine projecting from the thecae; and
5. periderm - the substance composing the rhabdosome, which consists of an inner layer (fusellar tissue) with growth bands and lines and an outer layer (cortical tissue) of laminated material (Crowther and Rickards, 1977; Crowther, 1981).

Microstructures visible in reflected light include the cortical tissue, common canal, and layered walls of the periderm **(Figure 1c and 4a-b).**

Kozlowski (1949) believed that the graptolite periderm was constructed of a chitinous substance. However, Towe and Urbanek (1972), and Bustin et al. (1989) suggested a collagen-like composition of the component fibrils of the fusellar and cortical tissue of the periderm.

Sample Preparation

Relief-free polished sedimentary rock samples are prepared using standard procedures of the International Organization of Standardization (ISO 7404-2, 2009) and ASTM International (ASTM D2797, 2021). However, a modification to the standard polishing procedure is required. Obtaining a flat, relief-free, polished graptolite surface in a section parallel to bedding is essential to ensure accurate reflectance measurements. Following the macroscopic identification of graptolites on a bedding surface, the sample is cut into a 20 mm cube and coated on all sides with a thin epoxy film. The sample is then mounted on a glass plate covered with a slurry of 600 grit silicon carbide powder and alcohol and ground gently until a portion (1-5 mm) of the Graptolite is exposed. After thoroughly rinsing the sample, the specimen was polished on water-soaked pieces of softwood, first in a slurry of 0.3 µm alumina and alcohol, and finally in a slurry of 0.05 µm alumina and alcohol. A detailed description of the preparation procedure is provided by (Goodarzi and Stasiuk, 1987).

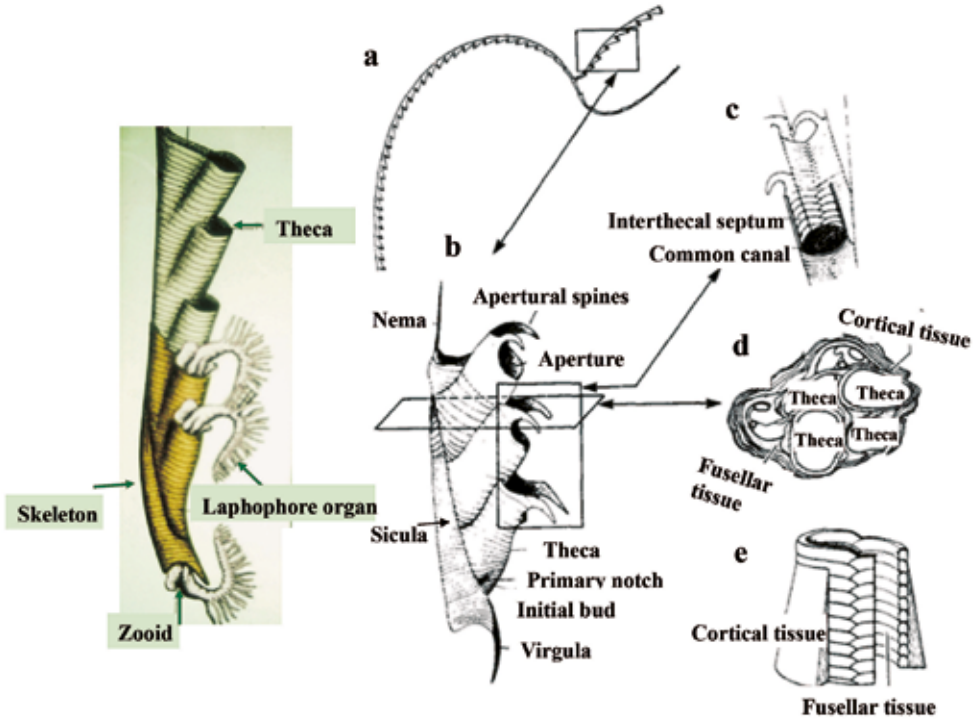

Figure 1. Graptolite zooids and details of the rhabdosome (after Crowther, 1981).

Reflected Light Microscopy

Reflectance measurements (both maximum and minimum) are determined based on ISO 7404-5, 2009, and ASTM D7708, 2014). When possible, fluorescence microscopy of organic matter is carried out using ultraviolet G 365 nm excitation with a 420 nm barrier filter. The Red/Green quotients (Q = relative intensity at 650 nm/relative intensity at 500 nm) of liptinite macerals are determined under standard conditions (filters: excitation 450-490, beam splitter 510, barrier 520 nm).

Factors influencing the reflectance

Graptolite-skeletal material has optical properties similar to vitrinite, and these are influenced by similar parameters. However, graptolites have distinct morphological features (Goodarzi, 1984, Goodarzi and Norford, 1985, Luo et al., 2016-2018, 2021).

The lithology of the host sediment. Graptolite fragments show a lamellar structure; the surface may be granular or nongranular (Figures 2 and 3).

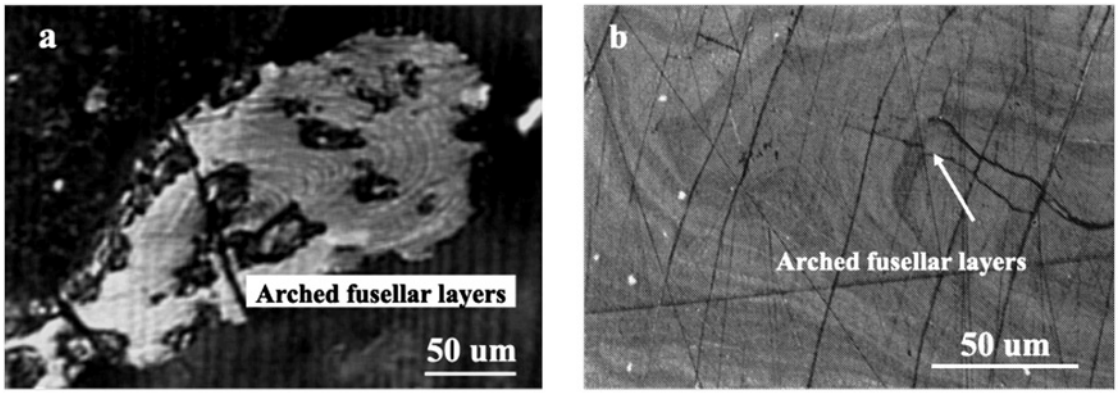

Figure 2. The cortical tissue (a), and layered walls of the periderm (b). Reflected white light, polished surface, oil immersion.

Nongranular fragments occur in an argillaceous matrix, whereas the granular type is normally found in the low maturity carbonate matrix (Figures 3 and 4) (Goodarzi and Norford, 1985). Nongranular graptolites commonly show a complex skeletal morphology under reflected light, consisting of a lamellar cortex with a fibrous structure (Goodarzi, 1986; Goodarzi and Norford 1985, 1989; Luo et al., 2016-2018; Figure 4).

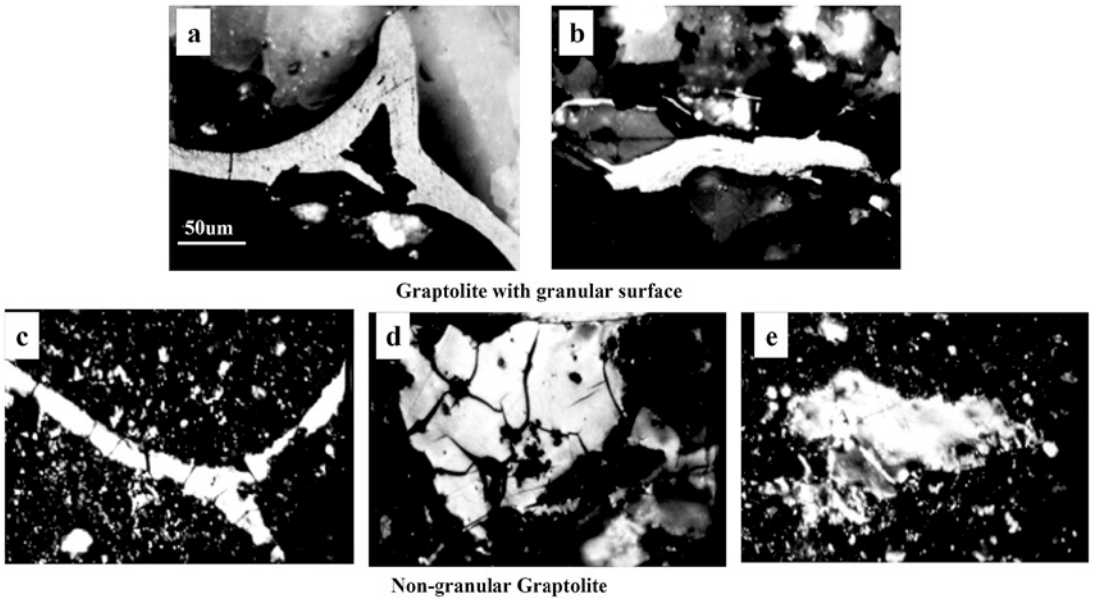

Figure 3. a-b) Granular fragment of Graptolite in carbonate matrix (% R_{omax}: 0.64); Lower Silurian argillaceous limestone (% R_{omax}: 1.60) nongranular graptolite fragments; c) Middle Ordovician shale (% R_{omax}: 6.82); d) Lower Silurian shale (% R_{omax}: 7.20); e) Lower Silurian shale (% R_{omax}: 11.90). Reflected white light, polished surface, oil immersion.

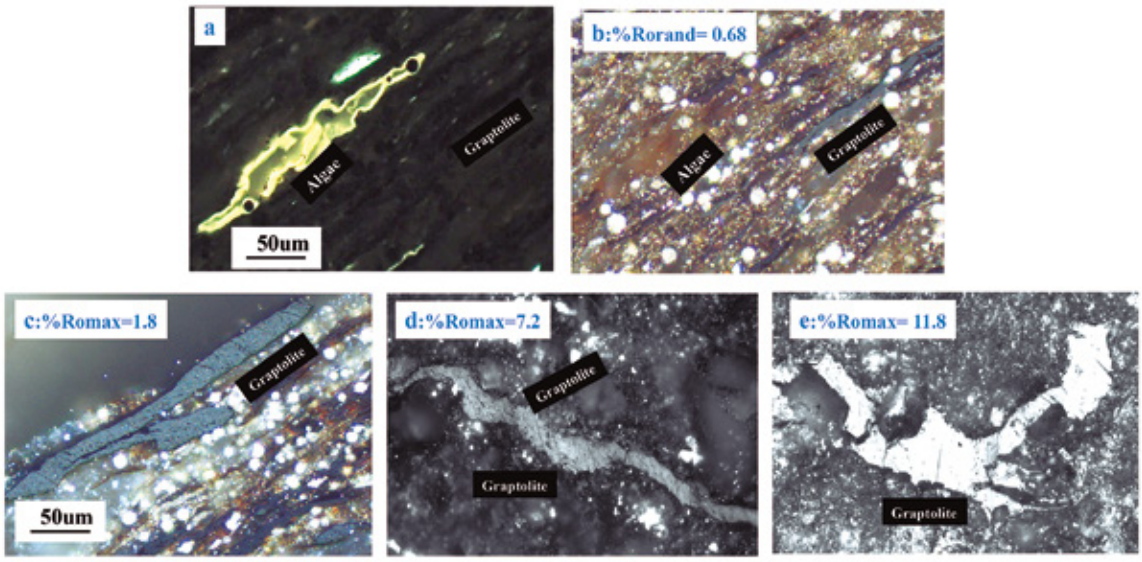

Figure 4. Va, b) Lower Silurian argillaceous limestone (% R_{omax}: 0.68), Nongranular graptolite fragments; c) Middle Ordovician shale (% R_{omax}: 1.8); d) Lower Silurian shale (% R_{omax}: 7.20); e) Lower Silurian shale (% R_{omax}: 11.90). a) Fluorescence light; b-e) Reflected white light, polished surface, oil immersion.

The reflectance and bireflectance (Figure 5) of the nongranular type are higher than those of the granular type (Goodarzi, 1986; Goodarzi and Norford 1985, 1989; Luo et al., 2016-2018).

The best example of a variation of graptolite reflectance in various lithologies, such as shale and carbonate, has been found in the Krapperup borehole (Figure 6), Scania, Sweden (Goodarzi et al., 1988). The % R_{omax} increased with depth in shale, but then abruptly, the trend of the % R_{omax} of the Graptolite reversed and decreased in the shale-carbonate matrix (Figure 6b).

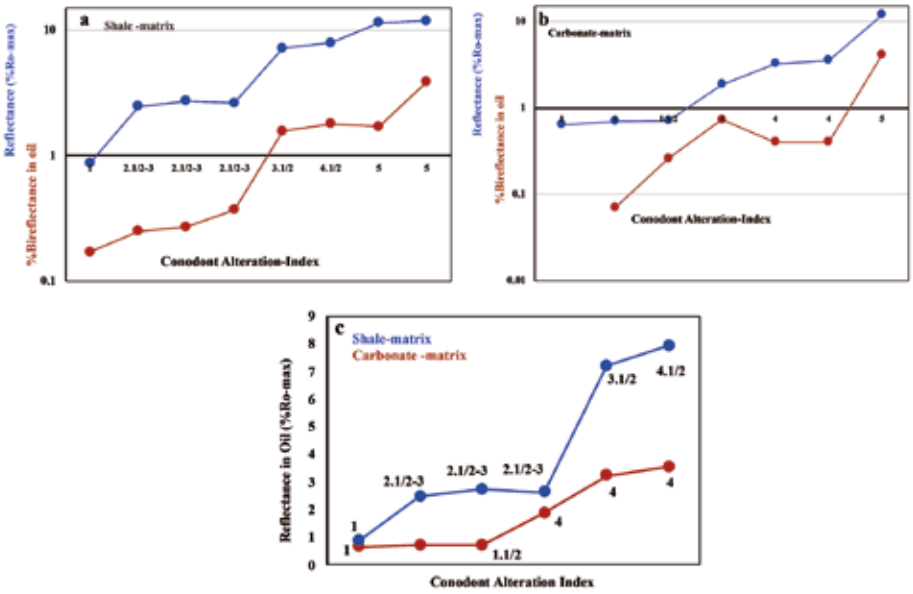

Figure 5. Variation of maximum (% R_{omax}) and bireflectance for graptolites in shale (a) and for in carbonate (b) matrices with Conodont Alteration Index (CAI), and (c) comparison of % R_{omax} of Graptolite in shale and carbonate between CAI of 1-4.1/2, number beside the data each point is the CAI.

Weathering/oxidation. All organic matter in contact with air for prolonged periods shows signs of oxidation/ weathering. This is a surface phenomenon that proceeds from the surface of the organic matter along microscopic fissures. Organic particles often show an oxidation rim (Figure 6a).

The impact of weathering and oxidation is greater the on reactive organic matter and the higher the hydrogen content of organic matter (Goodarzi, 1986). Weathering is a low-temperature oxidation that only includes the chemisorption stage. It occurs at 30 to 70 °C and is marked by an oxidation rim darker and with lower reflectance than the main mass of organic matter (van Krevelen, 1961; Goodarzi, 1986).

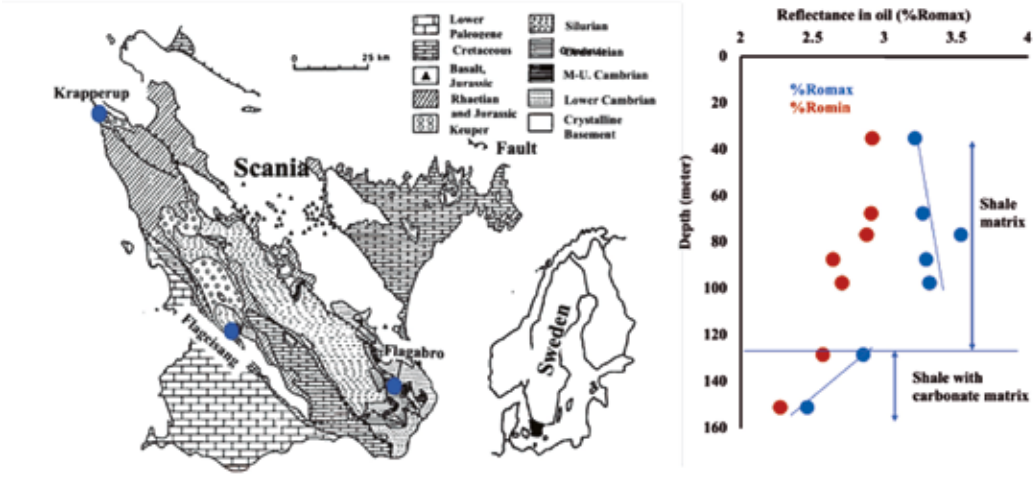

Figure 6. Simplified map of Scania, Sweden, and location of the boreholes (map redrawn from Bergstrom et al. 1982), (b) Variation of graptolite reflectance for Töyen shale-carbonate in sedimentary strata from the Krapperup borehole, Scania, Sweden (after Goodarzi et al.1988).

In general, reactive organic matter show lighter oxidation rims due to paleo-oxidation (Goodarzi, 1986). With increasing temperature and period of exposure, the oxidation rim's reflectance and hardness (as shown by increasing relief) increase compared to the main mass of organic matter (van Krevelen, 1961; Murchison, 1976; Goodarzi, 1986).

In common with vitrinite, the optical properties of graptolites are also affected by weathering/ oxidation and the development of an oxidation rim which has higher reflectance (% R_{omax}= 6.62) than the central mass of the graptolite particles (% R_{omax}=3.63), which indicates that Graptolite is very sensitive to weathering (Figure 7a). The reflectance of the central mass of Graptolite (% R_{omax}=3.63) follows a similar trend to Graptolite with similar maturity (conodont CAI =3), whereas that for the weathered rim is twice as high (% R_{omax}=6.62) with CAI of 3.1/2 (Figure 7b).

Enhanced thermal maturity due to thermal metamorphism. Bireflectance (anisotropy) is the difference between the maximum and minimum reflectance of organic matter in rock, such as vitrinite in coal and bitumen. It is an expression of the degree of ordering of the molecular structure, which increases with the rise in coalification/ maturation (Hirsch, 1954; Gartz and Hirsch, 1990; van Krevelen 1961; Goodarzi and Murchison, 1972).

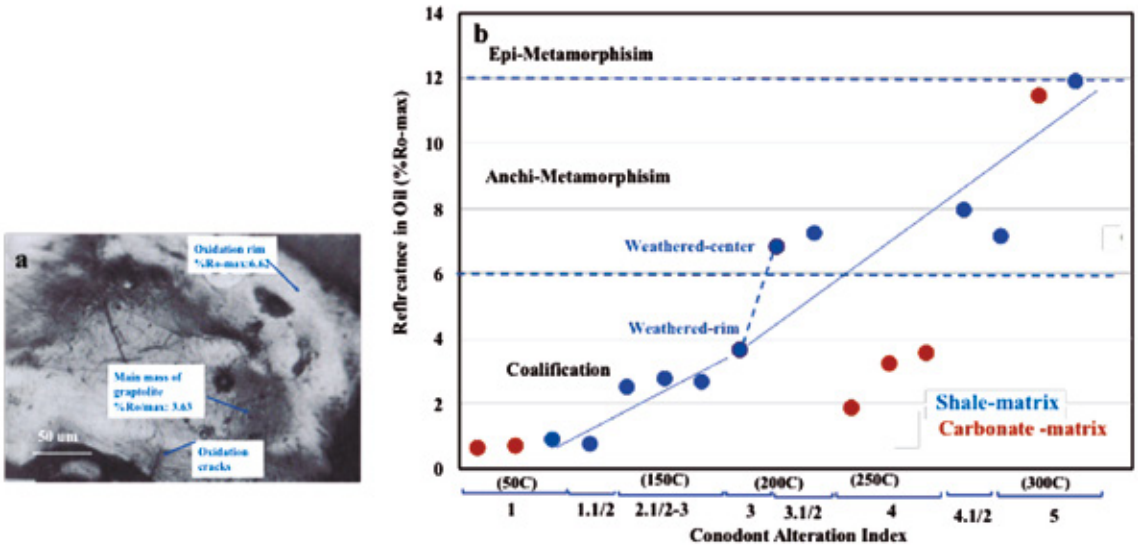

Figure 7. a) Weathered Graptolite fragment shows the oxidation rim with higher reflectance than the central mass. Lower Silurian dolomitic silty shale. (b) Variation of reflectance (% R_{omax}) for carbon with increased thermal maturation with a Graptolite and Conodont Alteration Index reflectance. The weathered Graptolite has a higher reflectance in the oxidation rim.

Graptolite is very sensitive to both thermal and tectonic pressure. It develops high anisotropy (16), representing better molecular ordering of the carbon structure, similar to the graphitizing of carbon, such as in prime coking coal and asphaltic bitumen (Goodarzi and Murchison, 1972; Khorasani and Murchison, 1978; Goodarzi et al., 2018) when subjected to enhanced thermal maturity due to local and regional metamorphism such as igneous intrusion and subsequent mineralization (Figure 8), (Goodarzi and Norford 1986; Goodarzi et al., 1988).

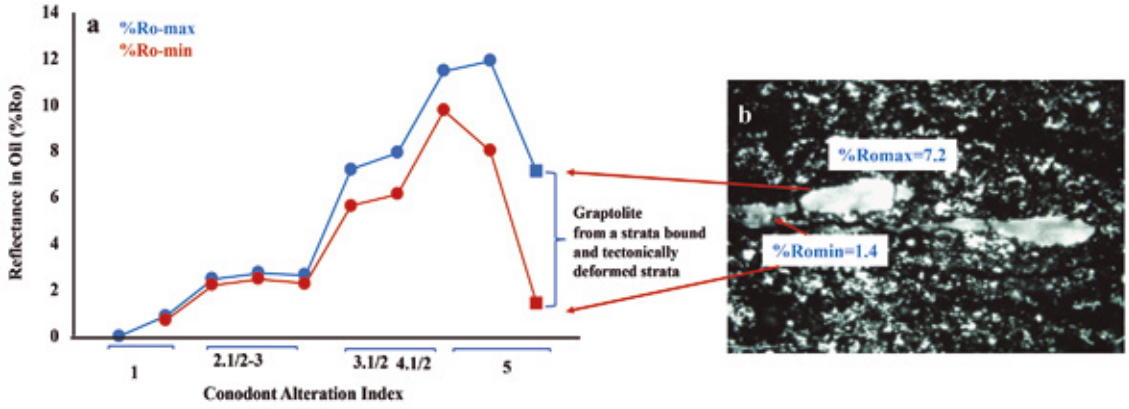

Figure 8a-b. Graptolite fragments showing strong anisotropy in a strata-bound lead-zinc deposit, Lower Silurian mineralized shale.

Unconformity. An unconformity is an indication of a buried erosional or non-depositional surface. The vitrinite reflectance depth profile occasionally records such a hiatus in a sedimentary succession. The presence of a hiatus and a discontinuous session of depositional layers is often shown by an abrupt change and increase in reflectance trend below the unconformity, as shown in the graptolite reflectance profile for shale (Figure 9) at an unconformity between lower Devonian rocks and a lower Silurian rock in an outcrop section of the Road River Group, James River, northwestern Canada (Goodarzi and Norford, 1989).

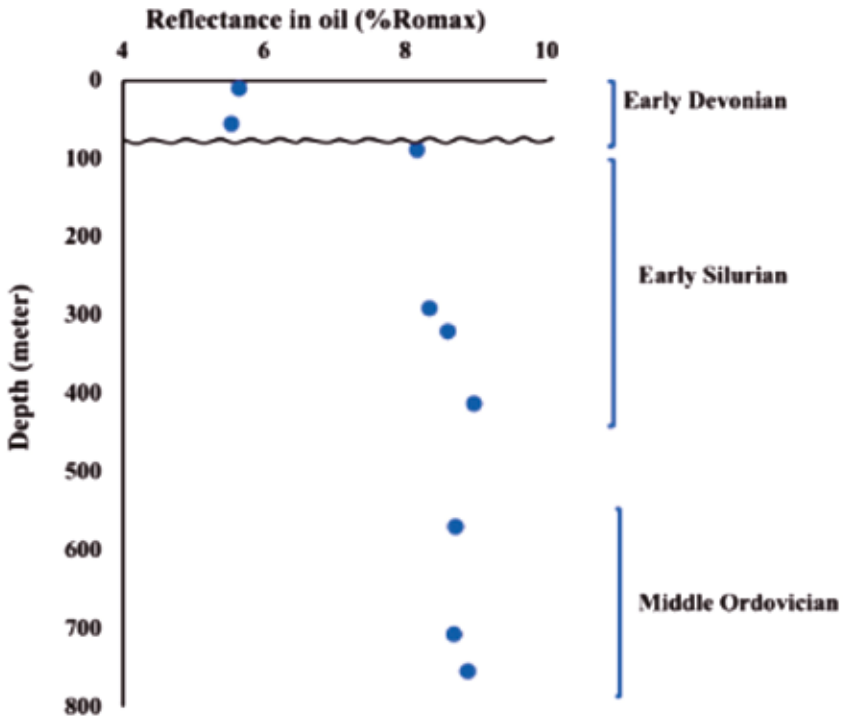

Figure 9. Graptolite reflectance with depth showing an abrupt trend change, indicating a hidden erosional surface and an unconformity; James River, Yukon Territory.

Variation with the depth of burial. The most important factor related to the maturity of organic matter is the depth of burial. Graptolite is very sensitive to the depth of burial and follows a similar pattern to that of vitrinite and solid bitumen (Khorasani, and Murchison, 1978; Goodarzi and Norford ,1989; Goodarzi et al., 1992). Both % R_{omax} and % R_{omin} follows often a similar trend with shallow mainly if maturity is above oil window for graptolite (0.70-1.75 % R_{omax}). Graptolite reflectance increases with depth (Figure 10b and c).

Regional studies of thermal maturation of graptolite

There are several regional thermal maturation studies using graptolite reflectance, including those of (Riediger et al., 1989; Link et al., 1990; Goodarzi et al., 1992; Gentzis et al., 1996), that deal with graptolites from western Canada (British Columbia, and Yukon and Northwest Territories, respectively). The most detail regional studies of thermal maturation using graptolite were carried out by (Goodarzi et al., 1992; Gentzis et al., 1996). In the late Ordovician through early Middle Devonian Cap Phillips Formation (CPF), graptolitic shale and equivalent strata in Arctic Canada over a distance of 600 km to estimate the lateral variation of thermal maturity and depositional history of the CPF from Ellesmere Island in the northeast to Melville Island in the southwest **(Figure 11).** The CPF is up to 3000 m thick and extends from central Ellesmere Island in the northeast to Melville Island in the southwest (Figure 11) (Trettin, 1989; 1990).

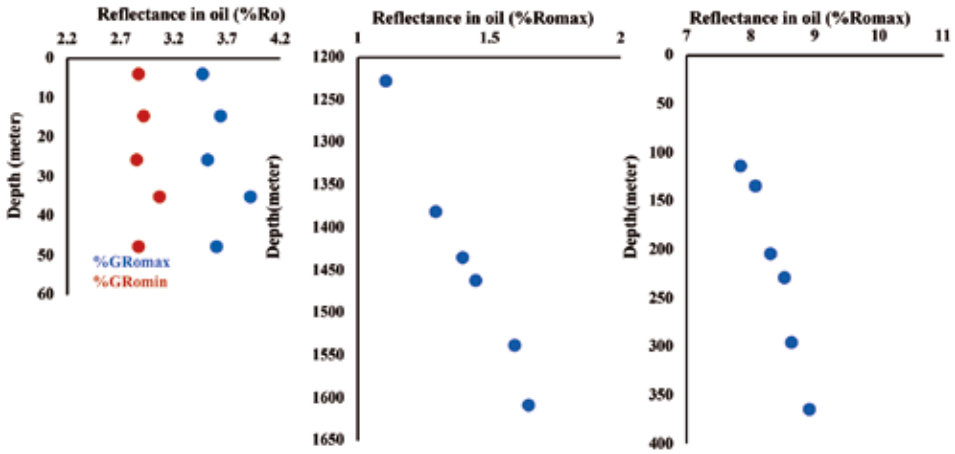

Figure 10. a) Variation of reflectance of Graptolite in carbonate in a shallow borehole with depth in the Fägelsäng borehole, Scania, Sweden (Goodarzi et al., 1988); b) Variation of reflectance of Graptolite in shale in Siedlce beds, Poland and; c) in the Glenogle Formation, southeastern British Columbia, Canada (Goodarzi and Norford, 1989).

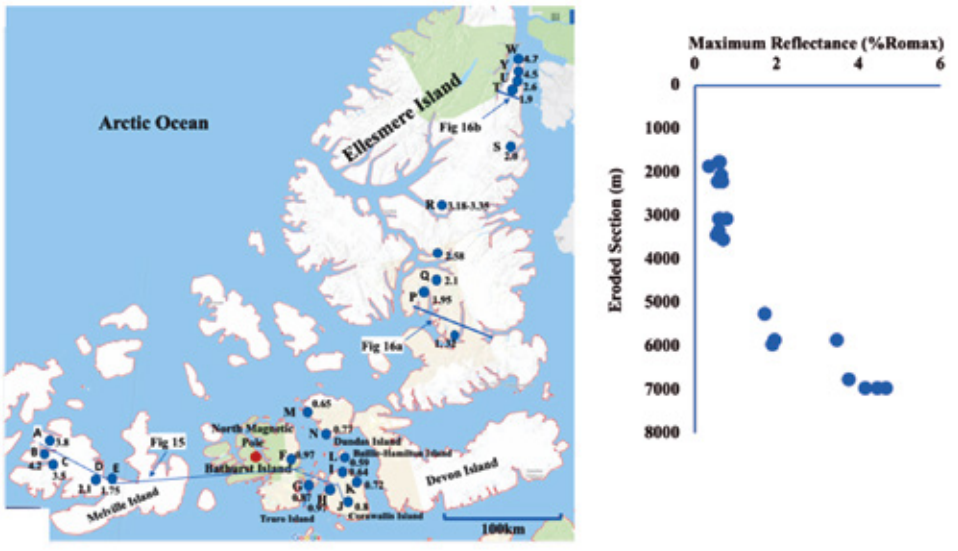

Figure 11. a) Map of the Canadian Arctic Islands showing sample location and graptolite reflectance (% R_{omax}) and line of cross-section; b) variation of graptolite (% R_{omax}) and eroded sedimentary loading on the Cape Phillipss Formation; see Figures 12, 13 and 14 for details.

The depth of burial is the most critical factor related to the maturity of organic matter. Graptolite is very sensitive to the burial depth and follows a similar pattern to vitrinite and solid bitumen (Khorasani and Murchison, 1978; Goodarzi and Norford, 1989; Goodarzi et al., 1992). Both % R_{omax} and % R_{omin} often follows a similar trend with burial depth, which is slow for a shallow depth **(Figure 10a),** mainly if maturity is above the oil window for Graptolite (0.70-1.75 % R_{omax}). Graptolite reflectance generally increases with depth **(Figure 10b and c).**

There are two thermal maturation trends over a distance of 600 km for the CPF in the Queen Elizabeth Islands, Arctic Canada (Goodarzi et al., 1992; Figures 12-14). The larger sample group is from the eastern Arctic; Devon, Dundas, Baillie-Hamilton, Cornwallis, eastern Bathurst, and Prince of Wales islands have low graptolite reflectance values in a range of 0.60-0.80 % R_{omax} (Figure 12). The second group is from drill holes in northern and western Melville Island, and Ellesmere Island has high graptolite reflectance values in the range of 1.75-4.5 % R_{omax} for Melville and 1.32- 4.7 % R_{omax} for Ellesmere Islands (Figures 12-14).

The variations in the thermal maturity of Graptolite are due to (a) age differences between samples, (b) regional variations in geothermal gradient, and (c) regional variation in the maximum thicknesses of the overburden. The sedimentation rates in the CPF were low to moderate. Therefore, age differences between samples are not likely to have made a significant impact on thermal maturation values. The regional geothermal gradient has been determined at about ~25 °C per km for many wells of Melville Island (Gentzis et al., 1996). This gradient is low but within the 'normal' range of geothermal gradients for other sedimentary basins of North America (Gretener, 1982). Geothermal gradients for the eastern Arctic Islands are unknown but probably not much less than 20 °C per km. Therefore, the difference in thermal maturation level between the two sample groups is probably due to the thicknesses of the original overburden. Gentzis et al. (1996) divided the study region into four areas based on their thermal maturation of Graptolite (% R_{omax}).

Melville Island. The % R_{omax} in the Ibbett Bay Formation in the Marie Bay D-02 drill hole, western Melville Island, is 3.5 % in the upper part of Ibbett Bay and 3.8-4.2 % in the lower part of Ibbett Bay (Goodarzi et al., 1992; Goodbody, 1994; Gentzis, 1991; Gentzis et al. 1996), with an estimated thickness of 9 km, similar to that in northern Ellesmere Island. Lower % R_{omax} values (1.75-2.1 %) in eastern Melville Island can be attributed to burial by Devonian clastic succession that was about 7-km-thick. The 7 km estimates based on the sum of the exposed thickness of the wedge (about 4 km (Goodbody, 1994) plus an estimated 2.5-3 km of eroded Parry Islands Formation (Embry, 1991), which indicates that about 7 km of the section eroded (Figure 12). Variations in % R_{omax} values in Melville Island indicate that the elastic wedge in eastern Melville was thin. This suggests that water depths at the onset of clastic deposition were considerably shallower than those of the adjacent deep-water basin where the Ibbett Bay Formation accumulated.

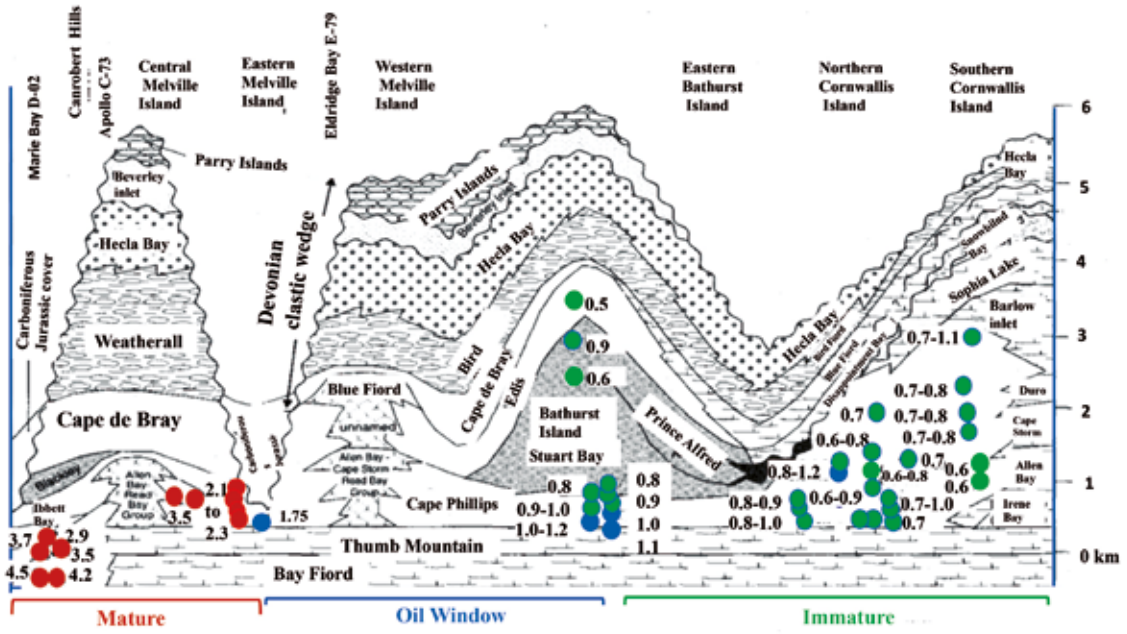

Figure 12. Schematics stratigraphic cross section from Melville Island, Bathurst to Cornwallis Islands, (after Goodarzi et al.,1992).

Bathurst and Cornwallis Islands. In central Bathurst Island, graptolites of the CPF have a R_{omax} of 0.97 % (Figure 12). These values are lower than those of Melville Island's drowned shelf and deep-water basin (Figure 12). The Cornwallis Island graptolites have R_{omax} values of 0.59-0.97 %, indicating that the burial thickness of about 5 km is nearly intact. In contrast, R_{omax} values in the CPF range from 0.59 to 0.76 %, indicating a very thin clastic wedge (Figure 12). In addition to resting on the drowned shelf, this area was deformed along northerly trends during the Early Devonian to form the Boothia Uplift-Cornwallis Fold Belt (Figure 12). Although most structural relief formed before the deposition of the Devonian clastic wedge, Middle and Upper Devonian facies and formation thicknesses indicate that the Uplift subsided more slowly than adjacent areas. Because of this, some Devonian siliciclastic map units are absent locally within the Boothia Uplift or much thinner than in Bathurst and Melville islands (Figure 12).

South-Central Ellesmere Island. Thermal maturity trends in Ellesmere Island (Figure 13) are similar to those in Melville Island, with the percentage of R_{omax} gradually increasing along the inner to outer shelf transect (Figure 13).

The Danish River Formation siliciclastics were covered by more than 3 km of Middle and Upper Devonian clastics and carbonates. About 2 km of sediment accumulated over the deep-water cherts and mudrocks of the Hazen Formation (Trettin, 1994).

Therefore, the graptolitic rocks were buried in about 4 km of strata. However, their thermal maturities are comparable to those in eastern Melville Island, buried beneath about 7 km of strata (Figure 13), indicating that about 3 km of strata have been eroded from central Ellesmere Island. An easterly decrease in % Ro values is possibly due to a thinner sequence of Middle and Upper Devonian clastics (Gentzis et al., 1996).

North Ellesmere Island. The drowned shelf transect in Judge Daly Promontory shows an abrupt basin ward increase in % R_{omax} of 1.9 to 4.7 % (Figure 14). In particular, maturity decreases from 4.5- 4.7 % to 1.9-2.58 % laterally (Figure 14). The maturation of the outer part of the drowned Late Ordovician shelf is similar to those of the basinal Ibbett Bay Formation in western Melville Island (Figure 12). This similarity indicates that the Judge Daly Promontory area accommodated a sedimentary column up to 7.6 km thick, slightly more than the values for the drowned shelf farther south (7 km). The siliciclastic thicknesses in the adjacent Hazen deep-water basin were complex because the oldest clastic deposits encountered a substantial shelf-margin submarine edifice with up to 2 km of relief (de Freitas 1991; Trettin, 1994). Therefore, 7.6 km of clastics accumulated initially in the basinal areas and later on the drowned shelf due to the infilling (2 km) of the submarine depression, resulting in an estimated 9.6 km overburden (Figure 14). The CAI of 5 supports this estimated 9.6 km burial thickness in Judge Daly Promontory (Trettin, 1994).

The abrupt lateral variation of % R_{omax} in Judge Daly Promontory is due to the tectonic down flexing of an inhomogeneous crust. As orogenic belts obducted across older passive margins, they were influenced substantially by the crust's pre-existing thermal and structural characteristics (Stockmal et al., 1986). The imposed load on the Cambrian-Ordovician passive margin reactivated older extension faults that developed during the late Proterozoic-Early Cambrian continental breakup and caused the abrupt lateral variation in sediment thicknesses and thus the observed % R_{omax} values (Soper and Higgins, 1990). Lateral variation of sediment thickness, and thus graptolite reflectance values, can be attributed to syn-sedimentary movement along older lines of basement weaknesses; however, these faults have not been identified in outcrop.

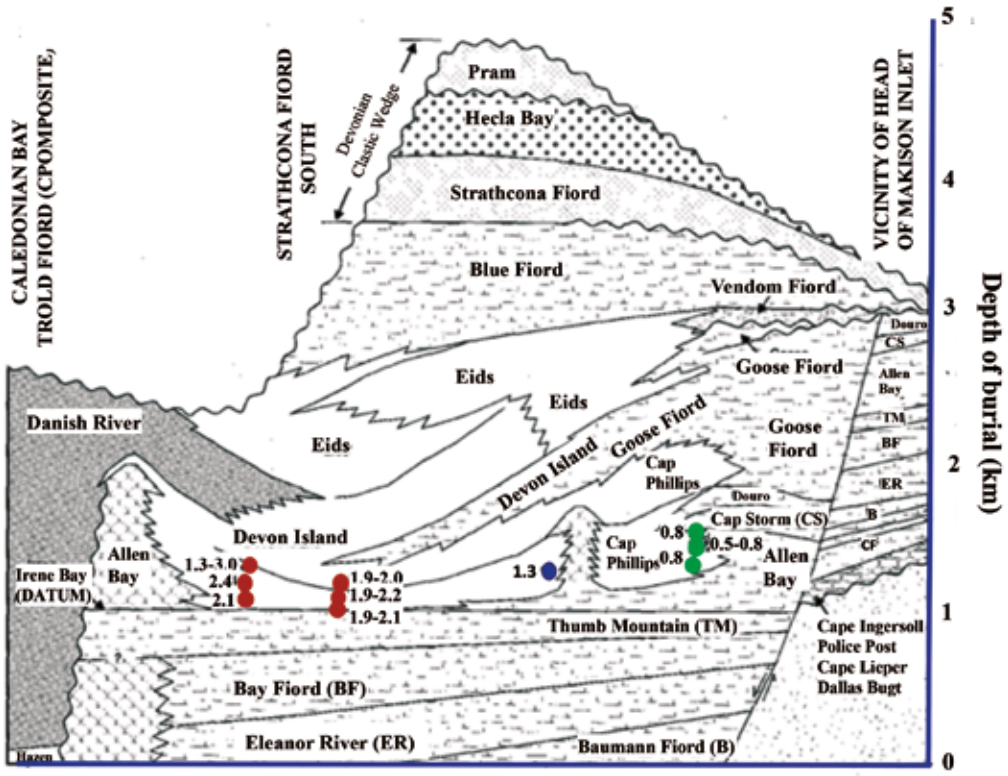

Figure 13. Schematics stratigraphic cross section from Caledonian Bay/Thorold Fiord to the vicinity of head of Mackinson Inlet, Ellesmere Island (after Gentzis et al.1996).

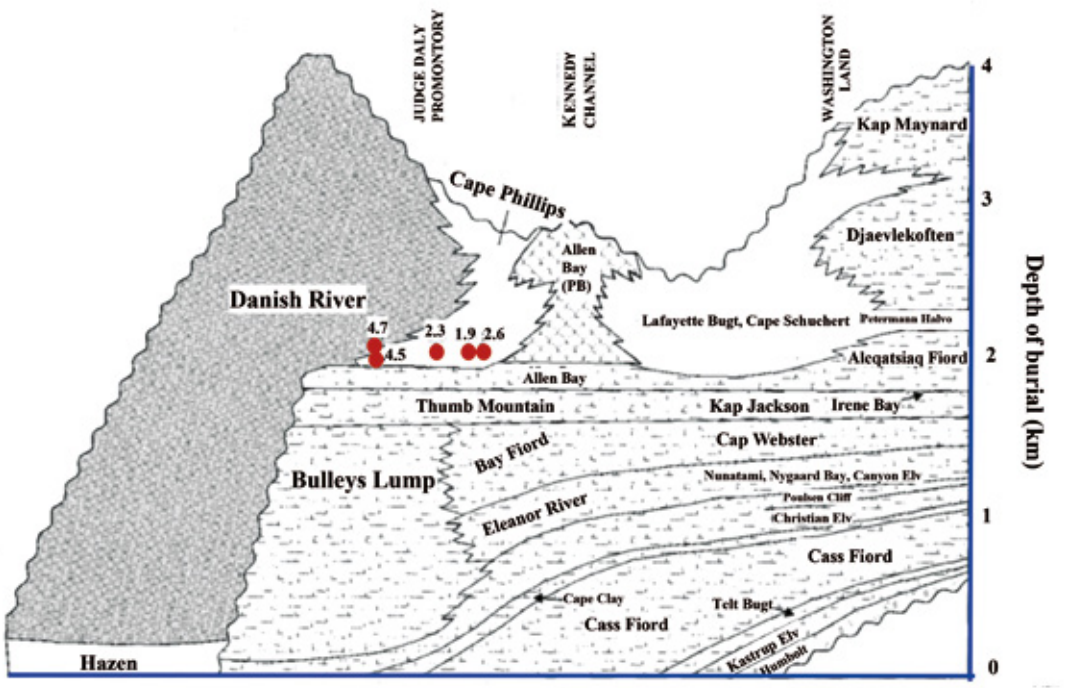

Figure 14. Schematics stratigraphic cross section from Judge Daly promontory, Ellesmere Island, Canada to Washington land, Greenland, (after Gentzis et al., 1996).

China. The Wufeng–Longmaxi graptolite-bearing shales in China are the most important exploration target of shale gas in China. They are characterized by abundant organic matter (TOC: 0.51–25.73 %), thick beds (30–130 m), abundant OM pores and strong gas generation intensity (Dai et al., 2014; Dai et al., 2016; Luo et al., 2016; Ma et al., 2016; Luo et al., 2017; Luo et al., 2018), and the abundance of graptolites shows a positive correlation with TOC, implying a significant contribution of graptolite to OM (Zhu et al., 2015; Deng et al., 2016; Luo et al., 2016; Borjigin et al., 2017). Graptolite reflectance has been used to assess maturity in the Wufeng–Longmaxi Formation (Luo et al., 2016; Luo et al., 2017; Wang et al., 2019). Regional maturation maps based on VR_o-eq converted from GR_o indicate increasing thermal maturity from southwest to northeast, with VR_o-eq ranging from 1.17 % to 4.93 % (Luo et al., 2018; Luo et al., 2020).

Comparison of maturity of graptolite with vitrinite

Graptolite bearing rock occurred between Ordovician and the Devonian when land plants were virtually absent present. Therefore, their maturities cannot be compared directly to those of vitrinite which occurs in younger sediments. However, they can be compared indirectly and through CAI (Goodarzi and Norford, 1985). In general, the reflectance of graptolite is very sensitive to all geological parameters influencing the thermal maturity of rock that alter the maturity trend of vitrinite as described above (Goodarzi, 1984; Inan et al., 2016; Bertrand and Heroux, 1987).

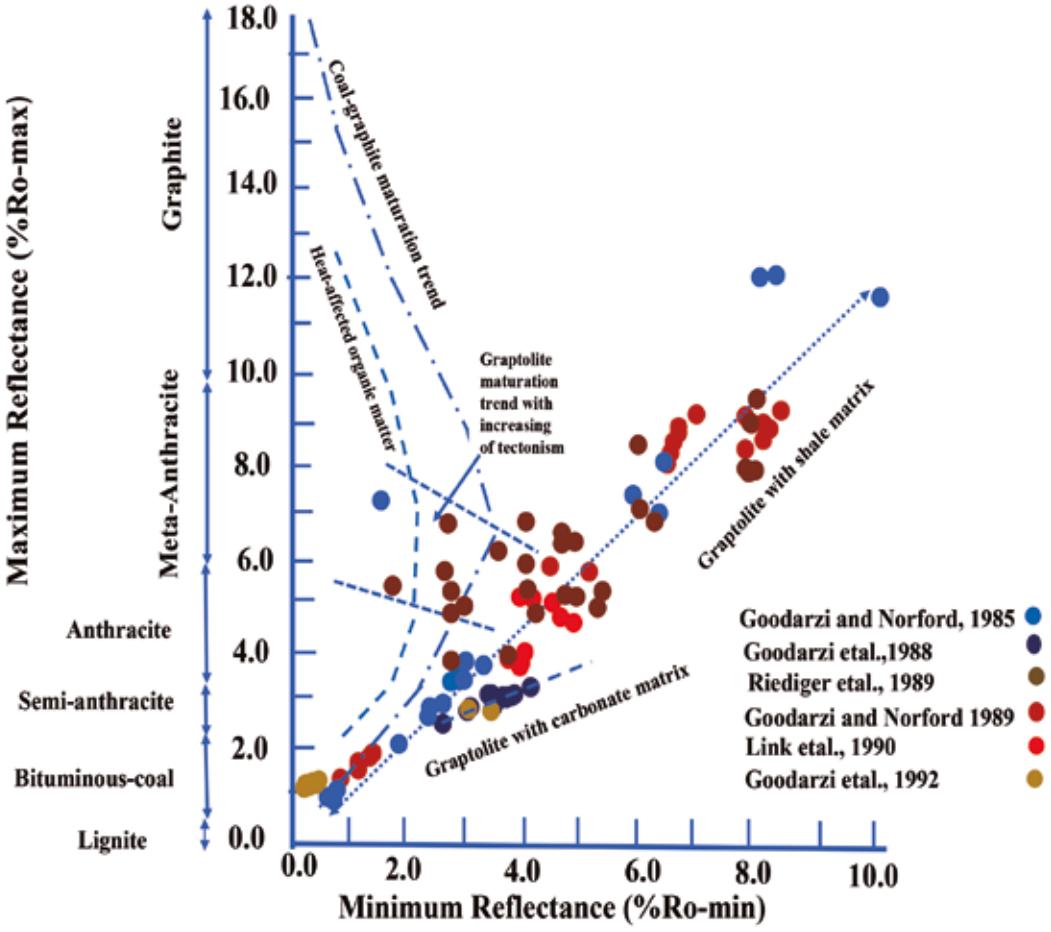

Figure 15. Variation of Maximum and Minimum Reflectance of graptolite and the trend of coal-graphite and heat-effected organic matter.

The maturities of early Paleozoic rocks can be determined accurately using graptolite reflectance without converting to vitrinite reflectance. However, the equivalent vitrinite value can be extrapolated, and the hydrocarbon generation boundary can be determined (Figure 16). In general, immature rocks have % a R_{omax} of <1.0 %, and at 1.75-1.8 %, Graptolite-bearing rocks enter the early thermal gas generation zone (Figure 12), which is clearly shown by detailed regional studies of (Goodarzi et al., 1992; Gentzis et al., 1996). Without the need to reference vitrinite (Figures 11-13). However, it is important to note that the rock matrix has more influence on graptolite reflectance than it does on vitrinite reflectance and may result in a variation of % R_{omax} in a borehole (Figure 6). A detailed study of graptolitic reflectance in shale using Rock-Eval (T_{max}, °C) and associated alginite under fluorescent light (Inan et al., 2016) indicates that it is possible Accurately correlate the % R_o with fluorescent parameters (red/green quotient, fluorescent color) of associated alginite in the same rocks (Figure 17). However, the correlation of % R_o with T_{max} is less sensitive and depends on the host rock's total organic carbon (TOC) content (Synnott et al., 2018).

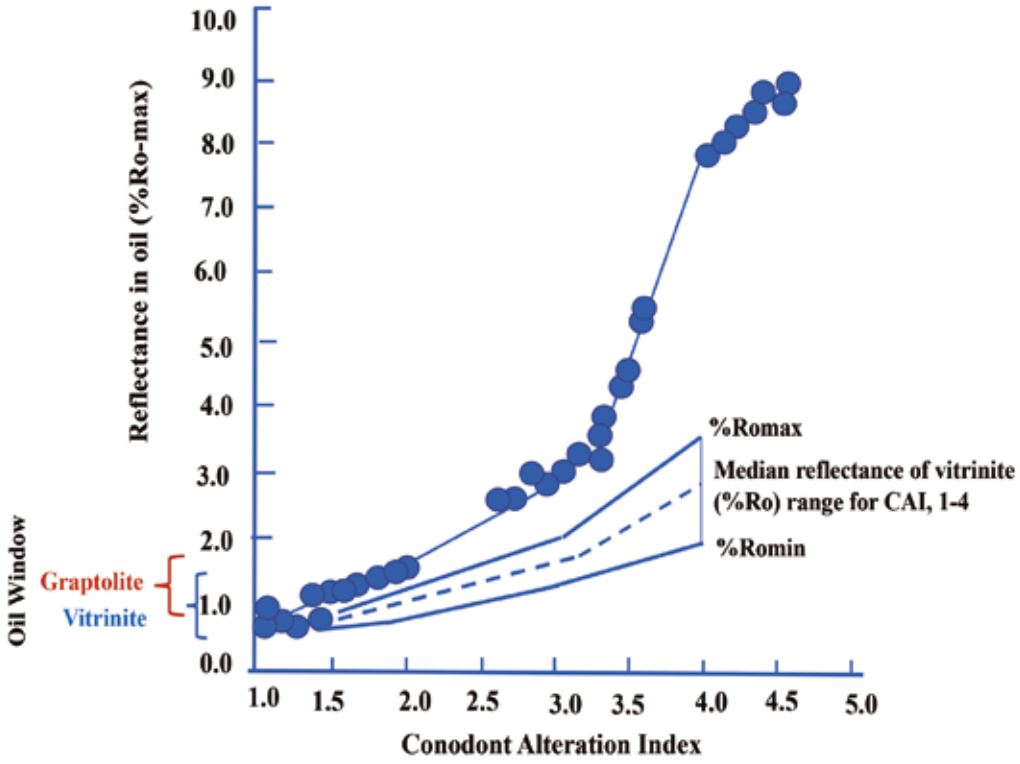

Figure 16. Variation of reflectance of graptolite and vitrinite (% R_{omax}, R_{omin}, % R_o) with Conodont Alteration index (Goodarzi and Norford, 1989; and references therein).

Inan et al. (2016) recommended that graptolite reflectance be the main reference point for comparison of maturity parameters obtained from other petrographic, geochemical, and spectroscopic techniques.

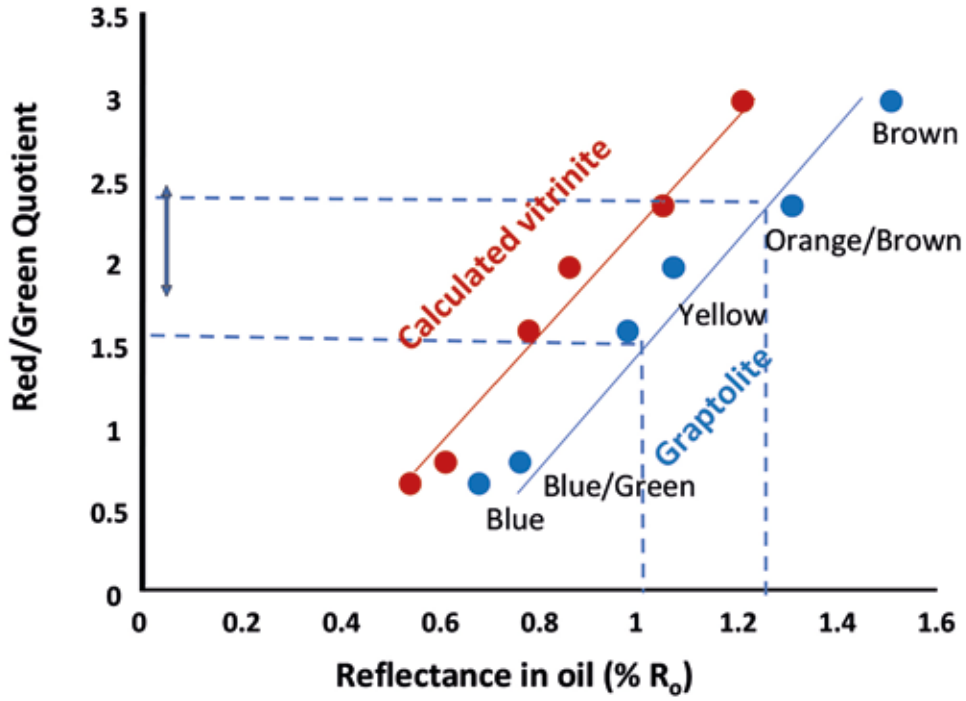

Figure 17. Variation of reflectance of graptolite (% R_o) and calculated vitrinite with Red/green quotient (after Inan et al., 2016).

Conclusions:

Worldwide research on Graptolite as a thermal indicator over the past forty years indicates that:

- Graptolite in rock is easily recognizable due to its unique morphology; in contrast, detecting primary vitrinitic particles is often difficult if multi-reworked vitrinitic and multi-phase bitumen particles (primary-migrated) are present.
- The reflectance of Graptolite (% GR_o) follows similar but different trends than vitrinite's (% VR_o).
- The reflectance of Graptolite is sensitive to geological factors, such as depth of burial, weathering, and abnormal thermal events, such as those due to igneous intrusions and mineralization.
- Geological events such as erosion or unconformity are accurately depicted in regional studies using % GR_o.

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Chapter 4

A REGIONAL FLAVOUR OF THE ICCP

ORGANIC PETROGRAPHY IN ARGENTINA

Héctor J. Villar [1] and Juan A. Pineda Álvarez [2]

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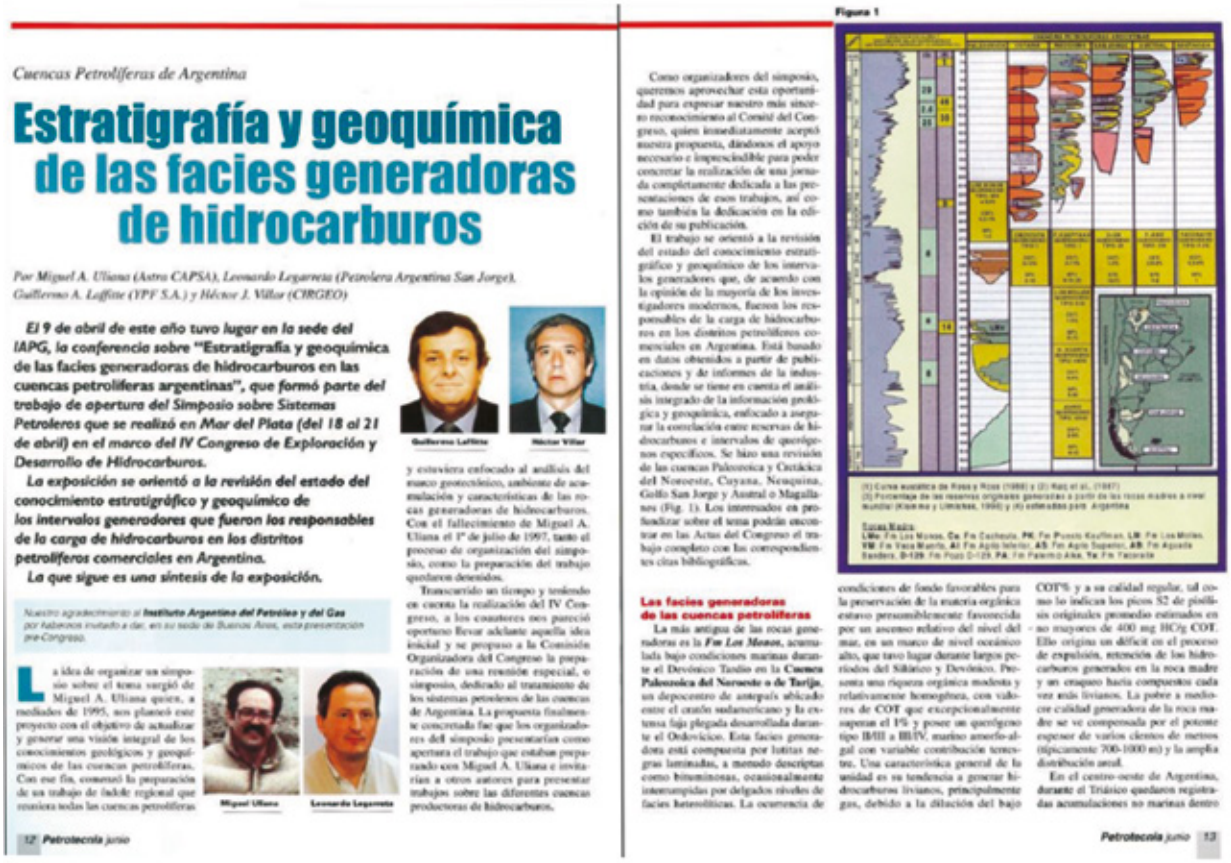
The beginnings of organic petrography in Argentina can be traced back to 1978 when at the Centro de Investigaciones en Recursos Geológicos (CIRGEO: "Research Center for Geological Resources") in Buenos Aires, an institute dependent on CONICET ("National Research Council"), a laboratory for palynofacial and organic-petrographical studies is grounded after the initiative of the prestigious paleobotanist Sergio Archangelsky. The lab was conducted by Héctor J. Villar, who acquired the initial background from the technical and scientific support provided by Dr. Johana Nahuys (CIENTEC of Porto Alegre. Brazil), Dr. Zuleika Correa da Silva (Federal University of Rio Grande do Sul in Porto Alegre) and Dr. Boris Alpern (University of Orleans, France). In 1979, the laboratory began to develop research projects and provide services for YPF, the national oil and gas company, covering the first studies of source rock characterization and thermal maturity assessments for the various Argentinian petroliferous basins. In 1980, the YPF geological laboratory also incorporated an organic petrography section led by Guillermo Laffitte, establishing both laboratories several complementing programs in those pioneering stages.

Between 1985 and 1988, Héctor J. Villar established himself with a CONICET scholarship at the Lehrstuhl für Geologie Geochemie und Lagerstätten des Erdöls und der Kohle (Institute of Geology and Geochemistry of Petroleum and Coal) of the Technical University of Aachen in Germany. There, under the direction of the Prof. Dr. Monika Wolf and the invaluable collaboration of Hans Hagemann and Walter Pickel, he gained the most advanced knowledge of the discipline in terms of characterization of hydrocarbon and source rocks and coals using organic petrography approaches and he enters ICCP for the first time, participating in Commission II and attending the 39th Meeting of the ICCP, at Doncaster, G.B., in September 7-12, 1986. This was an initial contact with the ICCP.

Upon his return to Buenos Aires, Héctor continued with the provision of organic petrography services for YPF and other oil companies. Based on this experience, numerous publications were made focused on the petroleum systems and source rocks of Argentina, in which the information contributed by organic petrography and palynofacies studies played a fundamental role. An emblematic publication is the one that headed the 1999 Petroleum Systems Symposium, organized by the Argentine Institute of Petroleum and Gas (IAPG), with a strong input from organic geochemistry and in particular from kerogen microscopy studies in the typing of the hydrocarbon generating subsystems of these basins (see photo in Figure 1) illustrating a chronicle clipping of this event published in the IAPG Petrotecnia Magazine).



Cuencas Petrolíferas de Argentina

Estratigrafía y geoquímica de las facies generadoras de hidrocarburos

Por Miguel A. Uliana (Astra CAPSA), Leonardo Legarreta (Petrolera Argentina San Jorge), Guillermo A. Laffitte (YPF S.A.) y Héctor J. Villar (CIRGEO)

El 9 de abril de este año tuvo lugar en la sede del IAPG, la conferencia sobre "Estratigrafía y geoquímica de las facies generadoras de hidrocarburos en las cuencas petrolíferas argentinas", que formó parte del trabajo de apertura del Simposio sobre Sistemas Petroleros que se realizó en Mar del Plata (del 18 al 21 de abril) en el marco del IV Congreso de Exploración y Desarrollo de Hidrocarburos.

La exposición se orientó a la revisión del estado del conocimiento estratigráfico y geoquímico de los intervalos generadores que fueron los responsables de la carga de hidrocarburos en los distritos petrolíferos comerciales en Argentina.

La que sigue es una síntesis de la exposición.

*Nuestro agradecimiento al **Instituto Argentino del Petróleo y del Gas** por habernos invitado a dar, en su sede de Buenos Aires, esta presentación pre-Congreso.*

La idea de organizar un simposio sobre el tema surgió de Miguel A. Uliana quien, a mediados de 1995, nos planteó este proyecto con el objetivo de actualizar y generar una visión integral de los conocimientos geológicos y geoquímicos de las cuencas petrolíferas. Con ese fin, comenzó la preparación de un trabajo de índole regional que reuniera todas las cuencas petrolíferas y estuviera enfocado al análisis del marco geotectónico, ambiente de acumulación y características de las rocas generadoras de hidrocarburos. Con el fallecimiento de Miguel A. Uliana el 1º de julio de 1997, tanto el proceso de organización del simposio, como la preparación del trabajo quedaron detenidos.

Transcurrido un tiempo y teniendo en cuenta la realización del IV Congreso, a los coautores nos pareció oportuno llevar adelante aquella idea inicial y se propuso a la Comisión Organizadora del Congreso la preparación de una reunión especial, o simposio, dedicado al tratamiento de los sistemas petroleros de las cuencas de Argentina. La propuesta finalmente concretada fue que los organizadores del simposio presentarían como apertura el trabajo que estaban preparando con Miguel A. Uliana e invitarían a otros autores para presentar trabajos sobre las diferentes cuencas productoras de hidrocarburos.

Guillermo Laffitte — Héctor Villar — Miguel Uliana — Leonardo Legarreta

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Como organizadores del simposio, queremos aprovechar esta oportunidad para expresar nuestro más sincero reconocimiento al Comité del Congreso, quien inmediatamente aceptó nuestra propuesta, dándonos el apoyo necesario e imprescindible para poder concretar la realización de una jornada completamente dedicada a las presentaciones de esos trabajos, así como también la dedicación en la edición de su publicación.

El trabajo se orientó a la revisión del estado del conocimiento estratigráfico y geoquímico de los intervalos generadores que, de acuerdo con la opinión de la mayoría de los investigadores modernos, fueron los responsables de la carga de hidrocarburos en los distritos petrolíferos comerciales en Argentina. Está basado en datos obtenidos a partir de publicaciones y de informes de la industria, donde se tiene en cuenta el análisis integrado de la información geológica y geoquímica, enfocado a asegurar la correlación entre reservas de hidrocarburos e intervalos de querógenos específicos. Se hizo una revisión de las cuencas Paleozoica y Cretácica del Noroeste, Cuyana, Neuquina, Golfo San Jorge y Austral o Magallanes (Fig. 1). Los interesados en profundizar sobre el tema podrán encontrar en las Actas del Congreso el trabajo completo con las correspondientes citas bibliográficas.

Figura 1

(1) Curva eucástica de Rosa y Rosa (1986) y (2) Raz et al. (1987)
(3) Porcentaje de las reservas originales generadas a partir de las rocas madres a nivel mundial (Klemme y Ulmishek, 1990) y (4) estimadas para Argentina

Sumas Madre:
LMo: Fm Los Monos, Ca: Fm Cacheuta, PK: Fm Puesto Kauffman, LM: Fm Los Molles, VM: Fm Vaca Muerta, AI: Fm Agrio Inferior, AS: Fm Agrio Superior, AB: Fm Aguada Bandera, D-129: Fm Pozo D-129, PA: Fm Palermo Aike, Ya: Fm Yacoraite

Las facies generadoras de las cuencas petrolíferas

La más antigua de las rocas generadoras es la ***Fm Los Monos***, acumulada bajo condiciones marinas durante el Devónico Tardío en la **Cuenca Paleozoica del Noroeste o de Tarija**, un depocentro de antepaís ubicado entre el cratón sudamericano y la extensa faja plegada desarrollada durante el Ordovícico. Esta facies generadora está compuesta por lutitas negras laminadas, a menudo descriptas como bituminosas, ocasionalmente interrumpidas por delgados niveles de facies heterolíticas. La ocurrencia de condiciones de fondo favorables para la preservación de la materia orgánica estuvo presumiblemente favorecida por un ascenso relativo del nivel del mar, en un marco de nivel oceánico alto, que tuvo lugar durante largos períodos del Silúrico y Devónico. Presenta una riqueza orgánica modesta y relativamente homogénea, con valores de COT que excepcionalmente superan el 1% y posee un querógeno tipo II/III a III/IV, marino amorfo-algal con variable contribución terrestre. Una característica general de la unidad es su tendencia a generar hidrocarburos livianos, principalmente gas, debido a la dilución del bajo COT% y a su calidad regular, tal como lo indican los picos S2 de pisólisis originales promedio estimados en no mayores de 400 mg HC/g COT. Ello origina un déficit en el proceso de expulsión, retención de los hidrocarburos generados en la roca madre y un enaqueo hacia compuestos cada vez más livianos. La pobre a mediocre calidad generadora de la roca madre se ve compensada por el potente espesor de varios cientos de metros (típicamente 700-1000 m) y la amplia distribución areal.

En el centro-oeste de Argentina, durante el Triásico quedaron registradas acumulaciones no marinas dentro

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Figure 1. A clipping of Petrotecnia Magazin (IAPG, 1999) highlighting the characterization of hydrocarbon source rocks in Argentinian basins, studies in which organic petrography played a key role.

In 2006, GeoLab Sur S.A. -a geochemical analysis service company for the oil and gas industry- was established in Buenos Aires under the direction of Héctor J. Villar. Among the different analyses provided by the laboratory, the organic petrography unit occupies a prominent place, today in charge of Camila Cristiani, who has already reached twelve years of experience in the specialty of source rocks appraisals, having produced numerous technical reports for local and foreign companies. In these last stages, it is worth to highlight the contribution of organic petrography to the typing of the world-class Vaca Muerta Shale, Jurassic of the Neuquén Basin, a non-conventional resource of high oil and gas productivity with enormous economic impact in the energy balance of Argentina. Plates characterizing the Vaca Muerta Formation are shown in Figure 2, extracted from the paper by Brisson et al. (2021).

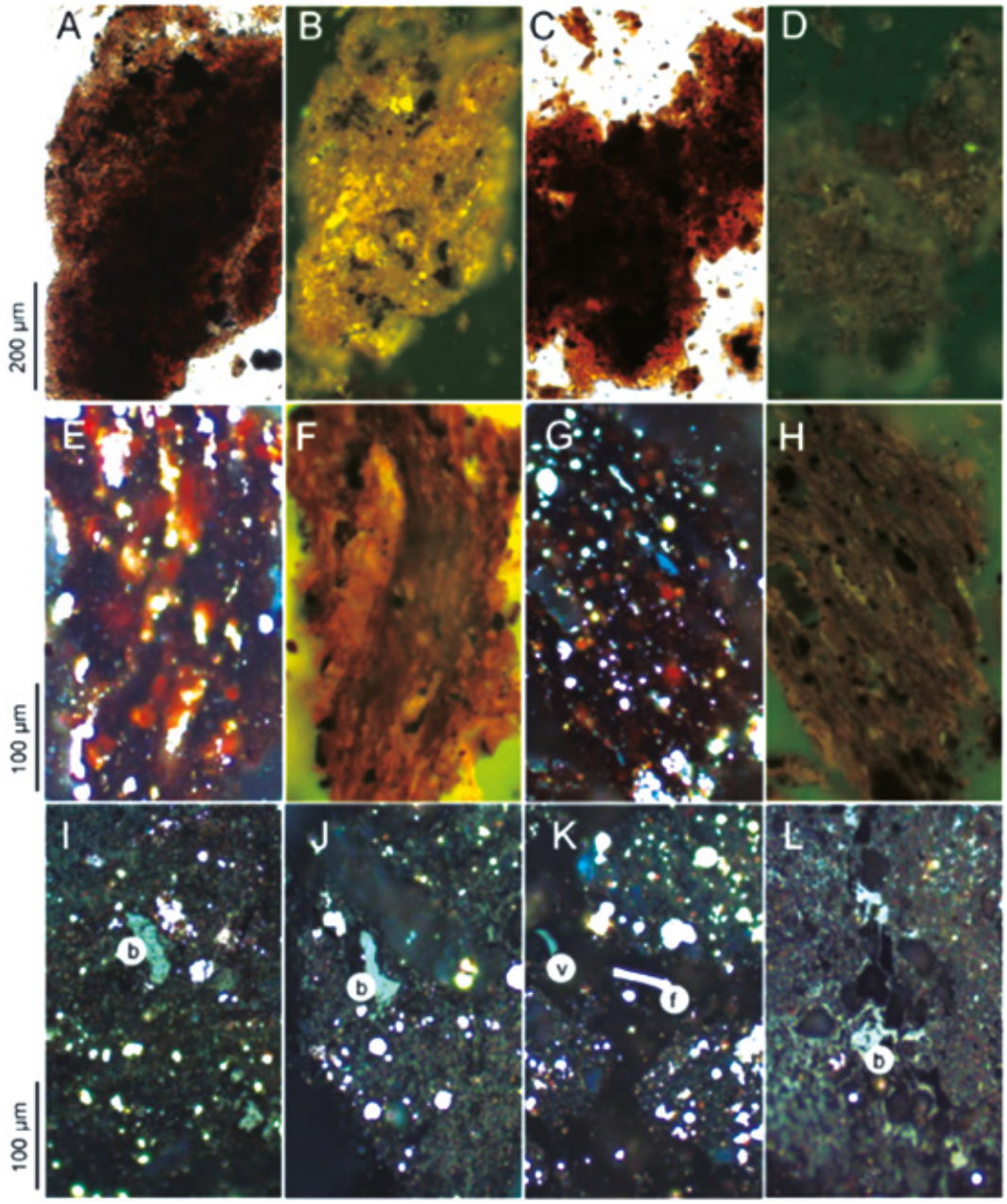

Figure 6. Microphotographs of Vaca Muerta kerogen concentrates (HCl/HF isolation). (A) Strew slide under transmitted white light of a typical amorphous assemblage at low-maturity status; (B) Same field under epifluorescence mode, showing strong greenish yellow fluorescence; (C) Strew slide under transmitted white light of a typical amorphous assemblage at mid-maturity status; (D) Same field under epifluorescence mode, showing moderate yellowish golden fluorescence; (E) Polished plug under incident white light (oil immersion) of a typical amorphous assemblage at low-maturity status, showing intense brownish orange internal reflection; abundance of mostly framboidal pyrite is outstanding; (F) The same field under epifluorescence mode showing strong yellow fluorescence; (G) Polished plug under incident white light (oil immersion) of a typical amorphous assemblage at mid-maturity status, showing moderate brownish internal reflection; abundance of mostly framboidal pyrite is outstanding; (H) The same field under epifluorescence mode showing moderate golden fluorescence; (I-L) Polished plugs under incident white light (oil immersion) of typical amorphous assemblages at high-to-very-high maturity status; (I) moderately reflecting (dark gray) amorphous mass associated with micrinite, framboidal pyrite, and presence of rough solid bitumen (b) particles; (J) and (K) Moderately reflecting (mid-gray) amorphous mass associated with micrinite, framboidal pyrite, and presence of rough solid bitumen (b), vitrinite (v), and fusinite (f) particles; (L) Strongly reflecting and micrinitized amorphous, forming a discrete and dense, light gray framework associated with solid bitumen (b).

Figure 2. Organic petrography characterization of the world-class Vaca Muerta shale (Jurassic of the Neuquén Basin), in Brisson et al. (2021).

In 2013, Y-TEC (YPF Tecnología S.A.) was established in Buenos Aires as a technology company focused on innovation and development for energy production. Subsequently, Georgina Erra, CONICET researcher, was summoned by Y-TEC to revive the organic petrology research line, abandoned in the 90's when YPF's research laboratories were closed. She helped to build the "Organic Petrography and Palynology" laboratory, which currently works in support of research projects of CONICET, laboratory services, and research and development projects to offer solutions to the hydrocarbon industry. Guillermo Ottone, palynologist from the UBA ("University of Buenos Aires"), and G. Erra instructed Juan Pineda in the organic petrography discipline under a PhD program at Y-TEC and UBA. J. Pineda works with palynology, organic petrology, and organic geochemistry of rocks from Argentinian basins in the context of unconventional shale reservoirs. He has contributed to various published manuscripts for peer-reviewed journals and several conference papers utilizing organic petrology.

At present the two ICCP members from Argentina work mainly in characterization of source rocks and unconventional plays with a very strong link with oil industry. We anticipate that organic petrography in Argentina will contribute in the future to multi-scale techniques and integrated analytical approaches to find solution for the oil & gas industry, having a significant participation in studies framed by the energy transition era of the country.

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ANTIPODEAN SYMBIOSIS BETWEEN THE ICCP AND AUSTRALIAN ORGANIC PETROGRAPHERS

Peter J. Crosdale [1]
with occasional thoughts from Joan S. Esterle [2], Paddy Ranasinghe1 and Greg Smith [3]

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Organic symbiosis, such as mycorrhiza associations between a fungus and a plant, is a resource-resource type of mutualism. The fungi get carbohydrates from the plant and in turn make nutrients like phosphorous and nitrogen available for the plant to use. What better term could be used to describe the relationship of the ICCP with the extensive group of organic petrologists that work, live and play in the Australasian realm.

It is tempting to draw parallels between the ICCP structure the Australian Coal Petrographers (ACPs). ICCP has 3 commissions; ACPs come from one of 3 schools (Figure 1): CFKDs (Claus Franz Karl Diessels); ACCs (Alan Cecil Cooks) and; NECs (Not Elsewhere Classifieds). Of course, CFKD and ACC have loomed large both in the Australian scene and in the ICCP but from time to time the NECs came and left their mark.

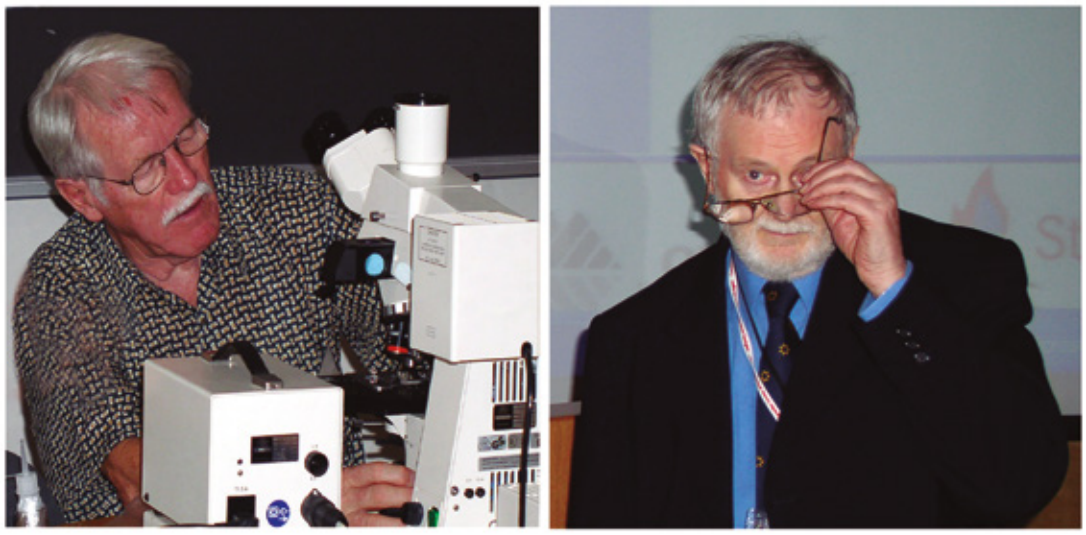

Figure 1. Claus Diessel (left) and Alan Cook (right) both doing what they did best.

Right from the very beginning Australia has been well represented. In the famous photo of the first meeting outside the Central Research Laboratory of The Netherlands State Mines, Dr. G. M. Burton (Australian Bureau of Mineral Resources and Geophysics – now Geoscience Australia) can be seen – but he was present as a guest only. Absent from the meeting was an ordinary and founding member, Prof. Dr. Charlie E. Marshall (Geology Dept. University of Sydney). Even in those days it is clear that funding opportunities to attend important international meetings were few and far between, especially for University professors.

It was not really until the arrival of CFKD from Germany and ACC from the UK around 1960 did coal petrology in the way we understand it now really take hold. And it took off like wildfire. Australia in particular with its leading role as the world's largest coal exporter had a large desire for expertise in this area. ACC and CFKD were ideally placed in their respective academic institutions of The University of Wollongong and The University of Newcastle

to attract academic research dollars, industrial research dollars and research students – and provide ICCP members. Their output was prolific and their disagreements the stuff of legend – both aspects that fed into the ICCP. Colin Ward (UNSW) came a little later on the scene but also had significant impacts with a special focus on mineral matter in coal. Although not active in the ICCP, Lloyd Hamilton, Ganjavar Khavari Khorasani, and Myriam Glickson built groups in Queensland; Krish Sappal in Western Australia and; Guy Holdgate in Victoria. These days the only active academic institutions of note are Joan Esterle's group at The University of Queensland and Greg Smith at Curtin University of Technology, and they are both emeritus.

Of course coal petrology was not confined to academic institutions. Government organisations such as the CSIRO, through Geoff Taylor and Michelle Smythe, and SECV (State Electricity Commission of Victoria), with Miles George, support from Joe Cudmore at ACIRL (Australian Coal Research Laboratories) and nowadays Adrian Reifenstein at ALS, and private companies like COPS (Coal and Organic Petrology Services) with Walter Picke and Harold Read. Before heading to Penn State, Alan Davis set up the powerhouse group at the Geological Survey of Queensland to characterize and assess the thousands of samples coming out of the stratigraphic drilling program for coal exploration. Jim Beeston founded the Journal of Australian Coal Geology, which to his chagrin was superseded by the International Journal of Coal Geology, and strong industry headed groups such as the NSW Coalfields Geology Council and the Bowen Basin Geologists Group, kept coal geology vibrant.

While this list of coal petrology related groups and organisations is impressive (and no where near complete) it is really their interactions with ICCP that is of greatest interest.

Despite Australasian members often comprising around 25 % of the ICCP family, only 2 meetings have been held Australia: 1990 in Wollongong (Alan Cook host; Figure 2) and; 2018 in Brisbane (Peter Crosdale host; Figure 3). The tyranny of distance! Such a tyranny works both ways, and many Australasian members find difficulty to justify the time and expense of attending meetings in remote locations, like Europe and North America.



Figure 2. Thick brown coals of the Yallourn area were a treat for ICCP members who attended the 1990 meeting in Wollongong.

The region has only been successful in having one ICCP President (Alan Cook) but his impact was significant. As well as his willingness to share with all his deep and profound knowledge of all aspects of organic petrology, he especially brought to the organisation a higher level of structure to the proceedings and record keeping in general, leading to a greater degree of transparency and decision making processes. It is also tempting to claim that Alan Davis in this category as he worked for a number of years at the Geological Survey of Queensland from 1965 onwards setting up the first petrology lab in Queensland. But he remains firmly in the US fold.



Figure 3. During the Meeting in Brisbane (2018). Of course, they should be in prison! Where else but to Australia would people travel so far as to be confronted by the world's largest variety of extremely dangerous animals?-including the kangaroos keeping a safe distance away.

Within the broader ICCP community, the region has been very active with many terms on Council and high levels of activity within working groups. Within Commission I, the position of chair has been held by Alan Cook, Walter Pickel and Peter Crosdale while Secretary has been held by Alan Cook and Walter Pickel. Commission III - Chair: Claus Diessel and Sandra Rodrigues (we now claim Sandra as our own) along with Aivars Depers as Secretary and Judy Baily assisting as needed. The lack of high level Commission II roles probably reflects the relatively low level of activity in petroleum exploration in the region. Other Council positions held include vice President (Peter Crosdale), Editor (Peter Crosdale) and Treasurer (Joan Esterle; Peter Crosdale).

At the working group level, contributions have been so numerous that it is dangerous to list them for fear of offending those accidently omitted. Nevertheless, some attempt should be made to mention people like Judy Baily with her enormous contributions to char classification; Nancy Ng on inertinite reactivity; Lauren Williamson (née Johnson) with coke petrography; the tireless work of Walter Pickel on standardization and trying to achieve consensus- or at least better definitions; Lila Gurba on CO_2 sequestration and continuing push for the acceptance of pseudovitrinite; just to mention a few. Also many many people have contributed the hard work to various working group activities; people like Ray Smith, Elizabeth Gawronski, Elvira Barcelona, Matt Todd, Beth McHugh, Garham O'Brien, Kady Pinetown, Tim Moore, Neil Sherwood, Antonis Bouzinos, Peter Handley, Barry Jenkins, Elena Karmazina, Mohinudeen Faiz, Glecy Baesa, Elvira Barcelona, Paddy Ranasinghe and Aivars Depers. It is probably little known or appreciated in ICCP but Walter also had legendary head butt sessions with the encampments of the ACPs.

One of the most important of ICCP activities is the accreditation programs. These programs had a long gestation period with numerous false starts. A major difficulty was in the formulation of a robust statistical method that incorporated the peculiarities of closed systems. Alan Cook was instrumental in delivering such a statistical package that allowed for broad acceptance of the accreditations. Aivars Depers had the onerous task of manually (now fully automated thanks to the efforts of others) running and tracking the statistics. Paddy Ranasinghe provided independent oversight of the process. The initial work in the SCAP program has now been extended to include DOMVR (thanks again ACC) and coal blends.



Figure 4. Walter Pickel always trying to convince somebody of something.

One of the most intriguing aspects of the relationship between ICCP and the Australasian region has been the development of Australian Standard AS 2856.2-1998 Coal petrography, Part 2: Maceral analysis. Unlike the ICCP classification system which uses separate nomenclature for brown and black coals, the Australian classification uses a single set of terminologies over the entire rank range while still maintaining the textural differences distinctive of changing ranks. This has happened despite (? because of) key members contributing to both classification schemes.

It would be remiss not to also mention the short courses. Walter P. **(Figure 4),** Alan C. and Claus D. had both founding hands and on going commitments to these. They provide interesting examples of the mutual interactions with ICCP. I recall from the course run in Brisbane seeing material that was familiar from my 3rd year and honours year at University. Not a criticism – good science is good science. It simply serves to illustrate how experience in one realm can be used to expand the knowledge into others.

Of course for all of this activity, ICCP has acknowledged the Australian realm with its highest award, the Thiessen Medal, on four occasions: Claus Diessel, Alan Cook, Geoff Taylor and Walter Pickel.

So it comes full circle. Thanks, from the ICCP community by acknowledging the significant contributions from members in the Australian area and thanks from the Australian members to the ICCP community for enriching their knowledge with experiences from vastly different areas that would be otherwise inaccessible.

COAL PETROLOGY IN AUSTRIA AND ITS LINKS TO ICCP

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Coal petrological investigations have a long tradition in Austria, especially at Montanuniversität Leoben. Within this context, papers of Wilhelm Petrascheck (e.g., Petrascheck, 1926), his son Walther E. Petrascheck (e.g., Petrascheck, 1940) and Walter Siegl (e.g. Siegl, 1940; Civran et al., 1943) have to be emphasized. Indeed, Siegl (1940) was one of the first scientists to use fluorescence microscopy in the investigation of liptinite macerals. Neubauer (1949) studied Triassic coals petrographically, but no systematic petrographic investigations were performed during the following decades until the 1980s (Sachsenhofer, 2004).

In 1983 Walter Siegl introduced his student Reinhard Sachsenhofer (Figure 1) to coal petrological methods. The latter became a member of ICCP in 1990 and was awarded ICCP´s Reinhardt Thiessen Medal in 2018. Although not a formal member of ICCP, Jutta Karasek established a coal petrological lab at the coke plant of Voestalpine in Linz in the 1990s.



Figure 1. Prof. Dr. Reinhard Sachsenhofer in the Lehrstuhl für Erdölgeologie - Montanuniversität Leoben.

The currently low number of Austrian members (2) does not reflect the substantial impact ICCP has on Austrian scientists in organic sedimentology, which benefit greatly from the ICCP network as proven by many international co-operations, especially with southeastern European and Asian countries.

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SYNERGY BETWEEN BRAZIL AND ICCP: A BOST FOR ORGANIC PETROLOGY

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Brief History

Modern coal science began to develop in Brazil during the 1960s and 1970s, with Porto Alegre city (Rio Grande do Sul State) emerging as a central hub. Two distinct yet complementary research pathways emerged during this period, housed in separate institutions: the technological aspect at the Science and Technology Foundation of Rio Grande do Sul (CIENTEC) and the geological facet at the Federal University of Rio Grande do Sul (UFRGS). In the early 1960s, Brazilian researchers established connections with the International Committee for Coal and Organic Petrology (ICCP), coinciding with the establishment of Brazil's first coal petrography laboratory in 1961 at CIENTEC under the leadership of Joanna Nahuys. Despite her background as a chemical engineer, Joanna specialized in coal petrography under the guidance of Boris Alpern at the Centre d'Etudes et Recherches des Charbonnages de France (CERCHAR; Figure 1) in Verneuil-en-Halatte, Creil, France. Joanna became an active member of the ICCP in 1961, making significant contributions to the Analysis Commission and Nomenclature Commission. She contributed to the second edition of the International Handbook of Coal Petrography (1963), which was a landmark in the standardization of coal petrographic nomenclature.

In 1977, a significant milestone was reached with the establishment of Brazil's first academic coal petrographic laboratory at the Institute of Geosciences at Federal University of Rio Grande do Sul (UFRGS), led by Zuleika Carreta Corrêa da Silva. By the early 1980s, Dr. Zuleika had become a member of the ICCP and was notably active, participating not only in several working groups but also serving as General Secretary. Throughout her career at UFRGS, Dr. Zuleika mentored numerous students in the fields of organic petrology and geochemistry at both the master's and doctoral levels. Many of her mentees subsequently joined the ICCP.

Organic petrology research gained prominence in the state of Rio de Janeiro in the 1990s, starting at the Petrobras Research Center (CENPES) under the guidance of Dr. Jorge Alberto Trigüis and later Carla Araujo, a former student of Zuleika's. Carla joined the ICCP in 1991 and served as Chair of Commission II, in addition to participating in various working groups. Since then, several ICCP members have conducted their research at CENPES, establishing a lasting presence in the field.

In 1999, Dr. João Graciano Mendonça Filho, also mentored by Dr. Zuleika, joined as a professor at the Federal University of Rio de Janeiro (UFRJ). By 2002, he established the Palynofacies and Organic Facies Laboratory (LAFO) and the Petroleum and Environmental Geochemistry Laboratory (LAGEPA), implementing palynofacies as well as organic petrography and geochemistry techniques. Prof. Dr. João Graciano became an ICCP member in 2000 and has maintained a strong connection with the organization, participating in several working groups and serving as Vice-President. In addition, he actively collaborates with ICCP members around the world.



Figure 1. Joanna Nahuys (Brazil) during a visit to CERCHAR (France) in 1985 with Boris Alpern (France) and other organic petrographers. Back row, from left to right: B. Pradier (France), H.J. Pinheiro (South Africa and Portugal), ?, and L. Martinez (Mexico); front row, left to right: Nancy Ng (Australia), B. Alpern, and J. Nahuys (Photo: M. Lemos de Sousa; ICCP, 2015).

Membership

ICCP membership in Brazil has evolved based on the geographical distribution of major organic petrography laboratories established over the years. From the 1960s to the 1990s, the state of Rio Grande do Sul served as the primary center for ICCP activities, attracting members primarily from academia (e.g., CIENTEC and UFRGS). In the 1990s, ICCP membership began to expand in the state of Rio de Janeiro, driven by the development of organic petrography at the Petrobras Research Center (CENPES), which fostered closer ties with the local oil and gas industry. Academic collaborations with the ICCP in Rio de Janeiro gained momentum in the 2000s, particularly at Federal University of Rio de Janeiro (UFRJ), which is currently most active ICCP center in Brazil. In 2009, Zuleika Corrêa da Silva was awarded the title of Honorary Member. Currently, ICCP has a total of 10 active members in Brazil (Table 1).

Awards

In recognition of their excellence, dedication, and talent in the fields of coal and organic petrology, two Brazilian researchers have been honored by the ICCP.

João Graciano Mendonça Filho (Figure 2A) received the Organic Petrology Award at the Beijing ICCP Meeting in 2012. This prestigious award recognized his leadership in Brazilian organic petrology and geochemistry, particularly in Petroleum Geochemistry, Palynofacies and Organic Facies, and Environmental Organic Geochemistry. In addition to his significant scientific contributions, João Graciano was commended for his commitment to teaching, dissemination, and promotion of organic petrology, as well as his active involvement in ICCP activities.

Zuleika Corrêa da Silva was honored with the ICCP's Reinhardt Thiessen Medal in 2014, duri ng the ICCP Potsdam Meeting (Figure 2B). This award celebrated her remarkable achievements and outstanding contributions to the field of coal and organic petrology, both in Brazil and globally. Zuleika played a pivotal role in advancing these disciplines throughout Latin America and served on the boards of numerous geological and geochemical associations. Her pioneering research with various research groups continued until 2011, solidifying her legacy as one of Brazil's most important geoscientists.



Figure 2. Brazilian Recipients of the Organic Petrology Award and ICCP's Reinhardt Thiessen Medal. A - João Graciano Mendonça Filho; B - Zuleika Corrêa da Silva.

Table 1. ICCP Membership in Brazil.

Name	Membership	Institution
Carolina Fonseca	2019 - present	UFRJ (since 2022)
Henrique Severiano de Jesus	2016 - present	ArcelorMittal Tubarão
Telma Ataíde dos Santos	2015 - present	TAS Consultoria & Auditoria
Paula Alexandra Gonçalves	2014 - present	UFRJ (since 2022)
Joalice de Oliveira Mendonça	2013 - present	UFRJ
Igor Viegas A. Fernandes de Souza	2008 - present	PETROBRAS/CENPES
Taíssa Rêgo Menezes	2008 - present	PETROBRAS/CENPES
João Graciano Mendonça Filho	2000 - present	UFRJ
Carla Araujo	1990 - present	PETROBRAS/CENPES
Zuleika Corrêa da Silva	Early 80s - present	UFRGS
Wolfgang Kalkreuth	1981 - 2017	UFRGS (since 1996)
Maristela Bagatin Silva	1997 - 2014	UFRGS
Marcio Kern	2008 - 2010	UFRJ
Noelia Franco Rondón	2008 - 2010	UFRJ
Roberto Heermann	2008 - 2010	PUCRS
Joanna Nahyus	1961 - 1999	CIENTEC
João Marcelo Medina Ketzer	2008 - 2010	PUCRS
Marcus Vinicius Berao Ade	1994 - 1999	UFRGS
I. Coelho	1991 - no information	no information
M. Ghiggi	1991 - no information	no information
N. Mergel	1991 - no information	no information
S. Nora	1991 - no information	no information
Jorge Alberto Trigüis	1991 - 1998	CENPES-PETROBRAS

ICCP Meetings

Three ICCP meetings have been hosted in Brazil: in 1991 in Porto Alegre (Rio Grande do Sul); in 2000 in Rio de Janeiro (Rio de Janeiro); and in 2009 in Gramado (Rio Grande do Sul), which was a Joint ICCP/TSOP meeting.

The 43rd ICCP Meeting in Porto Alegre (1991) took place at Federal University of Rio Grande do Sul (UFRGS) and was organized by Prof. Dr. Zuleika Carreta Corrêa da Silva and her colleagues. This meeting had the participation of 38 ICCP members and guests from 15 countries. The opening session featured lectures by the two pioneers who introduced organic petrology to Brazil in the 1960s and 1970s. Joanna Nahuys presented on "The Development of Coal Petrography at CIENTEC," followed by Zuleika Corrêa da Silva discussing "Organic Petrology in Brazil.".

In 2000, the 52nd ICCP Meeting was held in Rio de Janeiro, organized by the Centre of Excellence in Geochemistry of PETROBRAS Research and Development (CENPES), with Carla Araujo as chair of the organizing committee. The meeting attracted 40 ICCP Members and 6 guests from 18 countries **(Figure 3).** Dr. Wagner Victer gave a brief presentation on "Non-renewable energy resources of the State of Rio de Janeiro", followed by Dr. José Augusto Sartori Loyola Brandão, who spoke on "The history of oil exploration in Brazil".



Figure 3. Group photo from the 52nd ICCP Meeting in Rio de Janeiro.

In 2009, the ICCP returned to the southern region of Brazil, specifically to Gramado (near Porto Alegre, Rio Grande do Sul), for the first Joint ICCP/TSOP Meeting in the country. The 61st ICCP/26th TSOP Meeting was hosted by UFRGS, with Prof. Dr. Wolfgang Kalkreuth from the Institute of Geosciences of UFRGS serving as chair of the organizing committee. The organizing committee included members from various departments of UFRGS, as well as from other Brazilian universities such as the Federal University of Rio de Janeiro, and Brazilian companies and institutions like Petrobras and CIENTEC. A total of 101 participants **(Figure 4),** including 33 ICCP members, from 22 countries attended this joint meeting. Before the sessions, Prof. Dr. João Graciano Mendonça Filho conducted a short course titled "Palynofacies and Organic Facies: Principles, Methods and Applications". Two keynote lectures were delivered: the first, titled "The Contribution of Organic Geochemistry and Organic Petrology to Petroleum Exploration in Brazil" was given by Dr. L.A. Trindade (Petrobras), and the second lecture was presented by Prof. Dr. Wolfgang Kalkreuth on "Coal in Brazil".



Figure 4. Group photo from the 61st ICCP/26th TSOP Meeting in Gramado.

In the 63rd ICCP Meeting held in Porto (Portugal) in 2011, Brazilian researchers also contributed to a two-day field trip to Peniche, focusing on investigating the Lower Jurassic formations along the west coast of Portugal. This field trip was led by Prof. Dr. Luis Vitor Duarte and Dr. Ricardo Silva from the University of Coimbra, Portugal, and Prof. Dr. João Graciano Mendonça Filho from UFRJ, Brazil (Figure 5).



Figure 5. Field trip during the 63rd ICCP Meeting in Porto (Portugal). A – Theoretical introduction to the geology of Peniche (J.Graciano first from the left, wearing a dark t-shirt); B- The group on one of the beaches of Peniche (J. Graciano second from the left, wearing a dark t-shirt).

Training Courses

Since 2009, the ICCP has been offering training courses in organic petrology, focusing on both coal and dispersed organic matter (DOM). Brazilian researchers have actively participated in lectures at all DOM training courses.

The first DOM training course took place in 2011, with Prof. Dr. João Graciano Mendonça Filho (UFRJ) and Dr. Alan C. Cook as lecturers (Figure 6). Subsequently, three more training courses were conducted where Prof. Dr. João Graciano Mendonça Filho co-instructed with Dr. Angeles G. Borrego (INCAR, Spain) in 2014 and 2017

(Figure 7), and Dr. Carolina Fonseca (UFRJ) alongside Dr. Angeles G. Borrego in 2023 (Figure 8). Below is the list of these courses:

- 4th ICCP Course in Dispersed Organic Matter, 7-9 September 2011, University of Porto, Porto, Portugal;
- 7th ICCP Course: Dispersed Organic Matter, 23-27 June 2014, GFZ, Potsdam, Germany;
- 10th ICCP Course: Dispersed Organic Matter - Integrating transmitted and reflected light microscopy, 26-30 June 2017, GFZ, Potsdam, Germany;
- 15th ICCP Course: Optical Microscopy of Dispersed Organic Matter: facies and maturity, 25-29 September, University of Patras, Patras, Greece.



Figure 6. 4th ICCP Course lectured by João Graciano Mendonça Filho (UFRJ) in 2011. A – Closing ceremony (J. Graciano top row, third from the left); B – Theoretical classes; C – Group photo (J. Graciano top row, third from the right).



Figure 7. Group photos of ICCP Courses lectured by João Graciano Mendonça Filho (UFRJ, Brazil). A – 7th ICCP Course in 2014 (J. Graciano front row, first from the left); B – 10th ICCP Course (J. Graciano top row, third from the left).

ICCP Officers

Over the years, several members have held significant positions within the ICCP, contributing to its activities and initiatives.

Prof. Dr. Zuleika Carreta Corrêa da Silva served as General Secretary for two terms, from 1992 to 2000.



Figure 8. 15th ICCP Course lectured by Carolina Fonseca (UFRJ, Brazil). A – Field trip (C. Fonseca front row, third from the right); B – Practical classes (C. Fonseca in the middle); C – Group photo (C. Fonseca fith from the right).

Prof. Dr. Wolfgang Kalkreuth served as Secretary of Commission II from 1991 to 1994, and subsequently served as Chairman of Commission II from 1994 to 2002.

Carla Araujo chaired Commission II from 2008 to 2012, playing a pivotal role in establishing the first ICCP homepage (1998-2000) alongside W. Kalkreuth (Brazil), Z.C. Correa da Silva (Brazil), W. Pickel (Australia), A. Depers (Australia), and R. Reinhardt (Germany).

Prof. Dr. João Graciano Mendonça Filho has served as ICCP Vice-President since 2019 and has organized the Dispersed Organic Matter Vitrinite Reflectance Accreditation Program (DOMVR) since 2018, thereby also serving as a member of the Accreditation Sub-Committee since that time.

Accreditation

Currently, Brazil has seven accredited petrographers (Table 2) through the ICCP's Accreditation Programs, representing both universities and industry. The Dispersed Organic Matter Vitrinite Reflectance Accreditation Program (DOMVR) stands out with the highest number of accredited petrographers.

Accreditation Program	**Accredited Petrographers**
Dispersed Organic Matter Vitrinite Reflectance (DOMVR)	Marcos Bicca (UFRGS) Henrique de Maman Anzolin (UFRGS) Carolina Fonseca (UFRJ) João Graciano Mendonça Filho (UFRJ) Joalice de Oliveira Mendonça (UFRJ) Paula Alexandra Gonçalves (UFRJ) Regina Binotto (CENPES) Taíssa Menezes (CENPES)
Single Coal (SCAP)	Henrique de Maman Anzolin (UFRGS) Marcos Bicca (UFRGS)
Coal Blends (CBAP)	Henrique de Maman Anzolin (UFRGS)

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BULGARIAN COAL PETROLOGISTS IN SERVICE OF ICCP GOALS

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My involvement in ICCP started back in 2006. At that time, I was still a PhD student and was working on two small and poorly studied Bulgarian lignite deposits. My PhD research started a few years before that and considering the almost complete absence of petrographic data for these lignites, it soon became evident that organic petrology would be a substantial part of my work. This was a bit problematic, as at that time the university did not have a properly equipped microscopic system for organic matter research – a sad consequence of the lack of possibilities for updating the research infrastructure due to the numerous financial crises that Bulgaria experienced following the fall of the communist regime in late 1989. With great support from my supervisor Prof. J. Kortenski, I spent some time during the early years of my PhD research struggling to revive one the very old and nonfunctioning Carl Zeiss NU2 microscope that we had in the department **(Figure 1).** At the end of 2003 the microscope was already fully functional and was the first and only geological microscope in the country equipped with a blue excitation fluorescent light source, which I extensively used to perform the maceral analysis for my PhD thesis. By 2006, however, my organic petrology experience was limited to several studies of Bulgarian Neogene lignites, which have rather common petrographic characteristics. Therefore, with my application for an ICCP membership I was hoping that meeting and working with colleagues from around the world would significantly boost my experience. Sadly, things do not always happen according to the plan, and due to various obstacles, I was unable to attend most of the annual ICCP meetings. Over the years, however, I was able to participate in the round robin exercises organized by the Carbon materials working group, Commission III, which allowed me to test my analytical performance and broadened my knowledge on a topic that is typically beyond the scope of my research interests.

Apart from outlining my very limited contribution to the ICCP activities, the invitation to contribute to this book provides me the opportunity to pay a well-deserved tribute to some of the Bulgarian coal petrographers, who are regretfully not with us anymore, but whose work made a significant contribution to the development of the organic petrology. In Bulgaria, the participation of Bulgarian coal researchers in ICCP is shrouded in secrecy, and apart from a few brief notes regarding the acceptance of Prof. Minchev as a member of the organization back in 1963, nearly no other information is available. However, the ICCP archives keep records for several Bulgarian researchers being active members of ICCP between 1960s and 1990s, and I believe this will be the right place to honor their scientific work. I'd like to take the opportunity to express my sincere gratitude to ICCP's archive keeper, Prof. Deolinda Flores, as well to Assoc. Profs. Mariana Yossifova (Geological Institute, Bulgarian Academy of Sciences) and Elka Shalamanova (University of Mining and Geology) for providing part of the historical data outlined below.

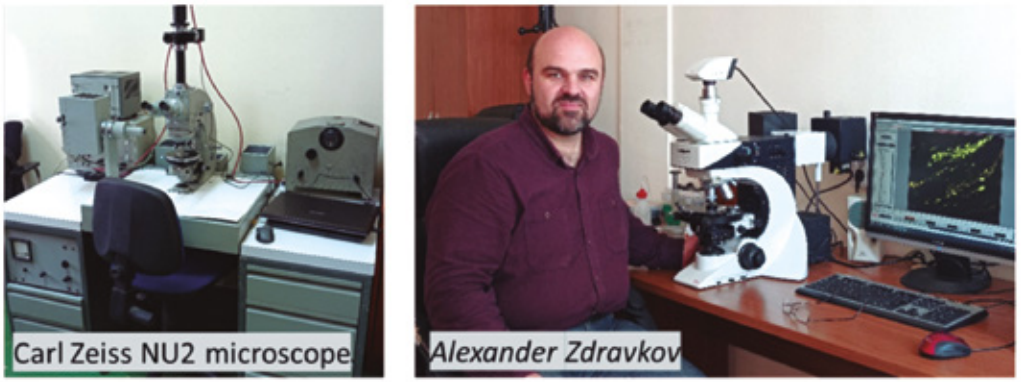

Figure 1. Existing petrographic microscope in the 80s at the University of Mining and Geology, Sofia (left) and the author, Alexander Zdravkov, close to the new equipment in the University.

Bulgaria hosts over 40 coal deposits spanning in age from Late Carboniferous to Pliocene and in coalification rank from very low-grade lignite to meta-anthracite. While many of these deposits were known at least since the mid-19th century, for most of the coals the targeted detailed geological exploration started shortly after the second World War. With the accumulation of knowledge on the geological settings, the quantity of the coal resources, and the quality of many Bulgarian coals, it was soon realized that coal represent a complex type of rock, whose properties and potential applications strongly depend on the conditions of its formation.

Prof. Petko Mandev, apart from being a petroleum geologist, was the first Bulgarian researcher that realized that organic petrography could provide significant information on coal genesis and can successfully be used to predict its technological properties. In 1954 he published a detailed petrographic study of Burgas coals (a sub-bituminous coal deposit of late Eocene age in SE Bulgaria), which marks the beginning of the coal petrographic studies in Bulgaria. His vision was further developed by one of his students, i.e. *Dimitar Minchev,* who is an iconic figure in the Bulgarian coal geology and petrology with significant contribution to understanding the processes of coal formation (Figure 2). His career started in mid-1950s after a successful defend of a PhD thesis dedicated to the petrographic composition and genesis of Balkan coals (an important bituminous coal deposit from central Bulgaria). At that time, information about the petrographic constituents in coal was rather scarce, most of it coming from Russian authors. The available petrographic nomenclature was based on the botanical origin of the macerals – an approach that produced complicated maceral scheme, difficult to apply in routine petrographic studies. Regardless of this, the data obtained during his extensive petrographic studies of Bulgarian coal gave him the basis to present in 1962 a preliminary genetic scheme for the transformation of the plant remains, which still remains valid today. In a search of a more pragmatic way to coal petrography, however, Minchev directed his attention to the research of European and North American authors, where he eventually found a less complicated and easier petrological scheme.



Figure 2. Pioneers in organic petrology studies in Bulgaria. Prof. Dimitar Minchev, member of the ICCP since 1963 and Prof. Violeta Konstantinova, member of the ICCP since 1969.

In 1963, Prof. Minchev was elected as Associate Member of the ICCP, and this marks the beginning of the modern organic petrological studies in Bulgaria. Together with the "Fathers" of coal petrology from the early years of ICCP, Prof. Minchev actively participated in numerous meetings and in the lengthy and passionate discussions on petrological nomenclature and methodology of petrology research. As part of the Brown coal working group, he actively contributed to the clarification of terminology and to the preparation and publication of the 1st supplement to 2nd edition of ICCP handbook (1971), which introduces the widely used maceral classification of the Stopes – Heerlen System.



Figure 3. 19th ICCP Meeting, Madrid, 16-21.10.1966. From left to right: V. Hevia, **D. Minchev, ?**..., R.R. Thompson, R. Noël, J.G. Prado, ? …, W. Spackman, E. Sontag, B. Alpern, ?..., L. Soós, H. Jacob, J. Harrison, P. Timofeev, M. Teichmüller, Ch. Delattre, ?..., G.G. Taylor, M.-Th. Machowsky, E. Meriaux, M. Ercegovac, I. Ammosov, ?..., R. Damiani, K. Karmasin, W. Hageman, B. Preuss, E. Schneider. Courtesy of J. Prado.

Dimitar Minchev was a passionate coal researcher and popularizer of the Bulgarian petrological achievement. In 1968 he initiated the creation of a research laboratory on coal petrology, whose results on Bulgarian coal deposits were published in numerous articles under the series "Petrology of brown coals in Bulgaria", later renamed to "Petrology and chemistry of brown coals in Bulgaria". Meanwhile, Minchev's great contribution to ICCP activities were well acknowledged worldwide and in 1969, following an invitation from his side, the 22nd annual meeting of ICCP was held in Golden beach resort near the town of Varna, Bulgaria. Sadly, a sudden serious illness occurred a few months before the meeting and prevented his attendance. Although the illness significantly shaped the next 30 years of his life, the enthusiasm and dedication to coal research did not disappear and until his passage in 1999 Prof. Minchev continued to play crucial role in the study of genesis of the Bulgarian solid fuels and their technological applications. In 1980, for his special merits for the development of coal petrology, D. Minchev was elected an Honorary ICCP member.

Senior researcher *Violeta Konstantinova* is among the first Bulgarian coal petrologists (Figure 2). She began her career in the early-1950s as a geologist in the Bobov Dol coal mines (SW Bulgaria), and later worked at the Geological Research Institute and the Science-Research Institute for Raw materials at the Bulgarian Committee of Geology. A large part of her activity was dedicated to the geological exploration of the coal deposits in Bulgaria, and to her we owe many of the petrographic descriptions of coal, accompanying the geological reports. Her scientific research activity began in 1956 with the publication of a detailed article on the petrographic features of the Bobov Dol coal, which was also one of the first petrological publications in Bulgarian geology. In the following years, she published several methodological materials concerning the methods for microscopic examination of anthracites, the place of petrographic analyses in the study of the genesis of organic matter and the use of differential-thermal analysis in coal characterization. After the discovery of the Dobrudzha coal basin (a large Carboniferous bituminous coal basin from NE Bulgaria) in the mid-1960s, Dr. Konstantinova took an active part in the study of the coals. Based on a detailed quantitative maceral analysis, she determined coal's origin and depositional environment, and attempted to correlate the coal seams; studied the thermal changes and the properties of the natural coke in the vicinity of intruding dykes and described the presence of graphite in the

coals. Since 1969, Dr. Konstantinova has been a member of the ICCP and actively participated in the working groups on terminology, coal analyses and industrial applications of coals.

Prof. *George Shishkov* is another emblematic figure in Bulgarian coal geology and organic petrology **(Figure 4).** He began his research activity in the mid-1960s and made a significant contribution to the study of the genesis, petrographic features, and technological characteristics of the largest Bulgarian lignite deposit - the Maritsa-East Basin. At the beginning of his career, together with other collaborators within the research team formed by D. Minchev, he invariably participated in all studies of the petrological characteristics of Bulgarian coal basins. At the same time, he directed his attention to the study of the optical characteristics of humic acids extracted from the different lithotypes in the Maritsa-East lignite, as well as to the improvement of H. Jacob's method for remission analysis, which he applied to the study of the technological characteristics of Bulgarian lignite. Prof. Shishkov's in-depth research gave him the ground to introduce a new lignite lithotype - liptain, which represents a highly resin-impregnated woody remains originating from coniferous vegetation and which has different petrological and chemical characteristics from that of the typical xylain. Within liptain Shishkov recognized three bi-maceral micro components (maceral varieties), namely "humoresinite", "geloresinite" and "peptoresinite" representing woody/detrital tissues with different degrees of resin impregnation and forming under different environmental conditions. During the 1980s, Shishkov's new lithotype and the bi-maceral classification were extensively discussed within the ICCP's working group on resocollinite, identified in hard coals. Eventually, resocollinite was abandoned and did not find place in the classification schemes, but liptain and its micro components are still valid terms in Bulgarian coal geology. All his scientific results Prof. Shishkov interpreted in terms of the environmental settings and biochemical processes during peatification in a DSc thesis, which he defended in 1986 and later (1988) published as a monography. He is also an author of a bibliography book (1986) representing all published materials on Bulgarian coals.



Figure 4. Relevant researchers in coal and organic petrology in Bulgaria: Prof. George Shishkov and Sevdalina Valcheva both members of the ICCP since 1969.

Until his sudden death in 1999 Prof. Shishkov has authored or co-authored two books and over 100 publications in national and international journals. During 1980 – 1985 he was the national coordinator for Project 166 of the International geological correlation program of UNESCO. Together with S. Valcheva, Prof. Shishkov contributed to the preparation of 10 national standards between 1978 and 1980, incorporating the international coal petrological nomenclature and analytical procedures. Some of them are still valid today. Prof. Shishkov was among the founders of the International Journal of Coal Geology and was a member of the editorial board until 1988. Since his involvement in ICCP in 1969, he remained an active participant in numerous working groups, among which the terminology, coal analyses and coal facies groups can be outlined. For his dedication to ICCP activities, Prof. Shichkov was awarded an Honorary membership.

Associate Professor *Sevdalina Valcheva* began her research career in the mid-1960s **(Figure 4).** Her interests were primarily focused on the petrology of solid fossil fuels and bituminous shales, as well as on the criteria

for evaluating the oil and gas potential of rocks of different ages from Bulgaria. The main emphasis in her work was the study of briquetting properties and microhardness of Bulgarian lignite and brown coals. Her research is the basis of the briquette production in the country and has helped in solving a number of scientific tasks and technological problems. She was part of the fossil fuel commission of the Bulgarian Institute for Standardization and together with Prof. Shishkov contributed to the preparation and acceptance of numerous standards incorporating the ICCP's and national achievements in coal petrology and coal analysis methods. Prof. Valcheva joined ICCP in 1969 and over the years contributed to advancing the industrial applications of coal, maceral identification and quantification, and methodology of reflectance measurements.

Bulgarian coal petrology has been developing successfully since the mid-1950s, in parallel to the development of the coal science around the world. This is mainly due to the visionary thinking of several Bulgarian coal scientists, who have actively participated in the ICCP's mission to standardize petrological nomenclatures and methodologies, exchange knowledge, and promote advancements in the field. I believe their expertise have greatly enriched the global coal petrology community and I can only hope that future generations will continue their important mission.

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MEMORIES OF ICCP FROM A FEW CANADIAN-BRAZILIAN PETROGRAPHERS' PROSPECTIVES

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with contributions from Wolfgang Kalkreuth [2], David L. Marchioni [3] and Lavern Stasiuk [4],

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We would like to offer our Congratulations to the ICCP on 75 years of successfully establishing working collaborations to set standards in the characterization of the components of coals and organic matter in hydrocarbon source rocks, residues and carbonaceous products from technological processes.

JP: When I was a student of Coal Petrology at the Coal Petrology and Organic geochemistry unit in Newcastle-upon Tyne, in 1977, my bedtime reading was the newly-published *Stach's Textbook of Coal Petrology, 2nd edition* (Stach et al., 1975). The authors of that venerable book (and the English translator) were my heroes and mentors and when I joined ICCP, I got to meet them in person, work alongside them and the many formidable members I now consider colleagues, mentors and friends.

For over 71 years, ICCP has been a formidable working body of venerable coal scientists. We have all worked together and attended annual meetings to discuss the results of round robin exercises, status of new standards and new additions to the Handbook of Coal Petrology. For me, some of the most memorable moments are the friendships and collaborations formed during the ICCP annual meetings and I fondly recall some of the colorful moments from our annual meetings as well as the occasional sad one.

The first ICCP meeting I attended was in Illinois in 1979. I was teaching coal petrology at the University of Regina, Canada at the time and took four undergraduate students with me on an adventure to the International Carboniferous Congress in Champage-Urbana. I remember my students "swooning" when we walked into a pub in Urbana where two ICCP greats, Professor Duncan G. Murchison and Prof. Marie-Therese Mackowsky stood laughing and joking at the bar. I introduced them to "Smurch", as all his former students fondly called him, who was at that time, ICCP Treasurer and Chairman of the Coal Petrology and Organic Geochemistry Unit at the University of Newcastle upon Tyne where I had been a student only 2 yrs before. He, in turn, introduced me to Prof. M.-Th. Mackowsky- it was my turn to swoon as I recall this first meeting with the great Prof. Mackowsky!! A sad conclusion to that meeting was a disastrous plane crash that occurred on our group's return to Canada- a DC10 passenger plane crashed on take-off just as we were driving into O'Hare Airport, in Chicago to return home.

The next ICCP meeting I attended was in Porto, Portugal in 1982. When I arrived at the hotel where I was staying, I met Prof. Murchison leaving the hotel with a group of local policemen. He said he was on his way to the local jail to bail out an unruly ICCP member who had been incarcerated after being taken into police custody at the airport. I had flown into London Heathrow Airport earlier that day and met an old colleague of mine from The Organic Geochemistry Unit in Newcastle who had also been a student of Prof. Murchison's. We parted ways in the departure lounge agreeing to "see you in Oporto" but I did not see him on arrival. He had suffered a medical emergency and passed out on the flight to Oporto. On arrival, he had been "removed" from the plane by police because the crew thought he was drunk aboard the aircraft. He was successfully 'bailed out of jail" by Prof. Murchison. Clearly, the responsibilities of the executive members of ICCP go far beyond academic and administrative duties!

JP, WDK, DLM: The 37th and first ICCP meeting hosted by the Geological Survey of Canada and the Canadian Coal Petrographers Group was held at the University of Calgary, Alberta, Canada in 1984. It was organized by scientists at the Institute of Sedimentary and Petroleum Geology, Geological Survey of Canada, led by Dr. Alex Cameron who became Thiessen medalist in 1992. At that time, the focus of the ICCP working groups was still on the definitions of bituminous coal macerals, the applications of vitrinite reflectance as a thermal maturation

index and solving structural problems; on UV fluorescence as a maturation parameter; the geology of peats and the lithoypes of brown coals and on the bituminous coals of Western Canada which did not behave in the coking process like the Carboniferous coals of NW Europe and the Maritimes of Canada, largely due to the presence of *"pseudovitrinite".*

At this meeting, the ICCP President, Prof. Alan Cook and ICCP members were treated to a memorable banquet at the Elkana Ranch, a western BBQ ranch, located at Bragg Creek, 20 kilometres from Calgary. A few kilometres from the ranch, the bus carrying members to the venue was held up by a group of masked cowboys (outlaws) on horseback who boarded the bus and kidnapped ICCP Treasurer, Prof. Duncan Murchison. They hoisted him up on to a horse and rode off with him, leaving ICCP members stunned! When the bus carrying the rest of the members eventually arrived at the ranch, Prof. Murchison was mounted on a horse with his head in a noose and cowboys were readying him for a wild-west style hanging. They slapped the horse's rump intending for it to gallop away leaving Murchison to hang but fortunately, the rope "failed" and Prof. Murchison was saved!

WDK: In another wild-west tradition, working cowboys had to roundup herds of cows (steers) before anyone could eat. So ICCP members gathered in the corral to watch this spectacle. Participants grabbed ropes, donned cowboy hats and chaps and formed teams to move cows from one end of the barn to the other. The team comprising Wolfgang Kalkreuth, GSC Calgary (conference chair), Hans Hagemann and Walter Pickel, University of Aachen, won third place. These were some of the funniest moments in the history of ICCP meetings.



*Figure 1.*ICCP members attending the 59th ICCP at the University of Victoria, Vancouver Island, B.C. Canada, 2007.

JP, LDS, DLM: A second Joint International Meeting of ICCP, TSOP & CSCSOP was hosted by CSCSOP (formerly, The Canadian Coal Petrographers Group) and held on Vancouver Island at the University of Victoria, British Columbia, August 19 to 25, 2007 **(http://geocities.com/victoriaconference2007/).** In addition to the traditional ICCP forums and working group sessions, this meeting, titled *"Advances in Organic Petrology, Organic & Inorganic Geochemistry"*, included presentation of research papers and posters and focussing on coals and OM associated with the unconventional petroleum systems, including coalbed methane & shale gas, petrography of peats and subbituminous coals, and included a symposium on minerals and trace elements associated with coals to celebrate work on the inorganic geochemistry of coals and the many other contributions to coal science by Prof. Fari Goodarzi, PhD, D.Sc., senior Research Scientist with Natural Resources Canada (Geological Survey of Canada-Calgary). Prof. Goodarzi had recently been awarded the Theissen Medal by the ICCP in 2005. In honour of ICCP and TSOP members, the weather for the event was beautiful, the University of Victoria campus was overrun by rabbits, the banquet was held in a winery on the island, no-one was hanged and everyone left with a sample of smoked salmon – a celebrated food on the west coast of British Columbia!

WDK: At the ICCP meeting in Crete in 1993, I was approached by Dr. Monika Wolf to see if I was interested to stand for election of secretary of commission II. I was interested and consequently was elected in 1994. For the

next 12 years or so I continued as secretary and later as chairman of Commission II. My participation in working groups was as follows:

Coal Liquefaction (A. Davis).
Peat Petrography (K. Christanis).
Coal Blends (A. Davis, I. Suárez-Ruiz).
R_o standardization (W. Pfisterer).
Thermal Indices (C. Araujo).
Qualifying vitrinite (A.G. Borrego).
Pseudo-Vitrinite (L. Gurba).
MOD samples (N. Bostick, J. Castaño and others).
Fluorescence (K. Ottenjann, C. Araujo, B. Pradier).
Environmental Application of Organic Petrology (A. Depers, M. Masterlerz).

In my new career as Professor of Geology at UFRGS in Porto Allegre, Brazil, I had great pleasure in hosting the 61st ICCP meeting in Gramado in 2009.



Figure 2. CSCSOP/ICCP members at 61st ICCP Meeting in Gramado, Brazil, 2009. L to R: Hamed Sanei, David Marchioni, Wolfgang Kalkreuth, Julito Reyes and Mike Avery.

DLM: One of the 1-day fieldtrips was to the nearby wine producing area, to test wine quality in relation to climate and soil type. It included an excellent visit to a champagne vineyard and a banquet of fine Italian food followed by dancing -which included some of the restaurant staff! There was also a huge downpour which lasted a few days during the conference sparking fears of flooding.

We hope these collective remembrances will tweak some fond memories for ICCP members and wish the ICCP many more years of scientific collaboration and productivity.

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THE ICCP IN COLOMBIA

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Immersed in a brief yet profoundly reflective journey, we extend a sincere tribute to the ICCP, an extraordinary committee that has contributed significantly to our understanding of organic petrography and Colombian coals. Colombia is well represented in the ICCP nowadays with four members being the second country with more members from Latin America.

Beginnings of the Study of Organic Petrography

The origins of organic petrography in our country date back to the seventies, when professor Pedro Ramirez from Universidad Nacional de Colombia had the opportunity to study organic petrography under the guidance of Drs. Mackowsky and Teichmüller in Germany. Subsequently, professors Carlos Sandoval from Universidad Pedagógica y Tecnológica de Colombia (UPTC), Jorge Mejía from Universidad Nacional de Colombia, and Guillermo Blanco from INGEOMINAS (now Servicio Geológico de Colombia), returned from their coal analysis training in Spain at the Carbon Science and Technology Institute (INCAR) by its initials in Spanish.

Achievements, Progress, and Challenges

Studies in organic petrography have principally focused on the analysis of coals from various coal basins in Colombia. The formations containing coal in Colombia span from the Maastrichtian in the upper Cretaceous to the Paleogene and Neogene periods, including the Paleocene, Eocene, Oligocene, and Late Pliocene to Early Pleistocene epochs. Coal deposits are distributed across the three mountain ranges of the Colombian Andes: the Eastern Cordillera, the Central Cordillera, and the Western Cordillera. Colombia plays a pivotal role in coal production and exportation in Latin America. Approximately 91 % of Colombian coal originates from the northern regions of Cesar and Guajira and is primarily exported to Europe, Asia, and the United States. The remaining coal, sourced from the central and southern parts of the country including Cundinamarca, Boyacá, Antioquia, Caldas, Valle del Cauca, and Cauca, is mainly used for domestic consumption.

The mining industry's need, particularly from major coal producers and companies initiating coking processes in Colombia, prompted the initiation of petrographic characterization of coals, especially in the central region. These companies were interested in conducting their analyses in accordance with ASTM and European standards to ensure better traceability of results.



Figure 1. The TSOP and ICCP conference in Victoria, Canada, 2007, captured at the Pearson Petrography Laboratory. In the center of the photo, second row, Fredy Arango Arias stands as the first Colombian to be accredited at the Universidad Nacional de Colombia, Medellín.



Figure 2. TSOP and ICCP Meeting in Oviedo, Spain, 2008. Professors Inés Carmona López and Astrid Blandón Montes white arrows from Universidad Nacional de Colombia, headquartered in Medellín.

At the beginning of 2007, the first petrography accreditation exercises began at Universidad Nacional de Colombia and later at UPTC. This international endorsement has been significant for companies involved in the international marketing of coal and those conducting coking processes, demonstrating the reliability, credibility, and quality of our analyses. Currently the country, particularly the universities, have several accredited petrographers. Colombian petrographers have had the opportunity to participate in ICCP laboratories, meetings **(Figure 1, 2 and 3),** and various activities around the world. Additionally, some ICCP members have visited Colombia to conduct coke petrography courses, such as those led by Dr. Rosa Menéndez in the 1990s, and have participated as speakers in some of the coal congresses held in Colombia.



Figure 3. Olga Patricia Gómez and Yaneth Cecilia Pérez from Universidad Pedagógica y Tecnológica de Colombia, Sogamoso, participated in a field trip during the 65th Annual Meeting of the International Committee for Coal and Organic Petrology at the University of Silesia in Sosnowiec, Poland.

ICCP members have made significant contributions to the development and advancement of knowledge about our coal resources. Notably, they have been involved in training processes, such as the School of Mining Engineering event in 2014, where a coke training course (taught by Angeles G. Borrego) and a conference on coal characterization and petrography were held **(Figure 4).**



Figure 4. Images from the coke petrography course led by Dr. Ángeles G. Borrego at UPTC Sogamoso in 2014.

Legacy and Learnings

Currently, Colombian universities and Servicio Geológico Colombiano continue their research on Colombian coals, carrying our various projects. These projects involve the determination of macerales (Gómez Rojas, 2014), microlithotypes, association with mineral material (Reyes et al., 2017), paleoenvironmental interpretation (Gómez

Rojas et al., 2020). In addition, analyses of coal macerals and the generation of hydrocarbons, macerals, and palynomorphs are conducted, with applications in oil exploration (Blandón, 2007; Blandon et al., 2008; Blandón and Gorin, 2013). These efforts have led to student and faculty participation in projects, including short visits to other laboratories and attendance at ICCP meetings.

At Universidad Nacional de Colombia, headquartered in Medellín, Dr. Astrid Blandón Montes has dedicated herself to advancing the knowledge of Colombian coals through her work in organic petrography. She has also devoted her career to teaching at all levels of education **(Figure 5).**



Figure 5. Practice session at the Petrography Laboratory of Universidad Nacional de Colombia, Medellín, with Professor Astrid Blandón Montes.

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ACTIVITY OF ICCP IN THE CZECH REPUBLIC

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The methods of coal petrology have been rapidly developing since the 1960s in the entire Eastern bloc, including Czechoslovakia. This development was related to increasing requirements for the quality of coal as a raw material in accordance with the international classification followed during geological exploration and mining of coal deposits for the production of energy and metallurgical coke, for the gas industry and the processing of brown coal by briquetting and gasification. Although coal petrologists were not allowed to join the activities and participate in ICCP meetings for political reasons, most of them followed new trends in the development of methods for determining reflectance and maceral composition and their application within ICCP activities, either by studying publications often obtained in the form of requested separates, by exchanging experiences of coal petrographers from the Eastern bloc, who had contacts with some members of the ICCP, most often with Mrs. Prof. M.T. Mackowsky, Prof. M. Teichmüller, and Prof. M. Wolf and later with ICCP members from Poland, Bulgaria, Hungary.

The knowledge gained was used in setting up new microscopic laboratories in research institutes, universities, geological services and also in mines and mainly in coke plants. Attention was paid to new and high-quality instrumentation for the preparation of high-quality polished-blocks, microscopes with photometers and spectrometers for measuring the light reflectance of vitrinite, and microscopes for the maceral composition of black and brown coals, which met the requirements of international standards (ISO 7404, 1984). In each of these laboratories, the publications International Handbook of Coal Petrography (1963; 1975; 1985 and 1986), Stach's Petrology (Stach et al., 1982), later Organic Petrology (Taylor et al., 1998) were available in addition to the book D. W. van Krevelen's "Coal" (1961, 1981, 1993).

Thanks to the first international seminar on coal petrology, held in 1992 at the Institute of Geotechnics, the predecessor of the IRSM, in addition to Czechoslovak coal petrographers under the leadership of Prof. J. Peška (PřF UK in Prague) members of the ICCP participated for the first time. Prof. C.F.K. Diessel from Australia, Prof. W. Gabzdyl and Prof. B. Kwiecińska from Poland and Prof. C. Panaitescu and Dr. G. Predeanu from Romania, in addition to his expert lectures, informed us about the principles and system of the ICCP, about its activities and topics addressed in the working groups of three expert commissions.

Unfortunately, this positive impulse appeared at a time of a significant slowdown in brown and hard coal mining, a slowdown in heavy industry and engineering, and the transformation of the energy sector in Czechoslovakia and, since 1993, in the Czech Republic. This was followed by a reduction in geological exploration and research into raw materials and their processing, especially coal, which was linked to the reduction of workplaces dealing with coal research and processing. Petrological laboratories remained in Ostrava at the Technical University, at the Institute of Geonics AS CR and at the coking plant in NH and in Třinec, in Brno at the Masaryk University and in Prague at the Czech Geological Survey and at the Institute of Rock Structure and Mechanics of the Academy of Sciences of the Czech Republic, which in this area closely cooperates with PřF UK. Most of the non-Prague laboratories and coal petrologist have already creased their activities.

The remaining workplaces seized new opportunities and from their original focus on the quality and use of coal reserves, research in the Czech Republic, in cooperation with individual ICCP members, began to focus on the genesis, paleoenvironment and climatic conditions of coal deposits, on environmental protection, the occurrence and extraction of methane and sequestration CO2, study of ashes from combustion processes of fuels, characterization and maturation of dispersed organic matter in sediments (Suchý et al., 1997; Franců et al.,2012; Goldbach et al, 2017; Havelcová et al., 2013; Jirman et al., 2019; Johnson et al., 2012; Sachsenhoffer et al., 2018; Vöröš et al., 2018). Some laboratories still use the Single Coal Accreditation Program to control the quality of petrographic parameter measurements and to obtain a certificate for Accreditation in Vitrinite random reflectance Analysis and Maceral Analysis (measured using ISO 7404 techniques).

Since 1996, when the first representative of the Czech Republic was accepted as an associate member of the ICCP, and in 2000 when the first Czech representative became full member of the ICCP, interesting cooperation between petrologist of the Department of Geochemistry of the Institute of Rock Structure and Mechanics of the Academy of Sciences of the Czech Republic in Prague and members of the International Committee for Coal Petrology gradually began to develop. They took the form of annual professional activities in the working groups of three commissions. Their topics are expanded every year from basic information on coal and dispersed organic matter to new studies on instrumental methods and new applications.

For almost a quarter of a century, Commission 1 focused on Nomenclature and Classification, the international team "Huminite WG" revised and updated the huminite classification of brown coals (Sýkorová et al., 2005), within the Temporal variations of Coal WG a database of petrographic parameters of world coals was compiled (Vasconcelos et al., 2017) and the Peat Petrography WG worked on developing a petrographic characteristics of peat components. Within Commission 2 focused on Geological applications of organic petrology, publications were prepared based on a several-year study by the WG Identification of dispersed organic matter (Hackley et al., 2013; Kus et al., 2017) and in Commission 3 focused on Industrial Application of Organic petrology participates in the Environmental Application of Organic Petrology WG; Self-heating of Coal and Coal Wastes WG (Misz-Kennan et al., 2020) and from 2023 Larikova and Sýkorová (2023) manage the activity of Radiolytic alteration of the organic matter in coal and rocks WG and prepare robin round exercise of radiolytic alteration textures of organic matter.

In 2021, the Department of Geochemistry of the Institute of Rock Structure and Mechanics of the Academy of Sciences of the Czech Republic in Prague, under the leadership of department heads Martina Havelcová and Ivana Sýkorová, organized with the participation of the Faculty of Science of Masaryk University in Brno and Charles University in Prague and North Bohemian Mines the 72nd Annual meeting of the ICCP in the Congress Center (IRSM) from 20 September to 25 September. Friday 24 September was dedicated to the symposium "The Future of Coal and Organic Petrology in the Era of Transition from Fossil to Renewable Fuels" and Saturday 25 September to the excursion to Bílina and Most in the north-western Bohemia (ICCP News, No 80, Sept 2021 and No81, Dec 2021). This was the first hybrid (online and face-to-face) meeting organized by the ICCP (Figure 1), in which the Council and the organizing team were nervous about starting. Nineteen participants (12 foreign and 7 Czech) and 31 online participants from Australia, Brazil, Germany, Great Britain, Greece, India, Hungary, Poland, Portugal, Romania, South Africa, Spain, and USA and took part in the meeting. After all, like all previous meetings, the 72nd meeting in Prague took place in a friendly and creative atmosphere, in a pleasant environment and with excellent technical facilities (Figure 2).



Figure 1. 72nd Annual Meeting held in Prague in hybrid format showing the in vivo participants and the on-line participants in the screen (ICCP News 81, 2001).

During the last twenty-five years, several young Ph.D. students dealing with coal and organic petrology have been allowed to participate in ICCP meetings as associate members, which impressed them with the working and friendly atmosphere and tolerance. Unfortunately, all of them switched to other fields of work during their doctoral studies, often outside of geology, geochemistry or fossil fuel processing.

From 2022, Tatiana Larikova has decided to continue research in coal and organic petrology, and with her knowledge of geology, mineralogy, geochemistry and rock petrology, she significantly contributes to a deeper understanding of organic and mineral phases, the processes of their formation, and alteration in the rock environment. He is currently completing a study of radioactive alteration of organic matter in rocks with a high uranium content. Her involvement and continuation in the activities of the ICCP working groups is positive.
In conclusion, I can state that in the Czech Republic, cooperation with ICCP has always been, is, and according to current developments will continue to be considered the activity of an individual interested in coal and organic petrology and its applications.



Figure 2. Memories of the Conference Dinner of the 72nd Annual Meeting held in Prague (ICCP News 81, 2001).

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ICCP – THE DANISH CONNECTION

Henrik I. Petersen

GEUS Geological Survey of Denmark.

I am pleased to have been asked to give a personal and Danish perspective of my long association with ICCP. My first acquaintance with ICCP was in 1993 when I as a PhD student attended the 45th ICCP meeting in Chania, Crete. The then President of ICCP Alan Davis welcomed me, and he made an effort to introduce me and other newcomers to the society. It was a gift suddenly to meet so many skilled, dedicated – and some famous! – scientists within the field you were working in. I think I recall Harold Smith was also there, who the same year reviewed my first publication for International Journal of Coal Geology. Since then, I have on average but with an irregular frequency participated in an ICCP meeting every second year, often together with my now retired colleague Per Rosenberg. The irregularity comes from the fact that a varying work portfolio and job change may not always align with a one-week meeting with working groups on such a specialized topic as organic petrography. However, I have always returned to ICCP because it is so much more than just a meeting of organic petrologists. It is networking, learning and friendship, and as a bonus and privilege it has allowed me to visit some amazing places around the world.



Figure 1. Wine tasting in Lower Hutt Valley during the 49th ICCP meeting in Wellington, New Zealand, in 1997. Good company (from left): Tim Moore, Wolfgang Kalkreuth, Lopo Vasconcelos, and Walter Pickel.

But why was Denmark interested in sending scientists to an organization such as ICCP? The North Sea petroleum adventure was accelerating (source rock composition, vitrinite reflectance), but Denmark had no commercial coal deposits or steel industry. However, in the 1990's most of Denmark's energy production came from coal-fired power plants, and coal was imported from all over the world depending on market price. The power plants had problems burning these various coals efficiently and they thus engaged in research into coal combustion. Alongside this the Danish society was increasingly interested in North Sea petroleum geology, including investigation of source rock composition and thermal maturity – both topics related to organic petrography.

It was therefore natural that I got involved in all three commissions of ICCP, but particularly in Commission I and Commission III. When I joined ICCP, Commission I was working on a revision of the vitrinite and inertinite classification system (ICCP System 1994), which were published in 1998 and 2001 (ICCP, 1998, 2001). It was very exciting for a young petrologist to be involved with such fundamental work together with strong characters like Monika Wolf, Wolfgang Kalkreuth, Alan Cook, and Claus Diessel just to mention a few. Marlies Teichmüller was not attending the meetings any longer, but she sent written statements about her opinion on classification. The learning curve was steep. I think all that have attended an ICCP meeting know that these revisions can take what seems to be forever, but at the end highly valuable classification standards are available for the benefit of the global organic petrological society. This possibility for all petrologists to use the same maceral definitions and nomenclature should not be underestimated. Later I had the pleasure to work with Barbara Kwiecinska on the classification of graphite, semi-graphite, natural coke, and natural char. These macerals did not fit into the three primary maceral groups, and we thus established a formal classification of these within the ICCP System 1994, that was published in 2004 (Kwiecinska and Petersen, 2004). Another very important work was the Accreditation Program on single coal and dispersed organic matter. Participation in these programs was a powerful way to highlight the quality of the work carried out in the laboratory.

In Commission II, I was involved in the work related to dispersed organic matter (DOM) petrology, which was of direct relevance for my professional job, where I was strongly involved in characterization and quality assessment of petroleum source rocks. I do not recall when the work on DOM started in ICCP, but now in 2024 I am together with numerous other ICCP colleagues contributing to an article led by Paula Gonçalves on the petrology of DOM. However, one thing is maceral definitions, another is the use of these in practice. Such an issue was addressed with regard to the identification of alginite and bituminite. In Commission II, I had the opportunity to participate in round robin exercises led by Jolanta Kus. The round robin exercises were based on photomicrograph-based identification of dispersed organic matter. The photomicrograph-based way to conduct a round robin exercise is a very effective way to mobilize and involve many ICCP members to solve or investigate a problem. The results of three round robin exercises were published in 2017 (Kus et al., 2017).



Figure 2. Work, culture, and relaxation during the joint 64th ICCP/29th TSOP meeting in Beijing, China, in 2012. Work: I am listening concentrated to Joao Mendonça Filho during one of the sessions. Culture: Visiting Tiananmen Square together with Paul Hackley, Peter Crosdale, and Johan Joubert. Relaxation: Typical 'after meeting' discussion situation – all are invited!

Together with Per Rosenberg, my most dedicated contribution in ICCP was to the Combustion WG and partly also the Coal Blend WG of Commission III. These working groups were led by Angeles G. Borrego and Isabel Suarez-Ruiz, and we had through many years close collaboration with INCAR in Oviedo, Spain. Judith Bailey was Chair of Commission III when Per Rosenberg and I joined, but from 2000–2004 the chair was Rosa Menéndez, for who I had the privilege to serve as Secretary of Commission III for four years (plus several times acting secretary).

Bailey et al. (1990) had published a char morphology system, and an attempt to correlate combustion char morphology with combustion temperature and coal petrology was published by Rosenberg et al. (1996). However, a huge effort to establish a practical applicable combustion char classification scheme was led by Edward Lester, and the outcome of this was published in 2010 (Lester et al., 2010). The effort by the Combustion WG to establish a combustion char classification scheme and investigations into coal combustion provided very valuable insights that could be directly translated into the understanding of combustion in coal-fired power plants. Today I apply the classification scheme of the Combustion WG to classify biochar which ironically represents the complete opposite of combustion, namely pyrolysation where the goal is to store carbon, not to burn it.

The years from 2000–2004 were for me very active. I was member of the ICCP Council, and in 2001 Per Rosenberg and I arranged the annual 53rd ICCP meeting in Copenhagen, Denmark. When you are the organizer of an ICCP you really learn to appreciate the hosts of the meetings! It is a tremendous work but also a fantastic opportunity to show your ICCP colleagues your institute, hometown, and country. The weather was just great, the conference dinner was held at a restaurant with a view to Tivoli Gardens, and the excursion went to the amazing chalk cliffs at Møns Klint that are analogs to the hydrocarbon-bearing chalk fields of the Danish North Sea.

This meeting is also to my knowledge the first time TSOP was present outside North America. It was not an official TSOP meeting, but Charlie Barker, the President of TSOP at that time, and I arranged a TSOP session at the meeting. It was included in addition to ICCP's Marlies Teichmüller Symposium at the same meeting. Nowadays jointly ICCP/TSOP meetings are common, and I very much appreciate these meetings where both organizations, that complement each other so well, are present.

From 2011–2014 I had the honor to be elected as Vice-President of ICCP. As Vice-President I was together with Lopo Vasconcelos responsible for organizing ICCP training courses. Training in organic petrology is not a standard off-the-shelf product, which makes this ICCP activity highly important for young less experienced organic petrographers.



Figure 3. A walk along the Chalk Cliffs at Møns Klint, southern Denmark, during the 53rd ICCP meeting in Copenhagen in 2001.

In 2013, I changed job to the oil industry but in 2021 I returned to research, and finally after the Covid pandemic and online conferences for a couple of years, I participated in the 2023 joint 74th ICCP and 39th TSOP meeting in Patras, Greece. This time with two fairly new topics within organic petrology – namely biochar used for carbon storage in order to reduce atmospheric CO_2 concentrations and characterization of remaining oil and solid bitumen in depleted oil fields considered for CO_2 storage. This is the beauty of organic petrology: it is a technique and set of skills that can be applied in a myriad of contexts to solve problems for society, industry, and now the climate.

Organic petrology will never get outdated!

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GERMANY & THE ICCP

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The need for international agreement in coal petrographic nomenclature was already recognized during the 2nd Carboniferous Congress at Heerlen in 1935. Several ideas on classification had evolved and led to confusion over concepts and terminology. Stopes (1935) proposed the term 'maceral' to describe the microscopic constituents of coal and this initiated the Stopes-Heerlen System
.
The second world war hampered any progress on further developments. The topic was then reconsidered again at a meeting of interested coals scientists during the 3rd Carboniferous Congress in Heerlen in 1951, where Dick van Krevelen made a number of recommendations, one of which was that a "committee on petrographic nomenclature should meet every two years". Two years later, the International Committee for Coal Petrology, ICCP (now the International Committee for Coal and Organic Petrology) was formed and held its first meeting on June 9, 1953 in Geleen, The Netherlands.

At the founding meeting of the ICCP, four German scientists were present: Robert Potonié, as the first ICCP President, Erich Stach (who soon became ICCP General Secretary), and Marlies Teichmüller (a former student of Stach) from Geologisches Landesamt in Krefeld and Marie-Therese Mackowsky from Bergbau-Forschung in Essen **(Figure 1).** In the first years also east german scientists, mainly experts for lignite and soft brown coals like E. Sontag, G. Roselt, H. Preuß from the University of Freiberg, took part in the discussions and meetings. After the construction of the inner German border in 1961 and related travel restrictions for people from the German Democratic Republic, it became more and more difficult to contribute to the discussions and to travel. From the late 1960s, significant contributions to ICCP were also made from scientists from the Bundesanstalt für Geowissenschaften und Rohstoffe (BGR) in Hannover (starting with Helmut Jacob, who established the Organic Petrography Research Unit at later BGR) and the 1980s from the University of Aachen (starting with Hans Hagemann and Monika Wolf).

Guided by the requirements of the coal industry, especially the increasing international economic co-operations, the initial focus of ICCP activities was to develop an internationally agreed nomenclature and appropriate analytical procedures. Previously, there was no consistency in the various terminologies for macerals, microlithotypes, and lithotypes and even the names used varied from country to country. The petrologists of the early meetings were mostly very strong characters and discussions were intense. Geoffrey Taylor (1998) remembers his first meetings: *'Despite all the vigorous debates and heated arguments, my strongest memories are first, of the rich range of personalities and second, of the generosity of all present with, at the end of the day, good-natured acceptance of majority or consensus positions.'*

The first resolutions passed by the membership at the first meeting in 1953 were 'to make an International Glossary' (Nomenclature Commission) and 'to organise an exchange of experience in the field of coal petrographical analysis' (Analysis Commission).

In co-operation with European, American and Russian scientists, a 'Glossary' was created in just a few years, which included all European, American and Russian systems (nomenclatures) (ICCP, 1963). The individual sheets contained not only the petrographic description, but also chemical and physical properties.

Citing Duncan Murchison (2004, ICCP News 32), the German petrologists played a significant role in these developments and *'gradually became dominant (fortunately!) by handling and driving forward petrological issues'* in the early years of ICCP.



Figure 1. Four German participants attended the first formal meeting of the International Committee for Coal Petrology held at Geleen in the Netherlands in 1953; ICCP President Robert Potonié (1st row, 1st right); Erich Stach (1st row, 2nd from left), Marie-Therese Mackowsky (2nd row 7th from left) and Marlies Teichmüller (2nd row, 8th from left); (Organizer Dick van Krevelen 1st row, 1st left).

Noël (1987) noted that there was a great feeling of friendship from the start, which immediately united the participants into a real family and believes that this trend was initiated by the extraordinary personality of the President Robert Potonié. Speaking several languages and always knowing how to look at things from distance, he led the discussions with firm good nature and a somewhat skeptical smile, always bringing the debates back to the essential, bringing together the most opposing points of view. The secretary (and later president), Erich Stach, equally polyglot, but less sovereign, discussed with enthusiasm and defended step by step his convictions. Stach had already published a first edition of his Textbook of Coal Petrography in 1935, and decisively advanced the observation of polished blocks under oil immersion in the reflected light microscope. He also initiated the founding of a research centre for applied coal petrology. Edwin Hoffmann was the first to conduct reflectance measurements on polished coal blocks there. In later years this laboratory was headed by Marie-Therese Mackowsky after it became part of the Bergbau-Forschung (Teichmüller, 1989).

From a generation following that of Potonié and Stach, Marie-Therese Mackowsky and Marlies Teichmüller (Figure 2) marked the work of the ICCP from the beginning with their strong personalities, Mackowsky especially oriented towards petrography applied to industry, Teichmüller towards the problems of genesis and geology of coal.

From the beginning, Mackowsky's major concern was to obtain a method of petrographic analysis as precise as possible, which could be used without too much difficulty in industry, in particular for extracted coals, in grains, and on mixtures of coals of different ranks and made a first and pressing appeal to international collaboration for the development of such methods and for their recognition as ISO standards. She organized the first round robin analysis, which in the end led to the to the development of analytical methods recognized today as ISO standards and universally used. She chaired the Analysis Commission that was established in 1957 (Noël, 1989) and was ICCP President from 1975-1979. At the meetings, she passionately translated from one language into the other (English, German, Russian; Otte, 1987). *Many anecdotes exist about Marie-Therese Mackowsky. Harold Smith (1998) describes her as a 'formidable figure reinforced by her duelling scar which was said to have been acquired in her student days when women needed to demonstrate their independence. This may be apocryphal but it suites the personality'.*

Marlies Teichmüller tackled, for her part, the problem of the correlation between the American nomenclature, based on microscopic examination in thin section and the Heerlen nomenclature based on the microscopic examination of polished surfaces. In 1940s she had developed a technique for preparing thin polished sections that can be examined both by transparency and by reflection, gradually moving from one type of lighting to the other (Noël, 1989). In the 1960s and 1970s she chaired the Nomenclature Sub-committee which major emphasis on establishing definitions of terms. She contributed to the handbook and all three supplements (ICCP 1971, ICCP 1975, ICCP 1993).



Figure 2. Impressions from ICCP Meetings: Upper left: Oviedo 1983: from left: Claus Diessel, Monika Wolf, Eva-Marie Wolff-Fischer and Marlies Teichmüller; upper right: Aachen 1988 from left: Hans Hagemann, Werner Hiltmann (BGR), Walter Pickel (student of Monika Wolf); lower left: Doncaster 1986: Angelika Vieth and Reinhold Kutzner; lower right: Aachen 1988 field trip: from left Harold Smith, Hans Hagemann.

In the 2nd supplement (ICCP 1995), Marlies Teichmüller was as convenor responsible for description of the lignite group. She early recognized the benefits of maturity studies on organic matter in sedimentary rocks. After microscopic reflectance measurements were introduced into coal petrography, this area was of particular interest to the oil and gas industry. One of her many interests was 'Bituminite in rocks other than coal', and the sheet was published in the 3rd supplement of the Handbook. (ICCP 1993). In recent years, Jolanta Kus (BGR) took a very active role in the activities of Commission II and convened several working groups, e.g. Identification of dispersed organic matter.

A somewhat less extrovert person, but nevertheless important to the progress of ICCP standardization activities was Helmut Jacob. As a brown coal specialist, he already contributed in the 1950s and 1960s to the development of applied brown coal petrology and applied this knowledge for the development of methods to predict the quality of brown coal briquet and coke (Jacob, 1998). He contributed significantly to the development of nomenclature and classification of brown coals at macroscopic and microscopic scales within the Nomenclature Commission of the ICCP and made substantial achievements in the establishment of nomenclature and classification of solid bitumens (Kus et al. 2015). He convened the working group on migrabitumen (ICCP 1993), which was later taken over by Werner Hiltmann (BGR; Figure 2). Helmut Jacob was very much devoted to ICCP and almost until his death in 2014 he every year sent a letter with apologies to the General Secretary for not being able to attend the meetings.

Monika Wolf (Figure 2) took over the responsibilities of the Nomenclature Sub-Committee from Marlies Teichmüller. She was very much dedicated to ICCP and was involved in the Committee's activities for many years until her retirement. She started as a coal petrographer at the Geologisches Landesamt in Krefeld in 1963 and was appointed to chair of the Institute for Geology and Geochemistry of Petroleum and Coal at the Aachen University. Following a recommendation of Erich Stach, she participated in ICCP round robin analyses since 1963 and joined ICCP in 1968. Monika Wolf was active in many working groups and chaired several Handbook Editorial Groups. At the Porto Alegre meeting in 1991, she initiated the revision of the maceral sheets for the new Handbook edition, which in the end led to the new ICCP classification system 1994. To a large extent Monika convened the activities for the revision of the vitrinite group (1994) and intertinite group (2001).

The activities of the Analysis Sub-Committee i.e. the standardization of methodologies and ring analysis for comparison were continued in working groups also in the 1980s and 1990s. The working group on 'Standardization of reflectance' aimed to establishing internationally accepted standards and methods for reflectance measurements thereby to attaining comparable results between laboratories and improving the repeatable identifications of macerals between laboratories for reflectance measurements. Werner Pfisterer convened this working group a.o. until 1992 and was succeeded by Walter Pickel (Figure 2). As an additional activity of standardization, ICCP also provides the service to check reflectance standards against ICCP standards in order to get an idea of possible variations of reflectance measurement data due to calibration. This service - Reflectance Standard Checking- is still available a.o. from one of the German convenors Evelyn Bieg.

All ICCP efforts to standardize nomenclature and analysis methods in the end led to the development of the ICCP Accreditation scheme. The initiation of the ICCP Accreditation Program took place at the Aachen meeting in 1988. Following a proposal of Harold Smith, to establish procedures for accreditation in petrographic analysis, Reinhold Kutzner (Ruhrkohle AG; Figure 2) organized the first activities of selecting and preparing coal samples for ring-analyses. More information on the historical development of ICCP Accreditation Programs compiled by Angeles G. Borrego can be found in the ICCP website.

The application of fluorescence techniques for maturity determination in low rank coals was already addressed in the 1960s by a.o. Pieter van Gijzel and Helmut Jacob (BGR) and a sheet on 'Fluorescence Microscopy and Fluorescence Photometry' was published under the convenorship of Hans Hagemann (Aachen University; Figure 2) as the chair of the Analysis Commission (ICCP 1975). It was attempted to finding suitable standard methods and standards in the whole range of the fluorescence intensity of low fluorescing components. In the 1980s Karl Ottenjan a.o. convened the fluorescence working group and activities resulted in two sheets of the ICCP Handbook.

- Fluorescence Part I. Measurement of Fluorescence Intensity (1989) (ICCP 1993).
- Fluorescence Part II. Measurement of Spectral Distribution (1992).
- Results of a 1984/1985 round robin analysis were published (Thompson-Rizer et al. 1988).

Last but not least, the commitment of German scientists to Commission III should be mentioned. Coke microscopy and strength as well as automated reflectance measurements are just a few areas. Colleagues from Bergbau-Forschung and the German mining industry (a.o. Eva-Marie Wolff-Fischer, Monika Steller; Heike Liszio) have contributed to the discussion and results of this Commission from the beginning to present day.

ICCP Meetings in Germany

In the early years of ICCP (appr. until 1960) international meetings were held every two years, meetings of the Nomenclature Sub-committee took place in different cities in Europe every six month, two of them (1955 and 1957) in Essen. Later, annual meetings were held in Germany 1961 and 1971 in Krefeld (Figure 3), and 1968 and 1978 in Essen.



Figure 3. Group photo of the 24th Meeting in Krefeld (1971).

Since the early 1980s intensive ICCP engagement also included scientists from the University of Aachen, after Monika Wolf was appointed to Chair of the Institute for Geology and Geochemistry of Petroleum and Coal at the Aachen University in 1981. In 1988 a meeting was held in Aachen **(Figure 4).** This meeting also formed the starting point for the edition of the ICCP News with Eva-Marie Wolff-Fischer (Bergbauforschung) (replaced by Monika Wolf from 1991 until 2000) and Hans Hagemann (University of Aachen) as editors.



Figure 4. Group photo of the 41st Meeting in Aachen (1988).

Meeting in Potsdam

In 2015 the 67th ICCP meeting took place in Potsdam **(Figure 5 and 6).** The meeting was hosted by Deutsches GeoForschungsZentum (GFZ) with the support of the German Geological Society (DGG) and the Rolf and Marlies Teichmüller Foundation. Prior to the meeting, a training course on Organic Petrology in Industrial Applications was organised. Claudia Niemz and her colleagues from LAOP-consult in Lauta in cooperation with Henny Gerschel from the University of Freiberg organized a field trip to the East German lignite mines.



Figure 5. Group photo of the 67th. meeting in Potsdam (2015).



Figure 6. Impressions from the Potsdam meeting (from ICCP NEWS 63 – Nikki Wagner).

ICCP Symposia honoring early ICCP scientists

Marlies Teichmüller. A Marlies Teichmüller Symposium was held in combination with the 53rd meeting in Copenhagen and selected papers were published (Cook et al., 2005).

A 2nd symposium was organised at the 67th meeting in Potsdam. Jolanta Kus from BGR in Hannover was responsible for the Symposium scientific program and chaired the Scientific Committe of the ICCP Symposium on "Coal and Organic Petrology – New Perspectives and Applications: attribute to Marlies Teichmüller" (1914-2000). Papers were published in a special issue of the International Journal of Coal Geology (Kus et al. 2016).

Marie-Therese Mackowsky. The 55th meeting of the ICCP was associated with the XVth International Congress of Carboniferous and Permian Stratigraphy and organised by the Netherlands Institute of Applied Geoscience - TNO, National Geological Survey and the Faculty of Geosciences of the Utrecht University in August 2003. Petra David, assigned at TNO at that time, was co-organizer. A one-day colloquium in honour of Marie-Therese Mackowsky was organised and opened by Manuel Lemos de Sousa. Invited speakers honoured the work of Marie Therese Mackowsky in different ways. Selected presentations were published (Cook, ICCP 2006).

The Colloquium was also attended by many previous colleagues of Marie-Therese Mackowsky and active ICCP members from Bergbauforschung and Ruhrkohle AG: Eva-Marie Wolff-Fischer, (Figure 2 and 7) Werner Pfisterer (Figure 7), Reinhold Kutzner (Figure 2 and 7), Rolf Wartmann (Figure 7), Monika Steller (Figure 7), and Mackowsky's former PhD student Claus Diessel (Figure 7).

ICCP training courses in Germany

Under presidentship of Petra David, the first ICCP training course was organized in at the Geoforschungszentrum (GFZ) in Potsdam (Figure 8). This was due to the very favorable circumstances that Alan Cook and Claus Diessel agreed to prepare and teach an ICCP course on Organic Petrology. At about the same time the refractor building at the Telegraphenberg in Potsdam became available as the training location, thanks to the tremendous support of Andreas Küppers and Antje Treutler from GFZ. Later training courses were also supported by Hilgers Technisches Büro, who provided their microscope systems for the courses. In the period between 2009 and 2019, nine training course with different topics (Organic Petrology, Dispersed Organic Matter, and Organic Petrology for Industrial Applications) and teachers were organised in Potsdam, six more in Portugal, South Africa, Australia and Greece. In the meantime, the venue in Potsdam is no longer available, but training courses are now structurally organized at the University of Patras.



Figure 7. Impressions from Mackowsky's previous colleagues from Berbauforschung: Eva-Marie Wolff-Fischer, Monika Steller, Werner Pfisterer, Rolf Wartmann with Zuleika Caretta, Klaus Diessel with Monika Wolf and Marco Ercegovac, Reinhold Kutzner, Rolf Wartmann, Eva-Marie Wolff-Fischer.



Figure 8. Group photo of the first training course at the refractor building at the GFZ in Potsdam in November 2009.

ICCP Presidents from Germany

Five German scientists served as ICCP Presidents. Robert Potonie and Erich Stach hold the position from 1953 -1971. In 1975 Marie-Therese Mackowsky was elected and served for 4 years. All three belonged to the founding generation of ICCP. Monika Wolf joined ICCP on the 1960s and was ICCP President from 1987-1991 **(Figure 9).** They all were of great importance to the progress of standardising nomenclature and analytical procedures within ICCP. They also had great influence at their institutions and promoted coal and organic petrology, educated students and motivated young scientist to become engaged in coal and organic petrology at a later stage. Two of Monika Wolfs students, Walter Pickel and Petra David became intensively involved in ICCP activities and served in different council functions.

Petra David attended her first ICCP meeting in 1991 in Porto Alegre and was very warmly welcomed by the organizing committee and the ICCP community. She became member in 1994. After convening the Automation working group for several years, she was elected General Secretary and started her activities in 2000, with Alan Cook as President. From 2007 - 2015 she served as President of ICCP **(Figure 9).**

Thiessen Medalists from Germany

The activities of German ICCP members in organic petrolographical research is also reflected in the awarding of seven Thiessen Medals to Robert Potonié and Erich Stach in 1964, Edwin Hoffmann in 1968, Marie-Therese Mackowsky and Marlies Teichmüller in 1971, Helmut Jacob in 1993, and Monika Wolf in 1995.

Also, active and successful were the German “scientist exports” Claus Diessel, Wolfgang Kalkreuth and Walter Pickel **(Figure 10),** two of them were also honored with the Thiessen Medal (Diessel 1991 and Pickel 2015).

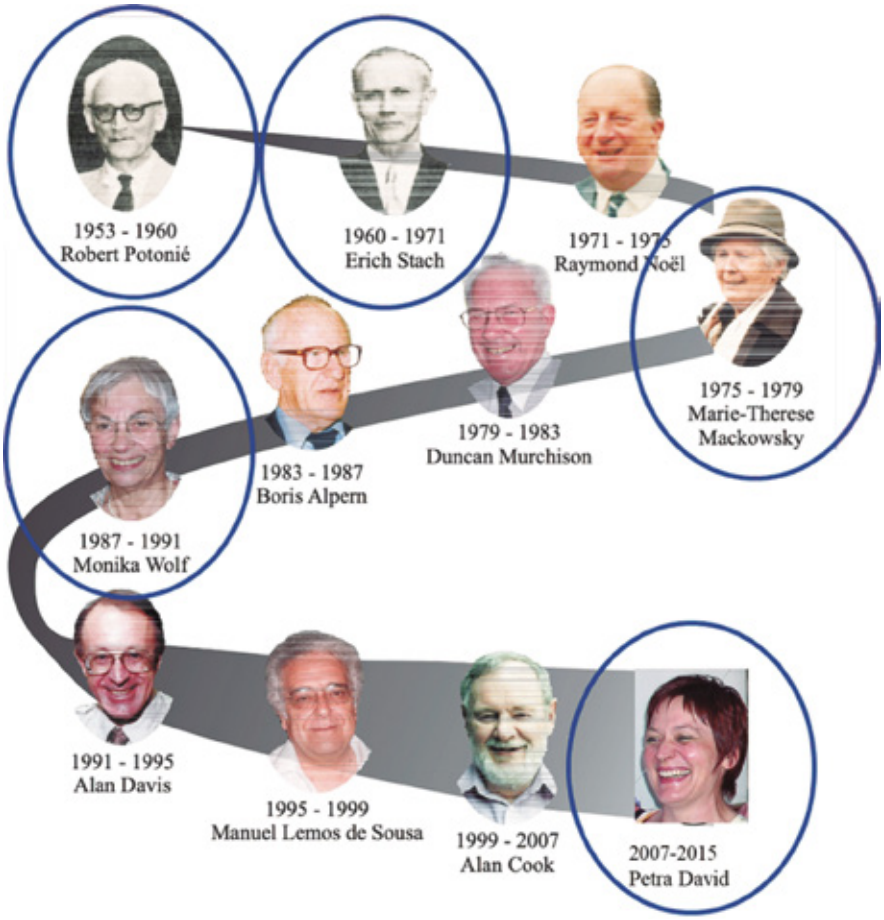

Figure 9. Presidents of ICCP up to 2015 – figure modified from title of ICCP NEWS 40 (Peter Crosdale). Encircled the Presidents from Germany.



Figure 10. Left: Walter Pickel receives the Thiessen Medal at the Potsdam meeting in 2015 (From left: Petra David, Walter Pickel, Angeles G. Borrego). Right: Jolanta Kus receives the Organic Petrology Award (From left: Paul Hackley, Jolanta Kus, Angeles G. Borrego).

Organic Petrology Awardee

In 2021 Jolanta Kus was awarded with the Organic Petrology Award and was presented the medal at the 2023 meeting in Patras (Figure 10). Jolanta is a very active member of ICCP. She contributed significantly to the publication of the ICCP Liptinite Classification (Pickel et al., 2017) and convened and convenes several working groups in Commission II. Since 2019 Jolanta chairs this commission with great success.

To conclude

ICCP has attracted many outstanding scientists who spent a lot of their time and energy to develop better standards in organic petrology. Apart from the persons mentioned in this article, many German petrologists were and are active in various working groups for the benefit of ICCP. Our thanks go to those as well.

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THE ICCP AND GREECE

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Due to the geotectonic regime, Greece hosts only low-rank coal deposits being mined by the Public Power Corporation and few small private companies for mainly power generation. On the other hand, the small quantities needed for metallurgical coke or for fuelling the cement and the chemical industry are covered by imports. For the above reasons there is no long Greek tradition in and contribution to Coal Petrology.

The first Greek publication including some Organic Petrology data, was a project report by Melidonis (1968).

There, Dr. Marlies Teichmüller included photomicrographs and petrographic descriptions of 30 thin sections and polished blocks prepared from peat samples, which were picked up at depths between 1 and 193 m beneath the surface along three cores retrieved from the Philippi peatland, the thickest (~200 m) peat deposit in the world (Melidonis, 1968).

Since the 1980's two Geologists, namely Drs. Cassiani Papanicolaou and Pantelis Kokkinakis, working at the Directorate of Fossil Fuels of the Institute of Geology and Mineral Exploration (IGME), Athens, began examining under the microscope coal samples from several Greek deposits. Their results were included in several internal reports of IGME, congress proceedings and journals. Dr. Papanikolaou compiled and published in 2001 the Greek Coal-Petrography Atlas, whereas later she coordinated a research project aiming to examine – in collaboration with few university laboratories – possible non-energy generating applications of Greek coals, primarily selected on the basis of their petrographic composition (Papanicolaou et al., 2006).

In 1993 ICCP's 45th Annual Meeting took place in Chania on Crete Island with Prof. Dr. Antonis Foscolos from the Technical University of Crete being the Organizer. During this decade the Technical University of Crete (Dr. A. Foscolos), the National Technical University of Athens (Dr. P. Antoniadis) and the University of Patras (Dr. K. Christanis) decided to invest on coal-petrography microscopes and to equip accordingly the relevant laboratories. Many under- and postgraduate students began working on Coal and Organic Petrology and the discipline won a lot of fans among the young scientists. Several Diploma, MSc and PhD theses dealing with the petrological examination of peat and low-rank coal deposits were carried out in the Geological Departments of the Universities of Patras and Thessaloniki, and the National Technical University of Athens as well; in several cases the results were published in congress proceedings and international journals (e.g., Iordanidis and Georgakopoulos, 2003; Kalaitzidis et al., 2003, 2004, 2006; Antoniadis et al., 2006a,b; Oikonomopoulos et al., 2008; Siavalas et al., 2009; Oskay et al., 2016). Further research conducted by the above mentioned Departments, focused on the geology and petrology of peat and low-rank coal deposits, as well as of hydrocarbon source rocks sampled from the country or abroad (e.g. Christanis, 2004; Giannouli et al., 2009; Kalaitzidis et al., 2010; Ogala et al., 2012, 2020; Damoulianou et al., 2020, 2022; Sarraj et al., 2021; Alexandridis et al., 2022; Kern et al., 2022; Ejeh et al., 2024; Nikitas et al., 2024). Additionally, and beyond the application of Organic Petrography in geological samples, various studies were conducted from Greek teams towards both environmental and industrial applications, which nowadays constitute the main shift of the conducted research (e.g. Cornelissen et al., 2006; Kalaitzidis et al., 2007, Siavalas et al., 2007, 2013; Papanicolaou et al., 2009; Georgaki et al., 2024).



Figure 1. Visit at Olympia archaeological site during the excursion of the 57th ICCP Meeting in Patras in 2005.

Currently, only the Laboratory of GeoEnergy at the Department of Geology, University of Patras, under the direction of Prof. Dr. Kalaitzidis remains active providing under- and postgraduate courses in Organic Petrology and conducting relevant research.

Beyond the 45th, also the 57th (Figure 1) and the 74th ICCP Annual Meetings, the latter joined with the 39th TSOP Meeting, were organized in 2005 and 2023 (Figure 2) in Patras by Profs. Drs. Kimon Christanis and Stavros Kalaitzidis, respectively. Moreover, the 14th and the 15th ICCP Courses on '*General Coal and Organic Petrology'* and *'Optical Microscopy of Dispersed Organic Matter: facies and maturity',* respectively, were held in 2022 and 2023 in Patras (Figure 3).

Since 2006 the GeoEnergy Lab (Dr. Christanis) of the Department of Geology, University of Patras, is organizing the Single Coal Accreditation Program (SCAP) exercises, on behalf of the ICCP.

Today the ICCP has seven and TSOP four active members in Greece.



Figure 2. Group Photo of the Joint 74th ICCP & 39th TSOP Meeting in Patras in 2023.



Figure 3. Fieldtrip during the 15th ICCP course on *'Optical Microscopy of Dispersed Organic Matter: facies and maturity'* in the Agyia Mire at the coast near Patras in 2023.

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CONTRIBUTION BY THE HUNGARIAN MEMBERS

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Introduction

Coal geology and petrology became an active research field in Hungary after the First World War when significant coal basins were lost for the country.

Dr. Elemér Vadász (1940, 1952) and Dr. Elemér Szádeczky-Kardoss were the first geologists interested in the microscopic constituents of Hungarian brown coals (Szádeczky-Kardoss 1939, 1943a,b). In the 1930s, they collaborated with Prof. Stach sending him high liptinite and funginite coal samples derived from the Eocene brown coals in the Transdanubian region in Hungary. These macerals were displayed in the photomicrograph tables in the first edition of the Coal Petrology Text Book (Stach, 1932) and were re-edited in the later editions too.

Members from the beginnings to the end of eighties

The first active and the most significant contributor to the ICCP Lexicon among the Hungarian members was Dr. László Soós. He was born in Szolnok (1920-1995) and has got his university degree at the Technical University of Budapest (BME) as a chemical engineer in 1944. First, he worked at the Department of Chemical Technology as a teaching assistant dealing with oil and coal chemistry until the end of the Second World War. From 1947 he worked for the Hungarian State Coal Mines Company, head of the Coal Distillation Unit in Dorog, and his research field was the extraction of pyrocatechinic and other phenol compounds.

From 1952 he became an aspirant at the Geochemical Research Laboratory of the Hungarian Academy of Sciences. His PhD thesis was about coal petrography, the study of the physical, chemical and optical properties of coal constituents. He established that the different constituents, macerals contain different organic composition which has relationship to their physical properties.

In the following years he worked together with Szádeczky-Kardoss on the Lower Miocene lignites in N-Hungary (Szárdeczky-Kardoss and Soós, 1959, 1964) and on Jurassic hard coals of the Mecsek Mountains in S-Hungary (Szádeczky-Kardoss, 1956) for the reconstruction of the peat forming environments.

As he had been an active member of the Nomenclature Commission from the early years of the ICCP his scientific results were communicated and built into the working group reports and became one of the authors of the International Handbook of Coal Petrography, 2nd edition (1963, 1971) with the physical, chemical and optical properties of some macerals. The first descriptions on “bituminite” and “ melanoresinite - periblinite” are derived from him (Soós 1963, 1964, 1966a,b). The bark origin tissue name in coal geology, periblinite became later the name of suberinite. In the seventies his eyes went very wrong, so he was not able to use microscope and gave up all activities in organic petrology and in science.

In the seventies with Mrs. Márta Belláné Pelsőczi and Mrs. Edit Vargáné Regéczi arrived as new members to ICCP. They worked as geologist petrographers for the Mining Research Institute (1950-1978), and later for the Central Mining Development Institute (1979-1991). The Institute’s main tasks were related to the mining and processing of coal, ores and other solid mineral resources. They worked mainly on the industrial utilization of coal, coking properties and briquetting, therefore they participated mainly in the working groups of the Commission III until 1991 (Bella & Varga 1981, Bella, 1985; Gyöngyös & Varga, 1987; Belláné Pelsőczi, 1992).

Coal and organic facies studies

The continuity of coal petrography was followed by Dr. Mária Hámor-Vidó, the author of this review. Her first steps in coal petrology were guided by Mrs. Edit Vargáné Regéczi. She shared her knowledge and great experience with patience and enthusiasm for two years between 1989-1991. She stopped her mentoring activities due to her sudden illness and early death in 1991.

In 1992 Dr. Mária Hámor-Vidó started to find the opportunities to enhance her knowledge in organic petrography (Hámor-Vidó, 1992, 1993). Her employer, the Geological Institute of Hungary established a bilateral scientific exchange program, so she initiated the cooperation with the Federal Geoscientific Institute for Raw Materials (BGR) in Hannover. This fruitful cooperation went on for 10 years with Dr. Joachim Koch, Dr. Heinz Hufnagel, and Dr. Hermann Wehner. First, Dr. Mária Hámor-Vidó asked the consultation with them on Hungarian samples, later they worked on joint bilateral scientific projects on the comparison of organic petrology of the Hungarian and German oil shales, and the optical and chemical changes during the attenuation of gasoline spills in Central Hungarian contaminated soils.

In 1993 Monika Wolf accepted her request for a consultation on her PhD thesis, which dealt with the reconstruction of peat-forming environments of the Lower, Middle Miocene brown coals. She confirmed the interpretations on the huminite group macerals related to the depositional environment. Her comments and steering were very important in Dr. Mária Hámor-Vidó's career. During her short visit in Aachen, she promoted and encouraged her to apply for the associate membership in the ICCP, in 1994.

Dr. Mária Hámor-Vidó's (Figure 1) PhD thesis was defended at the University of Miskolc in the period from 1994 to 1996. This was the time when she initiated an overview and applicability of the organic petrography methods for the reconstruction of the peat forming environments (Hámor-Vidó, 1998, 1999, 2004). At the end of 10 years work in the "Reconstruction of the peat forming environments" Working Group the White Paper (Hámor-Vidó, 1998) and later a global review, the first special volume of the International Journal for Coal Geology was published where she was the guest editor. This special issue publication was based on a bilateral cooperation and contract with the Elsevier Publisher, where the Chair of the Commission II Dr. Angeles Gomez Borrego and Dr. Jim Hower the scientific editor of the journal contributed for the success.



Figure 1. Maria Hámor-Vidó at two different ICCP Meetings: Left: Potsdam 2015, From left Maria Hámor-Vidó, Angeles G. Borrego and Georgeta Predeanu. Right: Budapest Meeting field trip to Eger 2004 Maria Hámor-Vidó observing wine pouring close to Alan C. Cook and John Vleeskens.

The special issue (Hámor-Vidó, Ed., 2004) consists of 14 compilations derived from 17 authors on the coal facies works of 13 different geographical areas and shows the robustness of the implication of the organic petrology methodology for the reconstruction of peat-forming environment.

Beside of the peat-forming environment reconstruction studies she also participated in other working groups dealing with the application of petrology of dispersed organic matter, e.g. contribution to DOM thermal maturity determination in ASTM D7708-11 standard.

From 2004 to 2007 she acted as a secretary of the Commission II Geological Applications and carried on officer position as General Secretary from 2019 to 2021. In 2004 she organized the 56th Annual Meeting of the ICCP in the Palace of the Hungarian Geological Institute in Budapest (Figure 2). The field trip to the Bükkalja lignite mine and the following wine tasting event in Eger was remarkable (Figure 1 Right). This later position was rather difficult during the pandemic of Covid because personal meeting possibility was limited. She supported the President Dr. Angeles G. Borrego to phase out the Commission from classical post mailing, personnel communication and voting to electronic solutions. This first wireline officer election was organised with her leadership and technically supported by Dr. Stavros Kalaitizidis and his colleagues in the Academy of Sciences in Greece. In 2021 we had a successful electronic voting of the Secretary Officer of the Commission I and that time Dr. Dragana Zivotic was selected.



Figure 2. Group Photo of the 56th Annual Meeting held in Budapest, 2004 at the entrance of the Palace of the Hungarian Geological Institute.

New members in the last twenty years

The new Hungarian members who joined to ICCP during the last decades participated usually on one or two conferences personally. Dr. Ferenc Fedor and Dr. Mária Hámor-Vidó dealt with the statistical approach and evaluation of thermal maturity using vitrinite reflectance method. In some papers they made a review on the methodology, concerns and eventually proposed to use statistically more robust median instead of average for the determination of the vitrinite reflectance (Fedor et al. 2001; Fedor and Hámor-Vidó, 2000, 2003).

Mr. Richárd Orbán came for the Hungarian Oil Company, MOL Ltd, who contributed to different working groups of Commission II. In 2015 during the Potsdam Meeting, he initiated a new exercise for the calibration method of the spectral measurements of macerals with Dr. Angeles G. Borrego but later his working activities turned to the geochemistry, his activity in the WG terminated. He was active in the “Identification of Dispersed Organic Matter” WG, especially in the round Robin exercises of bituminite. He not only participated in this exercise but supported Dr. Mária Hámor-Vidó to use the Zeiss microscope of MOL Ltd.

Attila Király another member of the Commission I gave a very interesting presentation on the Potsdam Meeting on the applicability of Raman Spectroscopy of organic matter in sediments but some years later he left organic petrography. These later associate members work turned from the petrography to other disciplines, but they still follow the activities of ICCP.

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INDIA'S CONTRIBUTION TO COAL PETROLOGY THROUGH ICCP

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The International Committee for Coal and Organic Petrology (ICCP) is a prestigious global organization dedicated to the scientific study of coal and organic materials. Established in 1953, ICCP's mission is to promote the advancement of knowledge in coal and organic petrology, establish standard methodologies, and facilitate international collaboration among scientists and industry experts. The committee's work encompasses a broad range of activities, including the classification of coals, the development of analytical techniques, and the fostering of a deeper understanding of organic materials in geological and industrial contexts.

Objectives and Functions of ICCP

- Standardize methods and terminology in coal and organic petrology
- Promote research and development in the field
- Facilitate the exchange of scientific knowledge and techniques among researchers globally
- Organize conferences, workshops, and training programs to disseminate the latest advancements
- Collaborate with other scientific organizations to address global coal and organic materials challenges

The ICCP operates through a structured framework of commissions and working groups, each focusing on specific aspects of coal and organic petrology, such as maceral and microlithotype analysis, vitrinite and bitumen reflectance measurements, applied coal and coke petrology, study on dispersed organic matter and coal chemistry. This structure allows for comprehensive field coverage and enables targeted research and development efforts.

Historical Significance and India's Alliance with ICCP

Since its inception, the ICCP has played a pivotal role in the evolution of coal and organic petrology. The committee's efforts have led to significant advancements in understanding coal properties, developing new analytical techniques, and establishing international standards. The ICCP has also been instrumental in addressing environmental concerns related to coal usage, contributing to cleaner and more efficient utilization of this vital resource. India has been an integral part of ICCP since its inception. Indian scientists like D. Bhardwaj, B. Mukherjee, and D. Chandra were present at the founding meeting in Geelen, 1953 (Figure 1), marking the beginning of a long-standing relationship between Indian organic petrologists and the ICCP. This early involvement underscores India's commitment to contributing to the global coal and organic petrology discourse.



Figure 1. 1st ICCP Meeting in Geleen, The Netherlands in June 1953. Second row third from the left D. Bhardwaj; third row second from the left B. Mukherjee, and fifth D. Chandra.

ICCP's Impact on Organic Petrology in India

The ICCP has significantly influenced the development of organic petrology in India. ICCP has facilitated the growth of this scientific discipline in India by providing a platform for standardization and international collaboration. Indian scientists have benefited from training programs, workshops, and conferences organized by the ICCP, enabling them to stay abreast of the latest developments and techniques in the field. The ICCP has significantly influenced the development of coal and organic petrology in India through:

- **Standardization:** By providing standardized methods and terminologies, the ICCP has ensured consistency and reliability in Indian coal research.
- **Training and Education:** The ICCP has organized numerous training programs and workshops, enabling Indian scientists to stay updated with the latest advancements and techniques.
- **Research Collaborations:** The committee has facilitated international collaborations, allowing Indian researchers to work alongside leading scientists worldwide.
- **Resource Development:** The establishment of well-equipped coal petrology laboratories in India, such as those at the Indian Institute of Technology (Indian School of Mines) Dhanbad, Banaras Hindu University, and Central Institute of Mining and Fuel Research, has been partly driven by ICCP's influence and support.

Contributions of Indian Organic Petrologists

The study of coal petrology in India began in the 1920s with initial thin-section analyses. The first microscopic examination of Indian coals was conducted by Lomax in 1911. However, it was Fox in 1926 who initiated

systematic petrographic studies. Significant progress occurred in the 1950s with the establishment of dedicated coal laboratories in leading institutions and universities across India. Since then, numerous researchers have made invaluable contributions to the field, advancing our understanding and application of coal petrology in India. Early work was led by Lahiri (1951), Lahiri and Basu (1952), and Chandra (1953, 1954, 1958, 1965). From 1958 to 2004, extensive studies by Pareek, H.S., and research by Mukherjee, B.C. from 1952 to 1976 further advanced the field. Collaborative efforts such as those by Lahiri and Bhattacharya (1961) and Pareek and Pandey (1971) also played a crucial role. The pivotal initiation of vitrinite reflectance studies by Chandra (1965) marked a significant milestone. Following the 1960s and 70s, the field continued to grow with substantial contributions from researchers who introduced new techniques and applications in coal petrology. Notable among these are Navale (1981), Navale et al. (1983), Navale and Mishra (1985), and Sen and Sen (1970, 1981). Singh and Singh's work in the mid-90s (1994, 1996) also added to the depth and breadth of coal petrology in India. These collective efforts have significantly strengthened the discipline and its applications in India. From early 2000 until recent times, Prof. A. K. Varma and his doctoral and masters students have contributed immensely to this field.

Some notable early pioneering contributors and their works include:

- Lahiri, K. C. and Basu, S. K. (1951, 1952) - Early pioneers in Indian coal geology.
- Chandra, D. (1953, 1954, 1958, 1965) - Initiated vitrinite reflectance studies of Indian coals.
- Pareek, H. S. (1958-2004) - Extensive research on Gondwana coal petrography.
- Mukherjee, B. C. (1952-1976) - Contributed to understanding coal characteristics.
- Late Prof. M. P. Singh (Figure 2) - Established the coal petrology lab at Banaras Hindu University and made momentous contributions to various aspects of coal petrology and organic geochemistry.
- Prof. A. K. Varma (1986-2024; Figure 3): Contributions to the coal and coke petrography and maceral reactivity.

Late Prof. Mahendra Pratap Singh (Figure 2) was a renowned coal petrologist whose impactful work significantly advanced national and international understanding of coal and organic petrology. Beginning his career in the late 1980s, he established a state-of-the-art coal petrology laboratory at Banaras Hindu University, positioning it as a hub for groundbreaking research. Prof. Singh's research spanned a broad spectrum, including the petrographic framework, surface microstructures, evolutionary trends, and maturation of organic matter and the mineralogy of Permian and Tertiary coals. His studies on source rock characteristics and hydrocarbon generation using fluorescence microscopy were particularly notable. A recipient of prestigious awards such as the Subrato Ghosh Award and Dr. J. Coggin Brown Memorial Gold Medal, Prof. Singh was also an active and dedicated member of the International Committee for Coal & Organic Petrology (ICCP). His allegiance to the ICCP was evident through his organization of numerous training programs and short courses aimed at industry professionals, enhancing the practical applications of coal petrology techniques. He made substantial contributions to the ICCP's standardization and international collaboration goals. His extensive research on Indian coal deposits, including those in Jammu & Kashmir (Singh and Singh, 1995), Rajmahal Basin (Singh and Singh, 1996), Meghalaya (Singh and Singh, 2000), Satpura Basin (Singh and Singh, 2004), Jharia coalfield, Vastan Lignite, and Sattupalli coalfield, resulted in a wealth of publications that continue to influence the field. Prof. Singh's legacy is marked by his dedication to advancing coal petrology and his contributions to fostering a global community of coal petrologists through the ICCP.

Prof. Prakash Kumar Singh, a distinguished faculty member at Banaras Hindu University, has over two decades of experience studying Tertiary and Gondwana coal deposits in India through advanced petrochemical techniques. His extensive research on various coal basins such as Rajmahal, Korba, Deoghar, Vastan (Singh et al., 2010), Sattupalli (Singh et al., 2012a), Rajpardi (Singh et al., 2012b), Tiru Valley (Singh et al., 2012c), Cambay, Barmer, and Saurashtra has significantly advanced the understanding of coal evolution, paleomire reconstruction, and source rock potential. Prof. Singh's innovative work includes using bacteria to remove hazardous trace metals and desulfurize coal, contributing to clean coal technology (Singh et al., 2012d). Recognized with numerous awards like the N.N. Chatterjee Award and Subrato Ghosh Award, he is an active member of the International Committee for Coal & Organic Petrology (ICCP) and other prestigious organizations, demonstrating his allegiance to advancing global standards and collaboration in coal petrology. His contributions continue to influence academic research and practical applications in the field.



Figure 2. Image of the audience in the 66th ICCP Meeting in Kolkata in 2014. Left first row: Late Prof. Mahendra Pratap Singh. Right: Dr. B.D. Singh and Prof. Alok Kumar Singh.

Prof. Atul Kumar Varma (Figure 3), currently associated with the Indian Institute of Technology, Indian School of Mines, Dhanbad, is a distinguished coal petrologist who is celebrated for his profound insights into various coal and lignite basins across India. Recognized for his remarkable achievements, the Government of India has honored him with the National Mineral Award in Coal and Lignite Exploration. Prof. Varma actively contributes to esteemed professional bodies worldwide, notably the International Committee for Coal & Organic Petrology, alongside memberships in The Society for Organic Petrology, Geological, Mining Metallurgical Society of India, Geological Society of India, and Journal of Indian Geological Congress. His involvement underscores his commitment to advancing the field nationally and internationally. His research encompasses extensive investigations into Permian coal deposits in regions like Raniganj (Varma, 1989), Barjora, Jharia, Bokaro, Auranga (Varma et al., 2018), Ib Valley (Varma et al., 2019), and Korba (Varma et al., 2013), focusing on petrochemical characterization, source rock potential, and paleoenvironmental settings (Varma, 1996b). His studies on individual macerals have also provided valuable insights into their behavior during industrial processes (Varma et al., 2014) such as coking and liquefaction (Varma, 1996a, 2002). Moreover, Prof. Varma's exploration extends to the source rock potential of Tertiary coal and lignite horizons in India, with notable contributions in Makum and Palana. His comprehensive work significantly enriches the global understanding and utilization of coal and lignite resources, showcasing his dedication to national and international scientific endeavors.



Figure 3. Images of the 73rd ICCP Meeting in New Delhi in 2022. Left: Dr. Prabal Boral, Dr. Santanu Ghosh, Prof. Joan Esterle, Dr. Ashok Singh, and Prof. Atul Kumar Varma; Right: Prof. Joan Esterle in a discussion session with Dr. R.P. Mathews, Dr. Rashmi Singh, Dr. Santanu Ghosh, Ms. Rimpy Chetia, and other students.

Dr. Bhagwan Das Singh, also known as Dr. B.D. Singh (Figure 2), a recently retired Scientist-F from the Birbal Sahni Institute of Palaeosciences, is a respected figure in the field of coal petrology. With a focus on various

coal and lignite basins in India, his expertise lies in the characterization of organic micro constituents under reflected and UV light (Singh, 1995), along with palynological studies of organic sediments. Currently, Dr. Singh is engaged in research concerning the petrographic characterization and dispersed organic matter of lignite and associated sediments in western India, specifically Gujarat, and Rajasthan, with a particular emphasis on economic and hydrocarbon prospects. His extensive work includes thorough exploration and analysis of Tertiary lignites across India (Singh and Navale, 1989). This includes research on the Neyveli lignite field in the Cauvery basin, the Panandhro and Matanomadh lignite fields in the Kutch basin, the Khadsaliya and Surkha lignite fields in Saurashtra, and the Tadkeshwar, Vastan, Valia, and Mangrol lignite fields in the Cambay basins. Additionally, he has contributed to research on the Bikaner-Nagaur basin of Rajasthan. Furthermore, Dr. Singh has made notable contributions to exploring Gondwana coal deposits in India, including the Auranga basin and the south Karanpura coalfield. His extensive research and contributions significantly advance the understanding of coal and lignite resources in India.

Prof. Alok Kumar Singh (Figure 2), also known as Dr. A.K. Singh, has dedicated the past 25 years to studying the petrological and geochemical aspects and the evolutionary patterns of India's Gondwana and Tertiary coals and lignites. His extensive research has made significant scientific contributions to Coal Geology, Coal & Organic Petrology, and coal chemistry, particularly in Biomarker Studies. The publication of over 60 research articles underscores Dr. Singh's expertise and profound understanding of the subject and its associated challenges. His application of coal microscopy has been instrumental in studying the liberation behavior of mineral matter from organic material and addressing issues related to the floatability of coal particles in flotation cells within coal beneficiation plants. Dr. Singh's research has garnered recognition from both national and international earth scientists, earning him several prestigious awards, including the Subrato Ghosh Coal Petrology Award, H S Pareek Award, the Young Scientist Award by the Indian Science Congress Association, and the Khare Award for the best paper by the Indian Institute of Mineral Engineers. Additionally, his nomination for full membership in the International Committee of Coal & Organic Petrology reflects his standing in the field. His primary research focus lies in exploring India's Tertiary coal and lignite deposits, emphasizing their source rock potential, utilization prospects, and the paleomire settings of the basin using petrochemical tools. Dr. Singh has extensively researched Tertiary lignite deposits in Rajasthan (Singh and Kumar, 2017, 2020) and coal deposits in Northeast India (Singh 2015, 2016). Furthermore, he has explored and studied Gondwana coals' petrological and geochemical characteristics in various basins, including the Godavari Basin, Mahanadi Basin, Damodar Basin, and Son Valley.

Dr. Bodhisatwa Hazra's research focuses on the geochemical and petrophysical characterization of shale and coal reservoirs using a multi-faceted approach, including organic petrology, pyrolysis, gas adsorption, infrared spectroscopy, and scanning electron microscopy (Hazra et al., 2015). His doctoral thesis identified type I kerogen in shales from India's Barren Measures Formation and highlighted the varied behavior of macerals in shale based on hydrogen content (Hazra et al., 2023). He also addressed source-rock classification fallacies and reconstructed the original source-rock potential of coals and shales (Hazra et al., 2019). His work on gas adsorption emphasized the role of inorganic matter, maceral type, and maturity. At CSIR-CIMFR, Dr. Hazra's contributions include optimizing metallurgical coal preparation and blending weak-coking with non-coking coals. Recently, he pioneered optical-electron correlative microscopy for dispersed organic matter in shales in India, significantly advancing the understanding of organic porosity and hydrocarbon estimation.

Dr. Santanu Ghosh (Figure 3): Dr. Santanu Ghosh's journey in coal geology and organic petrology is impressive. His PhD under Prof. Atul Kumar Varma and subsequent training at the University of Queensland with Prof. Joan Esterle laid a strong foundation. Dr. Ghosh's novel investigations into the vitrinite reflectance anisotropy of Anthracite A coals from the Himalayan Fold-Thrust Belts of Sikkim (Ghosh et al., 2018, 2022), India, demonstrate his expertise in employing advanced techniques like Reflectance Indicating Surface characteristics (Ghosh et al., 2020). He revealed that the Sikkim coals were on the verge of pregraphitization as reflected by the maximum reflectance axis values (R_{MAX}). Further, the R_{MAX}, R_{INT}, R_{MIN} axes, and R_{st} parameters suggested a biaxial negative optical sign of the vitrinite grains typically found in tectonically deformed regions. The bireflectance values further advocated a fascinating response of coal microstructure to severe Himalayan orogeny. His classification of microlithotypes based on optical appearances (slightly modifying after ISO, 2017) adds a nuanced understanding to the characterization of these coals Ghosh et al., 2018). In a nutshell, Dr. Ghosh introduced comprehensive anthracite petrography and vitrinite reflectance anisotropy in high-rank coals from India. Dr. Ghosh actively participates in international conferences and working groups. He has bagged Best PhD Thesis awards at department and institute levels from IIT (ISM) Dhanbad in 2022 and 'Young Scientist' National Award in the 'Earth System Science' section from the Indian Science Congress Association (ISCA, DST, GOI) in 2023 for his

tremendous contributions in organic petrology and geochemistry. Currently an assistant professor at Mizoram University, he continues to advance research and teach in fuel geology and organic petrology.

Dr. Alok Kumar, a coal petrologist, is based at the Department of Geology, Banaras Hindu University, Varanasi, India. He has extensively studied lignite, coal, and shale-bearing horizons in India and organic-rich rocks from Nigeria, Brunei, Australia, Malaysia, Thailand, Pakistan, and Yemen. He has trained officials from ArcelorMittal and foreign PhD students and researchers in organic petrology. His projects on coal characterization are funded by the Department of Science and Technology, Government of India, and Coal India Limited. He has received fellowships from the University of Malaya and the Science and Engineering Research Board for postdoctoral research. Dr. Kumar has investigated the Tertiary lignite deposits of Rajasthan and the Paleogene shale layers associated with these lignites for their hydrocarbon potential and paleoenvironmental settings (Kumar et al., 2022, 2024). He was the first to study the liquefaction behavior of Indian lignite based on petrographic constituents. His research also includes the Tertiary coal deposits of Meghalaya for source rock characterization and the Permian coal deposits of India for rare earth element extraction and paleoenvironmental analysis. Additionally, he has contributed to research on the bacterial desulfurization of coal. Dr. Kumar actively participates in the ICCP Accreditation Program organized by the International Committee for Coal and Organic Petrology.



Figure 4. Dr. Ashok Kumar Singh as Chair of the 73rd ICCP Meeting in New Delhi in 2022 welcoming the audience to the cultural night. Right: End of the party.

Furthermore, numerous researchers from India have delved into various aspects of Indian coal and lignite deposits utilizing advanced techniques. While they may not specialize in coal petrology, their significant contributions have enriched the field of coal geology. Among the esteemed researchers currently active in this domain are:

- **Dr. Ashok Kumar Singh** (Figure 3 and 4; Chief Scientist, CSIR-Central Institute of Mining and Fuel Research, Dhanbad)
- **Prof. Suryendu Dutta** (Professor, Department of Earth Sciences, IIT Bombay, India)
- **Dr. Vinod Atmaram Mendhe** (Principal Scientist, CSIR-Central Institute of Mining and Fuel Research, Dhanbad)
- **Dr. Binoy K. Saikia** (Senior Scientist, CSIR-North East Institute of Science & Technology)
- **Dr. Runcie P. Mathews** (Figure 3; Scientist, Birbal Sahni Institute of Palaeosciences)
- **Dr. Amiya Shankar Naik** (Associate Professor, Banaras Hindu University)
- **Dr. Sarat Phukan** (Associate Professor, Gauhati University)
- **Dr. Divya Kumari Mishra** (Scientist, Birbal Sahni Institute of Palaeosciences)
- **Dr. Subhashree Mishra** (Scientist, National Institute of Oceanography, Goa)
- **Dr. Suresh Kumar Samad** (Assistant Professor, Ranchi University)
- **Dr. Satabdi Misra** (Postdoctoral Fellow, National Taiwan University)
- **Dr. Balram Tiwari** (Postdoctoral Fellow, IISER Bhopal)
- **Dr. Sanki Biswas** (Postdoctoral Fellow, University of Johannesburg, South Africa)

- **Dr. Dinesh Kumar** (Assistant professor, Rajasthan technical University, India)
- **Dr. Susheel Kumar** (Associate professor, Jawaharlal Nehru University, New Delhi, India)
- **Mr. Tushar Adsul** (PhD Researcher, IIT (ISM) Dhanbad, India; Colin Ward Emerging Student Researcher Awardee, 2023)
- **Ms. Archchi Sarkar** (PhD Researcher, PDPU, Gandhinagar, India; Colin Ward Emerging Student Researcher Awardee, 2024)

While not solely focused on coal petrology, these individuals have made significant strides in advancing our understanding of coal geology through their dedicated research efforts.

Prominent Coal Petrology Laboratories in India

Several prominent coal petrology laboratories have been established in India, contributing to the global knowledge base (Figure 5):



Figure 5. Stars mark the location of the main coal petrology laboratories in India.

- **Indian Institute of Technology (Indian School of Mines)-Dhanbad:** A leading mining and coal research institution.
- **Central Institute of Mining and Fuel Research (Dhanbad):** Focuses on applied research in mining and fuel utilization.
- **Banaras Hindu University (Varanasi):** Known for its advanced research in coal petrography.
- **Rajiv Gandhi Institute of Petroleum Technology (Amethi):** Specializes in petroleum technology and related fields.
- **Birbal Sahni Institute of Palaeosciences (Lucknow):** Renowned for its paleosciences and coal petrology work.
- **Geological Survey of India (Kolkata, West Bengal):** Engages research in organic petrography of coals and shales.

- **National Metallurgical Laboratory (Jamshedpur):** Engages in metallurgy and material sciences research.
- **Tata Steel (R&D Division, Jamshedpur):** Conducts applied research in coal and materials science. Tata has been institutional member of the ICCP for many years with Dr. Rashmi Singh as representative (Figure 3).
- **Central Mine Planning & Design Institute Limited (Ranchi):** Focuses on coal petrology.



Figure 6. Group photo of the 66th ICCP Meeting in Kolkata in 2014.

Current ICCP Membership and Activities in India

India currently has a robust presence in the ICCP, with 15 active members from various prestigious institutions. These members actively participate in ICCP's commissions and working groups, contributing to ongoing research and development in coal and organic petrology. Their involvement ensures that India remains at the forefront of scientific advancements in this field (Figure 5).

Conclusion

The International Committee for Coal and Organic Petrology (ICCP) has been a cornerstone in advancing coal and organic petrology worldwide. India's alliance with ICCP has been mutually beneficial, with Indian scientists making significant contributions to the field and the ICCP providing valuable support and collaboration opportunities. As the ICCP celebrates its 75th meeting, the continued partnership with Indian researchers promises to enrich the global understanding of coal and organic materials, driving innovation and sustainable practices in this crucial study area.

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THE ICCP AND ORGANIC PETROLOGY IN KURDISTAN (IRAQ)

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A department for Organic Petrology has been established in the Kurdistan Institution for Strategic Studies and Scientific Research (KISSR). The head of the department was Prof. Polla Khanaqa, and also the president of the Institution until the end of April 2024. The department also includes Prof. Karwan Qaradaxi, who, like Khanaqa, completed his studies in Göttingen and a total of 7 geologists work there. Prof. Khanaqa is member of the ICCP since 2012 and he has attended regularly the annual meetings.

The organic petrology and geochemistry laboratory in KISSR is well-equipped for both microscopy studies with a total of three petrographic microscopes (two Leica DM 6000 and one DM 1000) and geochemical studies with a GC-MS Triple Quad., Leco and Rock-Eval, which are used for organic geochemical work.



Figure 1. Left Polla Khanaqa and Stavros Kalaitzidis at KISSR; Right Peter Crosdale in Bazar of Sulaimania during the first visit of ICCP members to Sulaimania in 2015.

Most of the projects currently running are in the field of organic geochemistry, especially on Jurassic and Tertiary formations, and most of the publications incorporate combination of organic petrology and organic geochemistry studies (Abdula, 2015, 2017; Mohialdeen et al., 2022, 2024).

Prof. Polla Khanaqa invited formally ICCP to held a Meeting in Sulaimani in 2013 to the earliest convenience. A initial date was proposed in 2015, which had to be postponed because of the war situation in Iraq and was re-scheduled for 2019. Although a general meeting could not be hold in Sulaimani in 2015 a group of ICCP members (Figure 1) travelled to the planned venue and carried out many interesting excursions with KISSR

colleagues (Figure 2). This was the beginning of a fruitful cooperation with German and Greek ICCP members who have visited Iraq a number of times. These projects have focused on the source and reservoir Mesozoic rocks (Kus et al., 2016; Damolianou et al, 2020, 2022; Abdula et al., 2020) and associated mineralizations (Pirouei et al., 2020).



Figure 2. From left to right: Peter Crosdale (AU), Dirk Prinz (DE), Polla Khanaqa (IQ), Stavros Kalaitzidis (GR), Antonis Bouzinos (GR) in Dokan lake during the first visit of ICCP members to Sulaimania in 2015.

Unfortunately, the political situation did not allow the 2019 annual ICCP meeting to be organized in Kurdistan as it was scheduled despite the repeated invitations of the Kurdish organizing committee. Since then the participation of Kurdish members in the annual meetings has increased and it is planed that three colleagues will attend the 2024 ICCP Meeting in Oviedo. until last year (ISSIS), although several times the Kurdish team has welcomed the meeting very much. It is expected that this year three people from Kurdistan will attend the meeting in Oviedo, Spain.

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CONTRIBUTIONS TO ORGANIC PETROGRAPHY FROM MEXICO

Genaro de la Rosa-Rodriguez [1], Juan Josué Enciso-Cardenas [1], Luis Fernando Camacho-Ortegón [1], Eduardo González-Partida [2], Yuriko Yarel Bueno-Yamamoto [1]

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We extend our sincere gratefulness to the honorable committee of the ICCP for the excellent tribute to the 75th anniversary of the contributions of organic petrography of coal and dispersed organic matter worldwide. Mexico, in particular, has nowadays one member in the ICCP, Genaro de la Rosa Rodriguez after the sad and unexpected loss of Noe Piedad Sánchez (Obituary in ICCP News 87, 2023) who was member since 2008 (Figure 1). This contribution highlights the research performed through the development of academic and government projects, and the international relationships with the ICCP members.



Figure 1. Noe Piedad Sánchez at his first ICCP Meeting in Oviedo, Spain, 2008.

Historical background of organic petrography in Mexico

The main coal deposits in Mexico are located in three main regions, in order of importance, in the states of Coahuila, Sonora and Oaxaca, where the study of organic petrography has contributed to the analysis and understanding of the geological study of these deposits. This paper describes the most relevant contributions and outstanding works in organic petrography.

In 1982, Obregón-Andría made one of the first studies in Mexican coals to establish a correlation between programmed pyrolysis and organic petrography to determine the evolution of coal, highlighting that there is a very good correlation, but with two limitations: it does not apply to highly evolved coals (T_{max} > 550 °C) and

for a given maximum temperature (T_{max}) there may be different reflectance values. In the same year, the state-owned company Comisión Federal de Electricidad (CFE) began the geological exploration of coal in the Cabullona Basin located in the state of Sonora, establishing by physical-chemical analysis characterization, good thermal qualities and coal classification, in the sub-bituminous range validated by organic petrography with reflectance values from 0.42 to 0.55 % (Yza, 1982).

In 1985, Obregón-Andría and Muñoz-Loredo, by employing organic petrography, established regional geothermal gradients, determining the maximum temperature to which the coal was subjected to reach its current evolution and the eroded thickness of the sediments in order to determine the maximum burial of the organic matter that gave rise to the coal in the Fuentes Rio Escondido and Sabinas Basins in the state of Coahuila. In the present work, a geothermal gradient of 2.8 °C/100 m, a maximum temperature of 50 to 67 °C and a burial of 1290 m was determined for the Fuentes Rio Escondido Basin, while in the Sabinas Basin 3.05 °C/100m geothermal gradient. 95 to 120 °C maximum temperature and a burial of 3390 m.

In 1987, Obregón-Andría and Arriaga-Arredondo, carried out petrographic analysis on samples of outcrops in the Cabullona and Barranca region to extend the study of characterization and classification of coal in the state of Sonora. Classifying the coal in a hypo-bituminous range with vitrinite reflectance ranging from 0.60 to 0.87 % and vitrinite content greater than 65 %.

In 1994, the Consejo de Recursos Minerales (COREMI), performed an evaluation of the coal reserves in the Fuentes Rio Escondido Basin in the state of Coahuila and classified the coal as bituminous vitric with values of 0.58 % vitrinite reflectance and 78.35 % vitrinite content.

Since the 60's, organic petrography has acquired an important international relevance in the petroleum industry, due to its remarkable application in the interpretation and compression of the thermal maturity of organic matter in petroleum systems, and in Mexico this contribution has been adopted, highlighting important scientific works described below.

In 2000, Santamaria-Orozco in his doctoral thesis, conducted geochemical and petrographic characterization work in the Campeche sounding to evaluate the hydrocarbon generation potential in the Tithonian source rock, highlighting a wide range of maturity, from immature to overmature with vitrinite reflectance values from 0.35 to 1.29 %.

In 2004, Noe Piedad Sánchez presented the first studies of the chemical and mineral composition of coal, including the geochemical characteristics of organic matter in two sedimentary basins: the Central Coal Basin of Asturias (Spain) and the Sabinas-Piedras Negras Basin (Mexico), with the intention of establishing the thermal history and evolution of organic matter through 1D modeling (Piedad et al., 2004).

In 2006, Gentzis et al, conducted an organic petrography study in an underground mine in the Sabinas sub-basin (state of Coahuila), highlighting an average desorbed gas content greater than 9.0 cm^3/g in bituminous coal of medium volatility, with a value of 1.30 % vitrinite reflectance and vitrinite content of greater than 86 %.

In 2008, Alsaab et al, made a comparison of the hydrocarbon production capacity of coals from the Donets Basin (Ukraine) and Sabinas Basin (Mexico). In this work they reported values of 0.92 % vitrinite reflectance and 84 % vitrinite content for Sabinas Basin coal, observing a linear relationship between methane generation and maturity level (% R_o) for Donets and Sabinas coals.

In 2009, Camacho Ortegón, in his doctoral thesis, carried out an extensive geochemical and petrographic characterization work to establish the thermokinetic parameters in 1D-2D and 3D numerical modeling with Petromod software, which allow calibrating and defining the behavior of the petroleum system, its evolution and the relationship with hydrocarbon generation in the Sabinas Basin.

In 2010 and **2012,** two intensive courses on organic petrology combining theory and practical training were taught at the High School of Engineering "Lic. Adolfo López Mateos" of the Autonomous University of Coahuila in Nueva Rosita by personnel from the Instituto de Ciencia y Tecnología del Carbono (INCAR-CSIC) in Oviedo. Both Angeles G. Borrego and José Ramón Montes were the ICCP Members teaching the course and strengthening the relationships between both institutions through the ICCP **(Figure 2).**

In 2013, De la O-Burrola in his doctoral thesis work, did a complementary work of petrographic and geochemical characterization in the coal sub-basins in the state of Coahuila, in which he reports reflectance values from 0.80 to 1.5 %, suggesting the generation window of oil and wet gas to condensate in which additionally the potential generator and methane gas resources are estimated by 1D and 2D modeling with Petromod software. The same year, Salas-Gutiérrez, carried out a petrographic study of vitrinite reflectance, mineral composition and paleoenvironmental indexes in coal beds in the southern part of the Sabinas sub-basin, which suggest a classification of coal of medium volatile bituminous rank for its reflectance values between 0.90 to 1.30 %, establishing a marshy environment with moderate to high flooding composed mainly of terrestrial plants for its vitrinite content of 87 to 97 %.



Figure 2. Students and trainers of the 1st course on organic petrology given by José Ramón Montes Sánchez (1st from the right) and Angeles G. Borrego (7th from the right) from INCAR-CSIC Oviedo at the Escuela Superior de Ingeniería Lic. Adolfo López Mateos (University of Coahuila), Nueva Rosita, Mexico. Second from the right Luis Fernando Camacho Ortegón (Director).

In 2015, Enciso-Cárdenas, in his doctoral thesis, implemented the first organic petrography study to correlate the parameters of thermal maturation and mineral content with the behavior of methane gas adsorption/desorption capacity in coal samples from the Sabinas Basin, using Langmuir isotherms by the thermo-volumetric method. In this study, it was verified that the amount of methane gas adsorbed increases in coals with a high maturation range and vitrinite content, while the lowest amounts of gas adsorption occur in samples with higher inertinite and mineral matter content.

In 2020, Gonzalez-Betancourt et al, studied the diagenesis and thermal markers of the Eagle Ford Fm. in the Sabinas Basin and southern Texas (U.S.A.), which, by using a correlation of stratigraphic columns, reported vitrinite reflectance values from 0.5 to 1.88 %, indicating a zone of oil generation to the zone of wet gas generation, which is in agreement with the thermal variability of the results obtained from fluid inclusions analysis.

In 2021, Enciso-Cárdenas et al. carried out an evaluation of the hydrocarbon generating potential in the Eagle Ford Fm. in the Sabinas Basin, where they reported two types of bitumen with equivalent vitrinite reflectance values of 1.61 and 2.76 % indicating an overmature stage of organic matter and depletion in the hydrocarbon generating capacity in the central zone of the basin.

In 2022, Camacho Ortegón et al. performed a 1D modeling work using vitrinite reflectance values as the main kinetic parameter of maturity, to calibrate the thermal history, heat flow and erosion in nine exploratory wells in the Sabinas-Piedras Negras Basin, in which two thermal anomalies are established, one of them corresponding to burial and the other associated to a thermal event.

In 2023, Gil-Bernal, in his master's thesis, conducted an evaluation of the hydrocarbon generating potential in core samples from the Eagle Ford Fm. in the Sabinas Basin, in which he reported two types of bitumen with equivalent vitrinite reflectance values, where bitumen 1 varies between 1.22 and 1.69 %, while bitumen 2 presents values between 2.05 and 2.49 % suggesting the wet-to-dry gas generation window.

In general, it can be concluded that organic petrography in Mexico represents an important scientific resource that allows us to dimension the context of the different geological provinces, helping to understand their thermal evolution and the processes that influence the maturation of the organic matter of fossil resources for both the mining and petroleum industries.

Development Genaro de la Rosa Rodríguez as a petrographer

In 2009, M.Sc. Genaro de la Rosa Rodriguez began his experience in Field Geology (Figure 3A) and Organic Petrography at the Chihuahua Experimental Center of the Servicio Geológico Mexicano (SGM), conducting studies in the Coal-Associated Gas and source rocks project in different basins of northern and southern Mexico. By 2012, he enrolled in the ICCP Accreditation Programs: Single Coal (SCAP), Coal Blends (CBAP) and Dispersed Organic Matter Vitrinite Reflectance Measurements (DOMVR). The same year, he joined the *Round Robin Exercise for ASTM D7708 test method for dispersed vitrinite reflectance* organized by Paul Hackley (Hackley et al., 2015). In 2013 and 2015, he made presentations at international congresses on paleoenvironmental indexes and petrographic characteristics in the coal of the Ojinaga sub-basin in the state of Chihuahua.

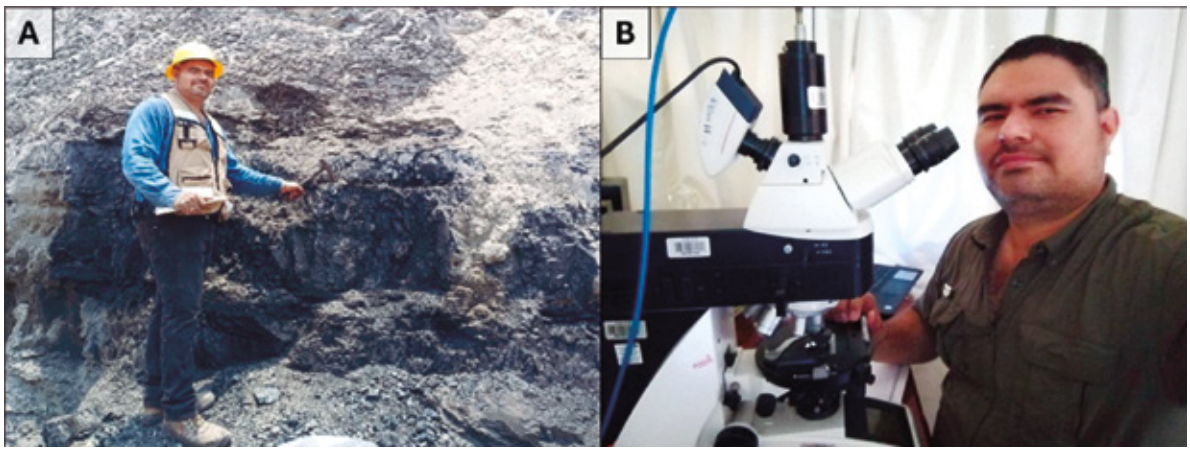

Figure 3. A) Bituminous coal bed (1.40 m) of Olmos Fm. (Maastrichtian) in open-pit mine, Saltillito-Lampacitos sub-basin in northeastern Mexico. B) Petrographer Genaro de la Rosa Rodríguez with Leica DM4500P optical microscope for organic petrography studies at the Universidad Autónoma de Coahuila (UAdeC) in Mexico.

Since 2019 he has actively collaborated in the development of bachelor, master and doctoral theses, by studying organic petrography (Figure 3B) in dispersed organic matter particularly the La Casita Fm. (Kimmeridgian-Tithonian), La Peña Fm. (Aptian) and Eagle Ford Fm. (Cenomanian-Turonian) and in the coal of the Olmos Fm. (Maastrichtian), with the purpose of conducting academic research applied to the evaluation of thermal maturity, hydrocarbon generating potential, its relationship with the depositional environment and the study of methane gas and carbon dioxide sorption in coal.

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THE ICCP AND MOZAMBIQUE

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In 1980, after being released by my university (Eduardo Mondlane University - UEM) from management duties at the then Faculty of Geology and considering that the coal sector was regarded as a priority in the Mozambique government's programs, I decided that I would continue my studies in the coal field. In this sense, I started a full-time internship at the then State Secretariat for Coal and Hydrocarbons, where I had the opportunity to visit the Moatize coal mines in the province of Tete, in the northeast of the country, as well as some coal basins in that same province.

In 1982, UEM decided that I should do my PhD with the German Democratic Republic, in a sandwich model, having been at the Bergakademie Freiberg for 1 year, starting work on the Mucanha-Vúzi Coal Basin (Tete Province). Unfortunately, the program had to be interrupted because the work area was affected by the civil war, making it impossible to carry out field work.

I remained linked to the coal sector and in 1988 I organised a 7-day course on Gondwana coals at my university taught by Professor Manuel João de Lemos de Sousa.

In 1988, I participated in the 41st ICCP in Aachen (Germany), where I met several coal petrographers from various parts of the world, where the topics discussed further awakened my interest in the problems of coal petrology. And I ended up going to the Department of Geology at the University of Porto (Portugal) in 1990, having defended my thesis in 1995, entitled Contribution to the Knowledge of Moatize Coals, Moatize Coal Basin, Tete Province, Mozambique.

The stay at the University of Porto was a time of great scientific activity for the Organic Petrology group. It was a moment of great friendship, solidarity and a spirit of mutual help that I had never experienced. During my stay in Porto, I was accepted as Associate Member of the ICCP at the Porto Alegre meeting (1991), and I participated in the Oviedo meeting in 1994, where I was accepted as a Full Member.

After returning to Mozambique in 1995, I had the opportunity to participate in almost all ICCP meetings until 2015 (missing 1995 and 2016), after which several contingencies prevented me from continuing to participate, to my great regret, especially because these meetings gave me the opportunity to visit amazing places, as well as the spirit of good camaraderie between ICCP members was always fantastic. Of course, and no less important, the scientific aspect of the sessions.

The idea of organising an ICCP Meeting in Mozambique came up at the New Zealand meeting (1997), in which several delegates showed the interest in Mozambique organising such an event. This interest came from the fact that Mozambique was going through a very large development of the coal sector at the time, with investments in the coal basins of the north-eastern province of Tete.

After returning to Mozambique, I contacted the Rector of Eduardo Mondlane University (UEM), who promptly welcomed the proposal. Thus, at the Porto Meeting (1998), I presented in writing to the ICCP the invitation to hold the event in Mozambique in 2002.

At the Bucharest meeting (1999), Ricky Pinheiro also presented in writing the proposal to hold the 2002 meeting in South Africa. The decision on the location was postponed until the following meeting in Rio de Janeiro (2000). After the Bucharest meeting, Lopo Vasconcelos and Ricky Pinheiro got in touch with each other and decided to present a proposal for a joint meeting Mozambique-South Africa, that was presented at the meeting in Rio de Janeiro (2000), with two organizational options. During this meeting, the ICCP accepted the joint organization, leaving the decision on which option to choose for the 2001 meeting in Copenhagen.

Thus, during this meeting, the option of organising the event was approved, which, for the first time in the history of the ICCP, would be organised in Africa, on the one hand, and on the other, in two different countries, requiring a cross-border organization, with logistics beyond complicated from every point of view. And within a timeframe of 1 year!

My activities at ICCP refer to two aspects:

a) proposal (accepted) to create a Working Group on Temporal Variations in World Coals, and
b) Vice-Presidency of the ICCP.

The Working Group's proposal arose from a survey of coal petrography data from around the world, carried out during my stay at the University of Porto, at the request of Professor M.J. Lemos de Sousa, the results of which he presented at the meeting in Porto Alegre in 1991. This survey collected, at the time, 4381 data. Over the years I collected more data and at the time of the proposal presented in 2000 in Rio de Janeiro, I had collected 6800 data. I kept on continuing to collect information, having received data from some ICCP members, stopping in 2020. We managed to create THE ICCP DATABANK ON PETROGRAPHY OF WORLD COALS, with a total of 17,551 data. This databank is available at the ICCP website.

At the closing General Assembly of the ICCP – South Africa part, I was proposed to Vice-President of the ICCP. During 2002-2003 elections for several positions took place, and I won the Vice-Presidency, having started functions at the ICCP in 2003 (Utrecht) and finished at the ICCP in Porto 2011.

One aspect that worried me at the time was that the position of Vice-President did not have specific tasks defined in the Statutes, other than replacing the President in the event of his impediment. In other words, it was a more decorative role than an executive-operational one. And that didn't interest me!! This led to the need to review the ICCP Statutes and it was up to me to initiate the process, a matter that was dragged on for a long time and has not yet reached an outcome. There were contributions from several members and a summary document was produced and submitted to the Council.

But the main activity that gave me a lot of satisfaction as Vice-President was launching the organization of the ICCP Training Courses, which seemed to be a very complicated task, as the ICCP does not have fixed headquarters, its members are spread across the world and coordinating all these people was a complicated task. During my Vice-Presidency, I had the task of organising 4 Training Courses: 2 in Potsdam (2009, 2010), 1 in Johannesburg (2011) and 1 in Porto (2011). I will not focus on this subject, as there is a chapter in this book that deals with Training Courses.

The ICCP held in Mozambique

I will now talk a little about ICCP Mozambique. In Newsletter nr. 27 November 2002, there is a text about ICCP Africa written by an anonymous author who attended the meeting, entitled: *ICCP 2002 - the inside story.* Very friendly and enjoyable text to read. And also ego-boosting!

An organising committee was created with two bodies, one in Mozambique and the other in South Africa, to carry out this herculean task, led respectively by Lopo Vasconcelos and Ricky Pinheiro. The two leaders met three times in Nelspruit (South Africa) to coordinate the activities to be implemented. In Mozambique, the organisation of the event was under the responsibility of UEM, and in South Africa there was a joint organization of CMT (Coal and Mineral Technologies), SABS (South African Bureau of Standards), SASOL and AfriOre Ltd. **(Figure 1).**

On the Mozambican side, the company AGENTZ Lda. **(Figure 1)** was hired to support the Organising Committee in dealing with hotels, immigration, customs, transports, catering and others. This company proved to be of extraordinary help in all this process.



Figure 1. Left: Logos of the organising entities in Mozambique and South Africa. Right: Logo of the company AGENTZ Lda.

Since the organization in the South African part is being reported by Nikki Wagner, I will restrict myself to the Mozambican part of the organization, with some reference to South Africa, when needed.

In Mozambique, the Organising Committee was composed by Lopo Vasconcelos (chair), João Mugabe and Humberto Saeze, all three staff members of UEM, and Nelson Ocuane, from the National Directorate of Coal and Hydrocarbons **(Figure 2).** Together with José Esmael (chair of AGENTZ Lda.) and his staff, we set to work to organise the event as best as we could and find the necessary sponsors.

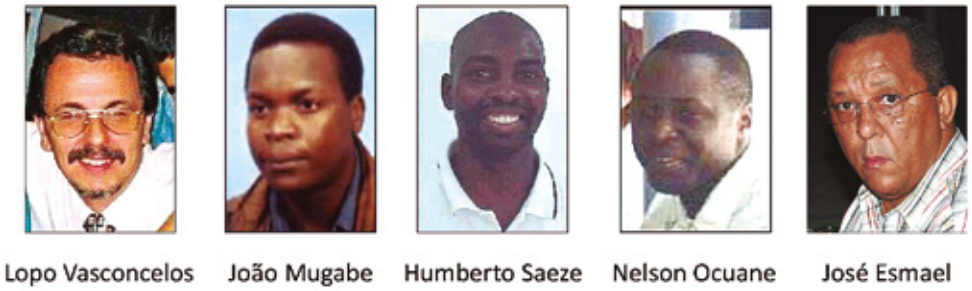

Figure 2. Members of the Organising Committee of the Mozambican side.

The support we had from various official bodies, such as the Rector of UEM and the Minister of Mineral Resources and Energy of Mozambique, was very important, as this support opened doors for us to obtain the necessary sponsorship, which came from the University itself, Petromoc, Mining Development Fund, Rio Tinto, Sasol Petroleum Temane-National Directorate of Coal and Hydrocarbons and Ernst & Young. Other organizations provided support in infrastructure and equipment, stationary, transport, maps, among others. The meeting was organised to give delegates not only a solid and interesting scientific program, but also to provide them with a tropical atmosphere including Mozambican culture and gastronomy.

And so, we started with an Ice Break Party at the Fortress of Our Lady of Conception **(Figure 3),** located at the place where the city of Lourenço Marques (colonial name of Maputo) started and spread around the region. Delegates were welcomed by the Director of the Fortress, Dr. Maria Inês N. Costa, who explained the history of the building. Guests had the chance to taste some delicacies of the local cuisine.



Figure 3. Ice Break Party. Left: Alan Cook, Lopo Vasconcelos and Ricky Pinheiro; Right: Several delegates enjoying the evening with a drink and traditional snacks.

Around 40 people from 16 countries attended the meeting in Mozambique/South Africa. The opening ceremony took place in the amphitheatre of the Faculty of Medicine of UEM and was chaired by the Minister of Mineral Resources and Energy, Mr. Castigo Langa, and co-chaired by the Rector of UEM, Prof. Brazão Mazula, and the National Director of Coal and Hydrocarbon, Mr. Arsénio Mabote, who gave a presentation about the coal and hydrocarbon industry in Mozambique.

The meeting went on with the General Assembly, followed by the meeting of Commission I, that lasted for 2 full days **(Figure 4).** The normal poster session for any ICCP meeting took place in Maputo, with the presentation of 12 posters, from which a small brochure was prepared and delivered to the delegates.



Figure 4. Top Left: Open Ceremony; Top right: Comission I Meeting; Bottom Left: Poster session; Bottom Right: Matola Coal Terminal.



Figure 5. Gala Dinner at Kaya Kwanga. Top Left: The Lusophone connection!; Top Right:Performance of the MIDZI Group; Bottom Left: Dancing delegates!I; Bottom Right: Carlos and Zaida Chongo.

In addition to this brochure, two others were prepared, one with detailed information on the two countries, and the other with an excursion guide for the Maputo-Pretoria trip. Our colleague Harold Read from Australia managed to bring with him a portable microscope, so it was possible do have a microscopy session in Maputo.

At the end of the second day there was a Gala Dinner at the Kaya Kwanga facilities **(Figure 5),** next to Maputo beach, where delegates were able to see a show of traditional Mozambican music and dances by the Group MIDZI. Guests had a lot of fun when invited to dance with the members of the group. There was also a performance by the musical group of Carlos and Zaida Chongo, who performed songs written by them.

The next day we got ready to depart to South Africa for the remaining meeting activities of Commission II and III in Berg-en-dal (Kruger Park) and Pretoria, respectively. But we made a stop at the Matola Coal Terminal, at the outskirts of Maputo **(Figure 4).** And to finalise, we headed first for a lunch at Quinta Jazz **(Figure 6),** in the middle of the bush in Matola area. And so was the first African ICCP, on the Mozambican side!!



Figure 6. Family photo at Quinta Jazz prior to departure to South Africa.

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A KIWI PERSPECTIVE ON THE ICCP

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New Zealand's relatively late start in coal petrography corresponded with nationwide drilling and analysis programmes during the Government funded Coal Resources Survey. This began during the global oil crises of the 1970's, prompted by New Zealand's vulnerability to energy shortages. New Zealand coals were popularly believed to be almost 100 % vitrinite and featureless in outcrop and drillcore. Although there were doubts that such enigmatic coals would provide much of petrographic interest, Pat Suggate's innovative work on the chemical diversity of isorank 'serial' plies inspired an approach that ensured petrography was applied very successfully in New Zealand.

Coal petrography commenced almost simultaneously at two universities in New Zealand. Professor Philippa Black at Auckland University embarked in 1978 on a major chemical and petrographic investigation of 172 coals from coal mines and drillholes all over the country. The acknowledgments in her resulting report list many familiar names among the coal scientists that provided training and interpretive assistance during a sabbatical in Germany. Notable ICCP members Marlies Teichmuller and Monica Wolf are included. Claus Diessel is mentioned as the person who first introduced Philippa, a hard rock petrologist, to the idea that coal was more than 'dirty black stuff that burned'. While active in the ICCP Philippa made a significant contribution to the Working Group on Brown Coal Lithotypes. Peter Crosdale, a Vice President, Editor and Treasurer of ICCP, and author of the Australian submission to the commemorative volume, was one of Philippa's students.

Meanwhile, in 1979 Jane and Nigel Newman travelled to Wollongong University, Australia, where they learned to prepare and analyse coals that were part of their University of Canterbury PhD projects. Alan Cook, Aivars Depers and several postgraduate students helped the Kiwis negotiate a steep 8-week learning curve. This included access to exciting international coal samples. A few years later Claus Diessel of Newcastle University, Australia, provided invaluable advice when Canterbury University ordered a Zeiss coal research microscope. He intervened with Zeiss in Sydney to ensure that the machine would be correctly adapted for quantitative fluorescence. Claus visited the University of Canterbury in person during 1986 and when offended by some petrographically ambiguous vitrinites in Eocene coking coals he growled "you should put these back in the ground!".

A large group of postgraduate students and postdoctoral fellows passed through the University of Canterbury Coal Research Group during the 1980's and early 1990's, including ICCP members Richard Sykes (GNS) and Joan Esterle (Brisbane University). An ICCP field trip to the West Coast coalfields after the Wellington meeting in 1997 **(Figure 1)** was well attended by a cheerful group including Aivars Depers, Walter Pickel and the Schwab's. Alan Cook exited the gangplank of the Cook Strait ferry at the beginning of this trip to delighted exclamations from the organisers, who were dejected to learn that he just happened to be on the same ferry as the participants and was commencing a private itinerary.



Figure 1. Scenes of the Fieldtrip after the Wellington meeting in 1997. Top Left: The bizarre 'pancake-stack' coastal formations of the Paparoa National Park. Top right: Stop close to the West Coal coalfields from right Ms. Rosenberg, Diego Alvarez, Per Rosenberg, Wolfgang Kalkreuth. Bottom: Brunner Coal Measures (Middle Eocene), Left: a group of ICCP members, Right: the main seam with Harold Read and Diego Alvarez.

Membership of the ICCP has provided the small group of New Zealand coal petrographers an opportunity to share their ideas and enthusiasms via attendance at meetings and participation in Working Groups and Accreditation programmes. There is a unique camaraderie at an ICCP meeting, where participants that have fiercely debated the correct use of terminology for hours during a session are revealed to be old drinking buddies when the evening revelry commences. It is an organisation with a lot of heart and a willingness to help members of the ICCP family who are just starting out on their coal petrography journey.

COAL AND ORGANIC PETROLOGY IN CHINA

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China coal petrological research began in 1980s. On Nov. 22-28th, 1980, took place the first symposium on coal petrology in China. For this event, coal geology professionals from the Geological Society of China and from China Coal Society got together to discuss the main challenges on coal petrology. There were 110 presenters and 67 papers discussed. This was followed by a second symposium on 21-27th December 1984 at Kunming city in Yunnan Province, a third one on 12-17th October 1992 at Emeishan in Sichuan Province, a fourth one on 18-22nd September, 1995 at Guilin in Guangxi Autonomous Region, and a fifth one on 26-28th July, 2002 at Guangzhou in Guangdong Province.

Research Status of China Coal Petrology

Chinese lithotype classification still uses the categorization of coal according to lustre of the Soviet Union. Considering the complex and multi-period geological structure of China, tectonically deformed coal was specially defined according to lithotype description. In 2013, the China Coal Standards Committee made the "Classification of Coal-body Structure" standard to categorize coal into original structured coal, tectonically crushed coal, granulated coal, and mylonitic coal. In addition, coal petrology and paleo-plant scholars discovered a special coal species in Yunnan, Sphagnum coal (Baipao coal), and explored its origins (Qi et al., 1994). Chinese sclerotia-algal coals were classified by their origins (Tang et al., 2021).

In the 1990s, semi-vitrinite and barkinite were defined as informal macerals aligned with the "Classification of Macerals for Bituminous Coal", and lepidophyte-fusinite, psaronius-fusinite, and other macerals were identified in coal. Compared with the international classification scheme (ICCP), semi-vitrinite should be considered as vitrinite (established in 2001), macrinite was divided into macrinite 1 and macrinite 2 in 2013 and barkinite was proposed by the Standardization Administration of China in 1991 (Figure 1), but has not been recognized as formal term by the International Committee for Coal and Organic Petrology (ICCP) and The Society for Organic Petrology (TSOP). Still there are many scientific problems that have not been resolved. The earliest study of bark coal in China was conducted by the coal geologist Hsleh, followed by many authors, Wang et al. (2014), who systematically discussed the Chemical characteristics of bark coal (barkinite) and rational utilization approaches. Other terms used by Chinese coal petrographers are: liptohuminite, introduced in the 1980s and categorized according to the classification scheme of peat and soft brown coal macerals (Jin et al., 1989). Meta-exinite, meta-vitrinite, meta-inertinite, in the 1990s divided according to the classification of macerals of high-rank coals in China (Qin, 1994). Many Chinese scholars summarized and analyzed the distribution characteristics of coal macerals in Chinese coal mines based on "China Coal Resource Database"(Chen et al., 2002).

Geological application of coal petrology

Some key work in **Coal facies** studies in China can be highlighted. The relationship between the coal-forming microenvironment and sulfur in coal was built up by used coal facies parameters. The enrichment facies of gallium and its carrier boehmite in coal were determined by means of the coal facies study. The sections change of coal sequence, coal facies, and coal petrology was discussed by combined sequence stratigraphy, coal facies, and coal petrology, which enriched the coal-forming theory. The research status on coal facies and sedimentary organic facies were discussed in Chinese coal measures. Dai et al. (2020) reviewed peat environment and coal facies.

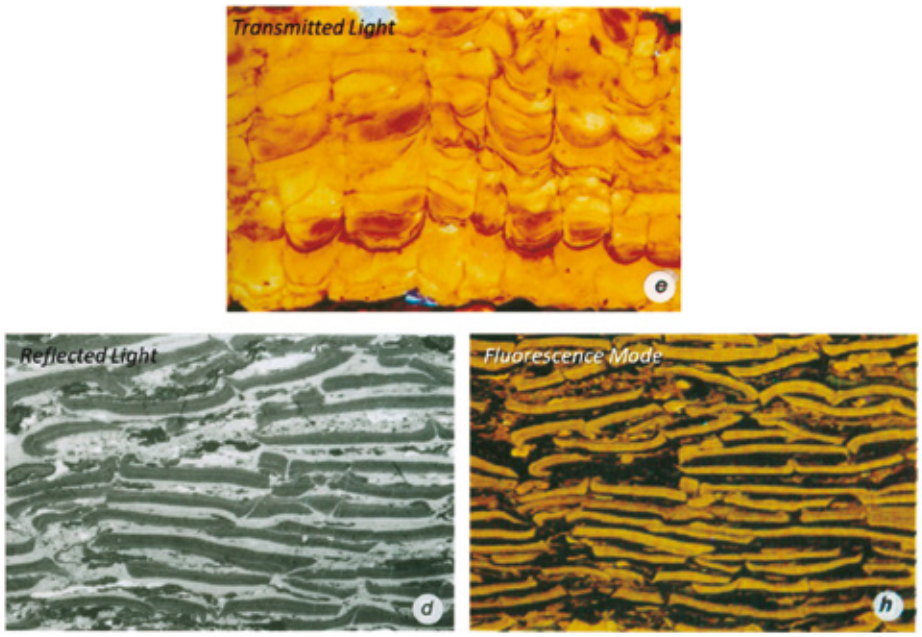

Figure 1. Images of the bark component commonly referred as Barkinite in the Chinese literature. (photos from China National Administration of Coal Geology, 1996).

Tectonically deformed coal and their categories are terms common in Chinese organic petrology. The classification of tectonically deformed coal was discussed and divided tectonically deformed coal into four types, or three series and ten categories according to the structural deformation mechanism. In recent years, tectonically deformed coal and its internal structure, deformation mechanism, and chemical and physical changes are the hot topics of coal geology. Tectonically deformed coal is relevant for structural geology, coal mine gas and safety and the exploration and development of coalbed methane (Tang et al., 2020).

Organic petrology. By the end of the 1960s the basis of coal petrology was well-established and the focus was enlarged to other organic rocks, being more generally named organic petrology. The International Committee of Coal Petrology (ICCP) also adapted its name in 1972 to incorporate organic petrology being named International Committee of Coal and Organic Petrology (although maintaining the acronym). This evolution is also reflected in the textbooks in which the Stach textbook of Coal Petrology (Stach et al., 1982) was followed by the Organic Petrology text book (Taylor et al., 1998). Professor JIN Kuili was the first person in China to study organic matter in source rocks. he proposed the classification of organic matter of continental hydrocarbon source rocks and marine hydrocarbon source rocks in China. Subsequent studies were conducted on the relationship between macerals and the formation of oil and gas. Scholars used the petrographic and geochemical characteristics of macerals to research organic sedimentary facies. As example, a large amount of terrestrial organic matter was detected in Northwest oil. Many achievements in this field were included in the monograph “Organic Petrology Research” (Jin et al., 1997).

Coalbed methane. Different macerals and coal ranks involve different generation and storage of coalbed methane. Professor QIN Yong (Qin et al., 1999) was the first person to apply the coal petrology method to the geology and exploration of coalbed methane in China, followed by researcher ZHANG Qun (1999). Many achievements have been made with regard to the physical and mechanical properties of coal petrology, as well as the coal-body structure and the classification of pore fissures.

Industrial Application of Coal Petrology

In the past 20 years, coal petrology has been mainly applied to the physical, chemical, and technological characteristics of coal macerals in processing, conversion and utilization, guiding the effective utilization of various coals and the reduction of environmental pollution. Coal blending coking theory is relatively mature (Zhou

1985), and the development of the technical process is manifested in the difference between automation and dynamic detection of coal blending technology. With the development of technology and economy, microscopic photometers have been installed in large-to-medium-sized coking plants and coal preparation plants in China. Reflectance statistical charts have been widely used in coal source detection and steam coal blending. The research of maceral properties and the separation of maceral and surface properties, coal–water slurry properties, pyrolysis characteristics, gasification characteristics, liquefaction characteristics, and combustion characteristics have promoted the level and the pace of the industrialization of clean coal technology in China. The micro-analysis of carrier minerals of sulfur and other hazardous elements in coal has developed into clean coal geological technology, which provides a basis for science and decision-making for coal desulfurization and demineralization, as well as the exploration and utilization of coal resources.



Figure 2. Group photo of the 40th ICCP Meeting at the entrance of the Beijing Science Council House in 1987.

New Coal Petrology Technologies

The traditional methods used in coal petrology are optical microscopy and luminometry, and modern coal petrology methods have been greatly improved. Firstly, by the use of light sources, such as in fluorescence and focusing confocal microscopy. Secondly, by the use of resolution, such as scanning electron microscopy (SEM), transmission electron microscopy (TEM), atomic force microscopy (AFM); Wang et al. (1993) used TEM to discover supermicroliptinte in vitrinite. Thirdly, by the introduction of large high-technology equipment for the micro-analysis of coal macerals, such as electron microprobes, atom microprobes, proton microprobes, microscopic infrared spectra, secondary-ion mass spectrometry, and in situ plasma mass spectrometry. The above methods and equipment have enabled scholars to break through the limitation of observing only the morphology and optical physical properties of coal macerals in the past and transformed coal petrography analysis from macro and micro-scale to molecular-scale visualization



Figure 3. Examples of the sessions of the first international Meetings on Organic Petrology held in China. Left 40th ICCP Meeting in 1987; right 23rd TSOP Meeting in 2006.

ICCP and TSOP in China

Chinese first ICCP members were Prof. JIN Kuili and Prof. WANG Jie. When the International Conference of Carboniferous Stratigraphy and Geology was held in Beijing in 1987, the 40th ICCP was also held in August, at Beijing Science Council House, China (Figure 2). This was the first ICCP Meeting in China (Figure 3). In 2012, the joint annual meeting of ICCP and TSOP was held for the first time in Beijing (Figure 4 and 5), marking a new milestone for the international status of Chinese coal and organic petrology. Prof. Kuili Jin convened the work of Micro-FTIR working group of ICCP. The Society for Organic Petrology (TSOP), founded in 1983 in the United States, met also three times in China between 2006 (Figure 3) and 2018. In 2021, Prof. Shifeng Dai convened and presided the work dealing with *in-depth interpretation of definition and classification of vitrinite, inertinite, huminite and liptinite in coal (ICCP system 1994) for Chinese Researchers* using photos of Chinese coal samples (Dai et al., 2021a.b,c,d).



Figure 4. Prof. Dr. Kuili Jin, Prof. Dr. Shifeng Dai, Prof. Dr. Yuegang Tang and Dr. Lila Gurba at the Conference dinner of the 64th ICCP Meeting held in Beijing in 2012.

The relevance of the research developed in the China University of Mining and Technology (Beijing) in the field of organic petrology has been recognized by TSOP with the Castaño Award to Professor Kuili Jin in 2007 and Professor Shifeng Dai in 2021, and with the John C. Crelling Distinguished Service Award to Professor Shifeng Dai in 2014 and Professor Lei Zhao in 2023 (now president of TSOP). In 2017, Professor Kuili Jin of China University of Mining and Technology (Beijing) received the Thiessen Award of ICCP for his important achievements and outstanding contributions in the field of coal and organic petrology.



Figure 5. Group photo of the joint ICCP-TSOP Annual Meeting, Sept. 15-19, 2012, Beijing held in at Beijing Xijiao Hotel. 1st row (From left to right): João Graciano Mendonça Filho, Atsuo Aihara, Barbara Bielowicz, Małgorzata Piechaczek, Iwona Jelonek, Krystyna Kruszewska, Suiping Peng, Petra David, Angeles G. Borrego, Polla Khanaqa, S. P. Ranasinghe (Paddy), Isabel Suárez-Ruiz, Lopo Vasconcelos, Kuili Jin.
2nd row: Jieqing Tan, Paula Gonçalves, Joana Ribeiro, Sandra Rodrigues, Marcin Bielowicz, Krystyna Tokarska, Deolinda Flores, Stavros Kalaitzidis, Paul C. Hackley, Judith Potter, Peter Crosdale, Irena Kostova-Dineva, Lauren Johnson, Shifeng Dai.
3rd row: Meifen Li, Xia Li, Ralph Delzepich, Walter Pickel, Dirk Prinz, Harald Behl, Rudolf Schwab, Antonis Bouzinos, Lei Zhao, Gülbin Gürdal, Lila W. Gurba, Magdalena Misz-Kennan, Yaofa Jiang, Cunliang Zhao.
4th row: Yanan Guo, Xiujie Deng, Long Jia, Fuzhou Liu, Johan Joubert, Jian Kang, Dao Zhou, Weiwei Li, Fangui Zeng, Qiaojing Zhao, Beilei Sun, Yuegang Tang, Shoucheng Han.
Fifth row: Xianxu Hou, Wei Cheng, Peipei Wang, Yichuan Wang, Zhiwei Wang, Xin Guo, Weijiao Song, Licai Zheng, Xiao Li, Lixin Zhao, Xukun Lu, Xin He, Yangbing Luo, Thomas Gentzis, Henrik I. Petersen, Shaoqing Wang, Xiaolei Yu.

Chinese standards and published books for coal petrology

So far, Chinese national standard committee had built up the standards as follows.

- GB/T6948-2008 Method for microscopical determination of the vitrinite reflectance of coal.
- GB/T 8899-2013 Method for determination of the maceral group and mineral of coal.
- GB/T12937-2008 Terminology of coal petrology.
- GB/T15588-2013 Chinese classification for maceral of bituminous coal.
- GB/T15589-2013 Chinese classification for microlithotypes of bituminous coal.
- GB/T15590-2008 Method for determination of the microlithotypes of Coal.
- GB/T15591-2013 Differentiate method for commercial blend types of coal.
- GB/T16773-2008 Method of preparing coal samples for analysis.
- GB/T18023-2000 Chinese classification for lithotypes of bituminous coal.
- GB/T19222-2003 Method for Collection of coal petrological sample.
- GB/T30050-2013 Classification of Coal-body Structure.
- GB/T40485-2021 Method for automatic determination of the vitrinite random reflectance of coal.
- Coal standards were built up as follows.
- MT/T264-1991 Method for determination of the microhardness of coal.

- MT/T507-2019 General stipulations for analytical methods of coal.
- MT/T594-1996 Method for determination of fluorescent spectrum of coal maceral.
- MT/T595-1996 Method for determination of fluorescent intensity of coal maceral.
- MT/T807-1999 Method for density separation to vitrinite of bituminous coal.
- MT/T968-2005 Method for description to fracture of coal.
- MT/T1053-2007 technical conditions for determination of the vitrinite reflectance of coal with microscopy photometer.
- MT/T1158-2011 The classification for coal rank of vitrinite reflectance.
- MT/T1160-2011 The vitrinite content classification.
- MT/T1161-2011 The exinite content classification.

From 1980s on, there were many monograph or books published on coal petrology. In 1996, in order to meet the 30th World Geological Congress held in Beijing, China, Academician Han (1996) edited "Coal Petrology of China" (Figure 5), Academician Yang (1996a) edited "The Coal Metamorphism in China". China National Administration of Coal Geology edited "Atlas for Coal Petrography of China" (Figure 5) and Chen et al. (1996) edited "Coal Petrologic Atlas of China". The Ministry of Geology and Mining also carried out a national coal prospect prediction study from 1982 to 1988 and published "Coal Petrology and Quality Characteristics and Metamorphic Rules of Chinese Coal"(li et al.,1996). In 2022, book titled "Petrology, Palynology, and Geochemistry of Cenozoic Coals in China"(Jiang et al.,2021) had been awarded the 2022 Dalway Swaine Award by TSOP.



"Coal Petrology of China" (*in Chinese with English abstract*)



"Atlas for Coal Petrography of China" (*in Chinese with English abstract*)

Figure 6. Relevant textbooks or monographs on coal petrology from China.

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ICCP IN POLAND

Magdalena Misz-Kennan

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Research on coal and organic petrology was carried out in Poland for many years in, among others, Central Mining Institute in Katowice (now GIG National Research Institute), Silesian University of Technology in Gliwice, AGH University of Kraków, Centre of Polymer and Carbon Materials of Polish Academy of Sciences, Institute of Energy and Fuel Processing Technology in Zabrze, Wrocław University of Science and Technology, Oil and Gas Institute in Kraków, Polish Geological Institute and University of Silesia in Katowice. The first researcher was Stanisław Karczewski, who investigated coals in the area of Dąbrowa Górnicza, which led to the publication entitled "On the microscopic structure of hard coal from Dąbrowa Górnicza" published in 1907.

For many years, the research concentrated, among others, on identifying coal seams for exploitation, mining safety including methane and dust explosions, coal properties for combustion and coking, graphite, coal oxidation, and dispersed organic matter in rocks. Currently, the research concentrates on properties of dispersed organic matter in rocks, biomass combustion, alteration of organic matter during self-heating, organic matter in various environmental samples, carbon materials and various coal applications. Of the many researchers who worked with macerals, only some became members of the International Committee for Coal and Organic Petrology.



Figure 1. Dr. Kazimiera Hamberger, the first Polish full member of ICCP (Z życia Politechniki Śląskiej 9 (173)/2007).

The first member of ICCP from Poland was Dr. Kazimiera Hamberger (1914-2007) from Silesian University of Technology in Gliwice **(Figure 1).** She finished her studies at Lviv University (now in Ukraine) and, after the IIWW, worked at the Faculty of Mining at the Silesian University of Technology in Gliwice, where she co-organized the

Department of Coal Deposits Geology. Dr. Hamberger was introduced to the community of ICCP by Prof. E. Stach and, in 1969, became the first full member of this organisation from Poland. Her work mainly concentrated on sapropelic coals, which were the subject of her PhD thesis. She inspired creation and was convener of the Sapropelites Working Group. In 1975, she co-organized the ICCP meeting in Ustroń-Jaszowiec (Poland), the first ICCP meeting in Poland. Dr. Hamberger introduced to ICCP Prof. Barbara Kwiecińska and Prof. Marian Wagner, both from the Academy of Mining and Metallurgy in Kraków and also Prof. Wiesław Gabzdyl from Silesian University of Technology in Gliwice.

The number of ICCP members from Poland kept changing in the following years. Some were members of ICCP only for a few years, others for decades. In total, the number of ICCP members from Poland was about 30.



Figure 2. Left: Barbara Kwiecińska during the ICCP Meeting in Patras in 2005. Right: Krystyna Kruszewska during the fieldtrip.

One of the most active members of ICCP was Prof. Barbara Kwiecińska **(Figure 2-4).** She was the first vice-president of ICCP from Poland **(Figure 3),** which is the highest position in ICCP that a person from Poland obtained. Prof. Kwiecińska performed that function during 1995-2005. She was a member of Pyrolitic Carbon, Raman Spectroscopy, SEM – TEM Editorial Groups, and she was a co-convener (together with H. Petersen, A. Deepers, and Nedelcu) of Graphite, semigraphites, natural coke, pyrolytic carbon Working Group in Commission I (Kwiecińska and Petersen, 2004). She author and co-author of several publications resulting from her activities in ICCP (Pusz et al., 2014; Lester et al., 2010; Predeanu et al., 2015). The second ICCP meeting in Poland took place in August 20-26, 1995 in Kraków in AGH University and was organised by her. Since 2005, she has been an honorary member of ICCP. Prof. Kwiecińska introduced to ICCP the next generation of members like Sławomira Pusz and Grzegorz Nowak **(Figure 3).** during the meeting in Serbia in 2010.



Figure 3. Barbara Kwiecińska in her role of Vice-president, during the 55th ICCP Meeting in Utrecht in 2003. From the left: Alan Cook, Barbara Kwiecińska, Petra David, Zuleika da Silva.

Another very active member was Prof. Krystyna Kruszewska **(Figure 2, 4-5).** In the late 1980s and early 1990s, she was a convener of the Saprovitrinite Working Group, and from the late 1980s to 1994, she was a convener of the Reactive Inertinite Working Group. After returning to Poland from abroad, she worked at the University of Silesia in Katowice, where she organised the Department of Coal Petrology. She inspired the next generation of organic petrologists and generously shared her knowledge and experience. Prof. Kruszewska supervised the PhD thesis of Magdalena Misz-Kennan and Iwona Jelonek and introduced them to the ICCP community **(Figure 2).** Besides being a great researcher, she is also a wonderful person and friend to many people, shortening the distance despite her position, always ready to give advice and support, not only in professional area.



Figure 4. Polish members of ICCP during the 50th ICCP Meeting in Porto in 1998. From the left: Magdalena Misz-Kennan, Sławomira Pusz, Barbara Kwiecińska, Grzegorz Nowak, Lila Gurba, Krystyna Kruszewska.



Figure 5. Krystyna Kruszewska (in the middle) with her former Ph.D students Iwona Jelonek (left) and Magdalena Misz-Kennan (right). ICCP Meeting in China 2012. Photo courtesy Iwona Jelone.

Sławomira Pusz (Figure 4) represented the younger generation from the Centre of Polymer and Carbon Materials of the Polish Academy of Sciences, who did her PhD under Prof. Kwiecińska's supervision. Sławka was a convener of the Application of reflectance for estimating structural order Working Group (Structural Order WG). She was also a co-convener of the Pyrolytic Carbon Editorial Group and SEM – TEM Editorial Group. Sławka was (and still is) a member of several working groups, greatly contributing to their activities. Grzegorz Nowak (Figure 3) from the Polish Geological Institute in Wrocław, also a former PhD student of Prof. Kwiecińska, was a co-convener of Coal facies Working Group.

Professor Kruszewska introduced Magda and Iwona (Figure 5) to the ICCP community and suggested they work hard and contribute to ICCP what they obediently fulfilled. Magdalena Misz-Kennan was introduced to ICCP during the meeting in Kraków (Poland) in 1995, and she was mostly involved in activities in Commission III, actively working in various working groups. From 2012 to 2015, she was the secretary of Commission III, and from 2016 to 2023, she was chair of this Commission. In the same years, she was a member of the Accreditation Subcommittee and later Chair of this subcommittee. For many years, Magda's interests were concentrated on self-heating coal wastes. During the meeting in Oviedo, several researchers from other countries presented the results of their work on that subject. That inspired Magda, Jolanta Kus, and Deolinda Flores to propose a new working group that was accepted, and they are conveners of that group and are active till now. In 2014, Magda was honoured with the Organic Petrology Award, which made her the first person representing Poland and honoured with that Award. She is also the Chair of the Organic Petrology Award Subcommittee. In 2013, she organised the third ICCP Meeting in Poland.



Figure 6. Left: Iwona Jelonek, Krystyna Tokarska-Schwab and Krystyna Kruszewska during the field trip during meeting in China in 2012. Photo courtesy Iwona Jelonek. Right: Małgorzata Wojtaszek-Kalaitzidi, Magda Misz-Kennan and Jolanta Kus at the luch break of the excursion to Micenae during ICCP in Patras, 2023.

Iwona Jelonek **(Figure 5 and 6),** after completing her PhD, became a very valuable member of the University of Silesia, bringing international projects and cooperating with industry. In recent years, her interests have concentrated on burning biomass, which led to the formation of the Centre for Biomass Energy Research and Education at the University of Silesia. Iwona is the Director of the Center. Together with her husband Zbigniew Jelonek and Magda Misz-Kennan, she is a co-convener of microscopic constituents in solid residues from households' combustion working group.



Figure 7. Top left: Polish team during the 65th ICCP Meeting in Poland in 2013. From the left: Jolanta Kus, Sławomira Pusz, Barbara Kwiecińska, Krystyna Kruszewska, Magdalena Kokowska-Pawłowska, Magdalena Misz-Kennan, Lila Gurba, Barbara Bielowicz, Joanna Komorek, Iwona Jelonek. Photo courtesy Iwona Jelonek; Top right: Polish members of ICCP during the 55th ICCP Meeting in Utrecht in 2003. From the left: Magdalena Misz-Kennan, (?), Krystyna Kruszewska, Lila Gurba, Albin Zdanowski, Maria Mastalerz, Barbara Kwiecińska, Sławomira Pusz; Bottom left: Iwona Jelonek, Leokadia Róg and Barbara Bielowicz during poster session. The 65th ICCP Meeting, Sosnowiec, Poland. Photo courtesy Iwona Jelonek; Bottom right: Polish team during the ICCP Meeting in Patras in 2005. From the left: Magdalena Misz-Kennan, Grzegorz Nowak, Ivana Sykorova, Rafał Morga, Maria Mastalerz, Maria's husband behind her, Krystian Probierz.

Małgorzata Wojtaszek-Kalaitzidi (Figure 6) represents the youngest generation of very active ICCP members from Poland from the Insitute of Energy and Fuel Processing Technology in Zabrze. In 2019, after Isabel Suárez-Ruiz resigned, she became the Coal Blend Accreditation Program organiser. She is a Secretary of Commission III, convener of Coke Petrography WG (from 2017) and co-convener of The Microscopy of Carbon Materials WG (from 2021).

Polish members of ICCP participate in accreditation programs. Currently, three members are accredited in SCAP, three in DOMVR, and one in CBAP. One member has all three accreditations. Figure 7 shows various images with the different members of the Polish team participating both from Poland or from abroad in the ICCP activities.

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PORTUGUESE CONTRIBUTION TO THE ICCP AND THE RELEVANCE OF THE ICCP TO ORGANIC PETROLOGY IN PORTUGAL

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A Brief History

In Portugal, the first scientific studies on coal began both at the departments of Geology (Faculty of Sciences) and Mining (Faculty of Engineering) of the University of Porto (Oliveira, 1945; 1956; Almeida, 1958).

Modern developments in the domain of coal petrology and geochemistry started at the Department of Geology of the University of Porto with the study of coals from the Moatize Basin (Lemos de Sousa and Mériaux, 1970) and, later, coals from the Douro Coal Basin (Lemos de Sousa, 1973; 1978a; 1978b). By 1989, the department had a fully equipped Organic Petrology Unit (OPU) within the Research Unit, Centro de Geologia da Universidade do Porto (CGUP). This unit carried out research in organic petrology and geochemistry with several theses developed on coal, from lignites to bituminous coals and anthracites, as well as in dispersed organic matter (DOM) petrology applied to oil and gas prospecting and exploration by several ICCP members.

Besides collaborating with companies, namely Siderurgia Nacional, in estimating the quality of coke for steelmaking (Lemos de Sousa et al., 1986), OPU was also contracted by oil companies (such as Chevron, Pemex, IMP, Conoco and Total) for the study of DOM in prospecting and exploration of hydrocarbons (numerous confidential reports) and by coal-fired power plants for the study of coal combustion products (Guedes et al., 2008; Valentim et al., 2008). Further contributions were made in the domain of coalbed methane (CBM) in collaboration with Gas de France, Total, Anglo American Coal and Sasol Technology (Pty) Ltd.

In addition, research was carried out within the scope of projects that led to the elaboration of PhD theses (Marques, 1993; Vasconcelos, 1995; Flores, 1996; Pereira, 1997; Valentim, 2000; Pinto de Jesus, 2001; Rodrigues, 2002; Guerner Dias, 2005) or the publication of several articles in international journals of the specialty. Though no longer a member of OPU, Pinheiro (2006) also concluded his PhD at the University of Porto.

Following retirement, Professor Lemos de Sousa established the Earth Sciences and Sustainable Research Team at the Universidade Fernando Pessoa, and Deolinda Flores became head of the research group at the Faculty of Sciences of the University of Porto within the Organic Petrology Laboratory. Since then, research activities have focused essentially on the following areas: petrography of coals to define organic facies; petrography of dispersed organic matter (DOM) in sediments and rocks to define the kerogen type, paleoenvironment and maturation; petrography of cokes and combustion residues; petrography of coal mining waste affected by self-combustion; petrography of natural and synthetic graphites; petrography of black shales associated with metallic ore deposits, and, more recently the petrography of biomass as well as of the biochar. Within this scientific area, several theses were developed (Ribeiro, 2011; Rodrigues, 2012; Gonçalves, 2014; Santos, 2022; Laranjeira, 2023), and currently, two more are ongoing.

Since its establishment in 2006, the Earth Sciences and Sustainable Research Team at Universidade Fernando Pessoa has focused primarily in organic petrology and geochemistry linked with the 3rd cycle in Earth Sciences. Implemented in 2009, this PhD programme focuses on two specialization fields, Petroleum Systems and Innovation Energy, and Energy Transition and Geology: CO_2 Geological Sequestration and Underground Energy Storage. As a result, several theses were concluded (Dinis, 2010; Enciso Cárdenas, 2015; Oliveira, 2016; Almeida, 2019; Cacama, 2021; Rocha, 2021), conjointly with other institutions, followed by publication of results. At present there are five theses in progress.

The ICCP members from the University of Porto were also involved in projects with a strong component of Organic Petrology, financed by Portuguese and European financial institutions, as project coordinators, principal investigators as well as researchers. Some of these projects are: DEASPHOR (ERA-MIN), CHARPHITE (ERA-MIN), PHIGO (ERA-MIN), NEXT-LIB (ERA-MIN), RAREASH (ERA-MIN, Project Manager - Georgeta Predeanu), ANNOX (FCT), PEASH (FCT), PhotoBioTrans (FCT), Buçaco Basin (FCT), ECOAL (INTERREG), CoalMine (FCT), SHS (Sistema de Apoio à Investigação Científica e Tecnológica—"Projetos Estruturados de I&D"—Horizonte Europa).
The teaching of Organic Petrology has also always been included in the courses offered by the Faculty of Sciences of the University of Porto, both in the 1st cycle (BSc) and in the 2nd cycle (MSc), either as modules in other subjects, in the Applied Petrology curricular unit, or in Seminars. Since 2013/14, an Organic Petrology curricular unit is part of 2nd cycle courses, and more than 30 MSc theses were supervised by Portuguese ICCP members. It is worth highlighting the contribution made by students from Portuguese-speaking countries, namely Mozambicans, Angolans, Timorese, and even Brazilians that chose their master's theses in the area of organic petrology with a focus on hydrocarbon prospecting and the study of coal basins (among others Mussa, 2014; Caetano, 2014; Manharage, 2014; Meque, 2016; Silva, 2017; Uaciquete, 2016; Mussa et al., 2018).

ICCP Members

Since 1971, the ICCP Portuguese members are/were the following, indicating the name, the institution that actually takes part, and the year/period of membership:

Manuel João Lemos de Sousa, Universidade Fernanda Pessoa, 1971 – 2009
Luís Nogueira e Sousa, Siderurgia Nacional, 1980's
José Pedro Montalvão Fernandes, Universidade do Porto, 1998 - 2012
Cândida Garcia – Universidade do Porto, 2002 - 2017
Manuela Marques, Universidade do Porto, since 1991
Deolinda Flores, Universidade do Porto, since 1991
Bruno Valentim, Universidade do Porto, since 1998
Cristina Rodrigues, Universidade Fernando Pessoa, since 1999
Sandra Rodrigues, Queensland University, since 2006
Joana Ribeiro, Universidade de Coimbra, since 2009
Paula Alexandra Gonçalves, Universidade do Porto and Universidade Federal do Rio de Janeiro, since 2014
Ana Cláudia Santos, Universidade do Porto, since 2023

ICCP Meetings organization

The Portuguese ICCP members have organized three ICCP meetings, with a fourth scheduled for 2026. A brief summary of each is given below.

The **35th Annual Meeting of the International Committee for Coal and Organic Petrology-ICCP** was organized by OPU (April 26 to 30, 1982), and subsequently OPU also organized the 1st Symposium on Gondwana Coals, in Lisbon (September 1st to 2nd, 1983), with participation of 28 specialists (Lemos de Sousa, 1984).

The **50th Annual Meeting of the International Committee for Coal and Organic Petrology-ICCP** (September 20 to 26, 1998) was hosted by the Faculty of Sciences of the University of Porto. The meeting included a poster session where twenty-seven posters were presented and the abstracts published in Lemos de Sousa and Fernandes (1998).

Prior to the 50th Annual Meeting of the ICCP the 2nd Symposium on Gondwana Coals took place on September 19, in the Faculty of Science of the University of Porto. Nineteen oral presentations and 8 posters were presented and the abstracts were published in Lemos de Sousa and Fernandes (1998). More information about this meeting was included in the ICCPNews nº 18 (1999).

The **63rd Annual Meeting of the International Committee for Coal and Organic Petrology-ICCP** (September 12 to 16, 2011) took place at the Department of Geosciences, Environment and Spatial Planning (DGAOT) of the Faculty of Sciences of the University of Porto, including a symposium on "New Trends in Coal Science" (Flores and Marques, 2011a). Previously the ICCP meeting, from September 7 to 9, the first "ICCP Training Course on Dispersed Organic Matter" was organized (Flores and Marques, 2011b), with lectures by João Graciano Mendonça Filho (Universidade Federal do Rio de Janeiro, Brazil) and Alan Cook (Australia). Between these two events (7 to 16 September), there was a field trip on "The Lower Jurassic of the west coast of Portugal: Stratigraphy, geological heritage and organic matter record" (Flores and Marques, 2011c). Refer to ICCPNews nº 54 (2012).

Selected papers presented at the symposium on "New Trends in Coal Science" were published in a Special Issue of the International Journal of Coal Geology "ICCP "New Trends in Coal Science" Symposium — In memory of Alan Cook" (Flores et al., 2013), in honour of the late Alan Cook.

The Faculty of Sciences of the University of Porto, Institute of Earth Sciences - UPorto, and the Academy of Sciences of Lisbon, expect to organize the 77th International Committee for Coal and Organic Petrology (ICCP) to be held in September 13-18, 2026.

Other Relevant Contributions

Coal Classification has long been a pertinent subject matter for many coal specialists, given its relevance to establishing a common language for both commercial, technological and industrial reasons as much as for geological and statistical reasons, in the calculation of coal resources and reserves. The use of petrographic parameters in classification meant that the ICCP played an important and active role in many discussions and engagements that resulted in the publication of the ISO standard 11760 – Coal Classification.

Portuguese specialists participated with several studies, and ICCP contributions are summarized in Lemos de Sousa et al. (1998). In fact, OPU organized two important meetings of the United Nations Economic Commission for Europe on coal classification/codification: Task Force on the Elaboration of an International Codification for Lignite and Sub-bituminous Coal Utilization (Porto 1997), and 8th Meeting of the Group of Experts for Coal Classification (Lisbon 1989).

Lastly, it is worth mentioning that, within the framework of the 55th ICCP Annual Meeting (Utrecht, August 10 to 16, 2003), Lemos de Sousa organized a symposium in memory of Marie-Therese Mackowsky, resulting in the publication of selected papers in a special volume by the International Journal of Coal Geology (Lemos de Sousa, 2006).

Awards

Organic Petrology research done in Portugal has always been nationally and internationally recognized. This recognition arose from the contribution to the enhancement and impact of Organic Petrology in society in general, and of the institutions in which the Portuguese ICCP members took part. Thus, Portugal's recognition of imminent ICCP members, and the ICCP's gratitude for Portuguese members, and the credit for research carried out by ICCP members resulted in honouring with awards. The following should be mentioned:

- Award of the title of **Doctor Honoris Causa** to **Professor Boris Alpern** on October 28th, 1987, by the University of Porto as proposed by the Geology Department of the Faculty of Sciences.
- **Thiessen Medal Award** to **Professor M. J. Lemos de Sousa** in 2001.
- PhD thesis awarded:
  - **Joana Ribeiro's** PhD thesis was awarded with the Eng. António de Almeida Foundation Prize in 2013, for petrography studies of coal mining waste affected by self-combustion;
  - **Paula Alexandra Gonçalves's** PhD thesis was awarded, in 2016, with the Montepio Prize of the Academy of Sciences of Lisbon, for the studies of the dispersed organic matter in sedimentary sequences of the Lusitanian Basin.

ICCP Officers

The ICCP members are very active in its activities. All of them took/take part in the working groups of the three Commissions, being, in some cases, Conveners of working groups. M.J. Lemos de Sousa, as well as D. Flores and S. Rodrigues, were members of the Council as officers in the ICCP, as mentioned in Table 1.

Table 1. ICCP Officers.

Name	Position	Period
M.J. Lemos de Sousa	ICCP President	1995-1999
M.J. Lemos de Sousa	Chair Com I	1991-1995
M.J. Lemos de Sousa	ICCP archives	1998-2004
D. Flores	Chair of Com I	2008-2016
D. Flores	Secretary of Com I	2000-2008
D. Flores	Chair of the ASC	2008-2016
D. Flores	Member of the ASC	2000-2008
D. Flores	ICCP archives	Since 2005
S. Rodrigues (Australia)	Chair of Com III	2023-2027
S. Rodrigues (Australia)	Secretary of Com III	2016-2023

Collaboration with Foreign Institutions for the Development of Organic Petrology

Since the beginning, the ICCP members of Portugal have established partnerships and collaboration with international and prestigious organic petrology laboratories.

The Instituto Nacional del Carbon – Consejo Superior de Investigaciones Científicas (INCAR-CSIC), presently Instituto de Ciencia y Tecnología del Carbono, Spain, is one of the main institutions with which the Portuguese ICCP members have maintained very close collaboration since the beginning of Organic Petrology in Portugal. This relationship has led to the supervision of PhD (Flores, 1996, Rodrigues, 2012) and MSc (Costa, 2008, Moura, 2016) theses and post-doctoral projects (Ribeiro et al, 2016a,b), the development of Portugal/Spain cooperation projects (GRICES/CSIC, FCT/CSIC; Suárez-Ruiz et al., 2006), and exchange visits by researchers (seniors and students) to both laboratories.

The Earth Sciences and Sustainable Research Team at Universidade Fernando Pessoa has a number of protocols in scientific collaboration with some national entities, as well as with the Université de Starsbourg (including conjoint PhD programme), Universidade de São Paulo/Instituto de Meio Ambiente, Universidade Federal da Bahia, Universidad Autónoma de Coahuila/Centro de Investigación en Geociencias Aplicadas (includes conjoint PhD programme) and Universidade do Estado do Rio de Janeiro/Faculdade de Geologia.

The Laboratory of Palynofacies and Organic Facies (LAFO-UFRJ), Brazil, is also a laboratory with whom the Portuguese ICCP members have a very fruitful association. An important scientific collaboration with this internationally renowned laboratory was established both in terms of postgraduate training and the joint

supervision of PhD theses (Gonçalves, 2014, Menezes, 2015), post-doctoral studies (Gonçalves et al., 2021a,b), and research projects (FCT/CAPES, CAPES/CNPq Invited Special Researcher-PVE). Through this collaboration, the first ICCP DOM course was organized, within the activities of the 63rd ICCP meeting (Flores and Marques, 2011b), hosted by the Faculdade de Ciências da Universidade do Porto.

Several collaborations were established with other countries in the framework of international projects, with the establishment of consortia supporting these projects, such as India, Sweden, Romania, and South Africa, among others.

A Selected Album of ICCP Treasures and Memories

Figures 1 to 4 were selected to remember the hosting of ICCP members at Porto, Portugal.



Figure 1. Family photo of the attendees of the 35th Annual Meeting of the International Committee for Coal and Organic Petrology-ICCP, Porto 1982.



Figure 2. Marie-Therese Mackowsky, Marlies Teichmüller, Monika Wolf and Margaretha Bengtsson (from right to left) attended the 35th Annual Meeting of ICCP. This photo was taken in Barcelos, North of Portugal, in 1983.



Figure 3. Family photo of the attendees of the 50th Annual Meeting of the International Committee for Coal and Organic Petrology-ICCP, Porto 1998.



Figure 4. Family photo of the attendees of the 63rd Annual Meeting of the International Committee for Coal and Organic Petrology-ICCP, Porto 2011

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CONTRIBUTION OF THE ICCP AND TO THE ICCP – FOCUSED ON ROMANIA

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In the opening ceremony of the ICCP meeting in Bucharest 2017, I spoke about the spirit of the ICCP. I wondered what would have happened without the curiosity of people to develop petrography as science. Certainly, it would not have written so much scientific literature, developed specific equipment and, would not have been major progress in geology, chemistry, mining, petrochemical exploration, metallurgy and many other related areas. The joy of seeing the first ones, the miraculous and unique images of a living history which represents coal and organic petrology, taught us to interpret, understand and use it, in a wider applicative context.

The ICCP longevity is due primarily to curiosity, limitless concerns of the petrographers, their professionalism, and especially their love for coal and organic petrology. The ICCP is an example of constant, tenacious and especially fruitful and efficient work. The love for coal and organic petrology kept petrographers together 75 years and made the ICCP a large family. Some grew up very young with the most experienced, and experienced become us, wanting now to share our knowledge with the young people.

Within the ICCP families that have expanded, the children became organic petrologists and, thus the ICCP increased its presence in our lives, that makes coal and organic petrology a never-ending story. The joy of seeing us within the ICCP meetings and therefore to travel of over a half or more of globe, was not an impediment. This fascinating world made us go through 75 years with the ICCP. Surely, there are more petrographers who worked in these first 75 years of the ICCP and certainly all think of them with gratitude! At 75th anniversary, I try a strong and best emotion having the honor and privilege to note the contribution of Romanian petrologists to the ICCP, and the role of the ICCP to some pioneering achievements and the development of the Romanian petrology.

The influence of the ICCP for the organic petrology in Romania can be defined as positive and profound. Romania's contribution to the ICCP must be understood in a historical context, the early years being marked by limited access to scientific publications worldwide, most of them procured on personal relations, and some attendance to the ICCP annual meetings without any institutional support. However, the contribution of Romanian petrographers was noted in coal geology and coal use.

It is now the time to pay tribute to professors, researchers, engineers, technicians, lab assistants and workers who have brought shine to coal, with passion and devotion, and therefore to organic petrology in Romania. Romanian scientific research carried out during more than seven decades in the field of coal and organic petrology accompanied closely the fields of geology, mining, energy and coal utilization, developed and diversified according to national and international trends in the field of steel, energy and manufacturing of carbon materials and products.

In Romania the development of coal geology, petrology and use is presented in detail by Popa and Predeanu, 2018, a work awarded with the most prestigious Romanian scientific award, the Romanian Academy Award, Geonomics Sciences Section, Award: *"Gheorghe Munteanu Murgoci",* in 2018 **(https://acad.ro/premiileAR/liste/2018.pdf).**

Creation of specialized laboratories

The study of bituminous coals mainly from Petroşani (Jiu Valley) and Reşiţa and Sirinia (Banat area) basins in terms of their rational use for coking, was initiated by the Institute of Carboniferous Research (ICEC) in 1953

and completed in 1966 by the Research Institute of Mining (ICEMIN) under the coordination of Ionescu (1969). Coal research was undertaken by Costel Nedelcu in Prospecțiuni SA (1997-2002) and in the Geological Survey of Romania (IGR), by Cornelia Bițoianu (1970) and by Nicolae Țicleanu in IGR, and after 2000, in the University of Bucharest.

Organic petrology research was initiated and supported by Isaac Blum and Ion Ştefănescu and organized by Ionescu-Şişeşti and Cornelia Panaitescu. The research was developed in the Polytechnic Institute of Bucharest, as the first Petrographic Laboratory in the Faculty of Industrial Chemistry, Fuel laboratory, which operates continuously since 1965 until today, being coordinated from 2012 by Georgeta Predeanu.

Between 1980 and 2012, organic petrology was developed also in the Metallurgical Research Institute of Bucharest (ICEM) by Călin Dumitrescu and Georgeta Predeanu and initiated in Hunedoara coke plant laboratory by Kurt Kovacs, and after 1996 in Galaţi coke plant laboratory by Gabriela Pleşa. After 2000, the petrographic research was continued either in the specialized laboratories of the University of Bucharest by Nicolae Țicleanu and Mihai Emilian Popa, and after 2010 in OMV-ICPT Câmpina, by Maria Doina Ghiran.

Development of petrographic research in Romania

In Romania, the petrographic research started at the beginning of the XXth century, mainly accompanying the geological studies dedicated to local coal seams. This preceded by at least a few decades the founding of the ICCP, as could be observed in most countries with coal resources used for the manufacture of cast iron and steel, in the time before and during the Second World War. Three main periods in the development of Romanian coal and organic petrology can be recognized.

Before 1970 it had mostly geological and mining applications. Remarkable early works of I. Mateescu included the first thesis in coal petrology about bituminous coals of Anina – Steierdorf, Banat in 1932, and later studies on macerals (1950-1957). The school he created was continued by contributions of Stana Kovacs and Ana Mocanu (1957-1959), I. Niţulescu (1959-1960), Cornelia Panaitescu (1959-1960), Smărăndiţa Ilie (1966-1968) and Cornelia Biţoianu (1960-1966). As an active full ICCP Member after 1968, Cornelia Biţoianu developed the petrographic research in Romania and its applications in geology and coal mining.

Between 1970-2000 a broad range of different topics were investigated, including basic and applied research of coal petrography related to coke making industry, energy industry and carbon products manufacturing. Organic petrology was developed by Cornelia Panaitescu in the Polytechnics Institute of Bucharest. Becoming an ICCP full Member in 1971 and having Marie Th. Mackowsky as her PhD supervisor, Cornelia Panaitescu provided during her teaching and research activity a special interest and devotion to coal and organic petrology. The interest in this type of research was enhanced after 1980 by Călin Dumitrescu and Georgeta Predeanu in the Metallurgical Research Institute in Bucharest and after 1996 by Gabriela Pleşa in Galaţi Steel Plant.

Many basic and applied issues of almost all scientifical and technological research fields were approached, such as: coal blends selection and processing, coke and semicoke making (Panaitescu, 1971, 1972, 1974-1989; Dumitrescu and Predeanu, 1982-1990); use of organic petrology for coke strength prediction (Panaitescu, Falk, 1974; Panaitescu, 1975; Predeanu, 1998); formed coke making (Nistor, Panaitescu, 1971-1974; Ştefănescu, 1972); coal tar pitch coke, backed electrodes and anodes, graphitized electrodes, electrode paste, electrographite (Panaitescu, 1973, 1977-1988; Predeanu et al., 2015); carbon fibers (Matei, Predeanu, 1992), petroleum needle coke (Dumitrescu, Predeanu, Geagulea, 1989), low rank coals use for energy making, slags and waste (Panaitescu, 1973-1975); shales composition and burning residues (Panaitescu, 1973; Niţulescu, Panaitescu, 1986); organic matter characterization from oil rock sources (Panaitescu, Penu, 1986, 1988); coals characterization (Panaitescu, 1967, 1971, 1975, 1992, 1994; Barca, Panaitescu, 1974, 1986; Dumitrescu, Predeanu, 1980-1991; Nedelcu, 1985-1992); use of florescence microscopy (Panaitescu, 1978, 1980, 1991), spin electronic resonance (Panaitescu, Meghea, Predeanu, 1999), and powder coal injection into the blast furnace (Predeanu, 1994-1999).

Between 2000-2024 the organic petrology researches were focused on coal blends (Panaitescu, Pleşa, Predeanu, 2000-2002), clean coal technologies and activated carbons (Predeanu, Panaitescu, 2002-2014); coal tar pitch characterization (Predeanu, Panaitescu, 2007); lignocellulosic chars (Predeanu, Panaitescu, 2006- 2008); Oltenia coals characterization (Țicleanu, Predeanu, Popa, 2005); energy wastes use (Predeanu, Panaitescu, 2012-2014);

composites incorporating ash (Predeanu, et al., 2012-2015, 2016); oil source rocks organic matter (Ghiran, 2013, 2017, 2023, 2024); carbon materials investigation through the ICCP Microscopy of Carbon Materials Working Group (2018-2024). Palaeobotany, palynology and coal geology evolved strongly during the last 70 years, with leading Romanian palaeobotanists and geologists such as Răzvan Givulescu, Alexandru Semaka, Iustinian Petrescu, Ion Preda, and Nicolae Țicleanu. These researchers and professors studied intensively Palaeozoic, Mesozoic, and Neozoic coal measures of Romania, providing in detail knowledge not only regarding coal reserves, coal field geometry, coal petrography and analyses, but also discovering coal generators, palaeophytocoenoses and coal genesis mechanisms (Anastasiu et al., 2018). Teaching palaeobotany and coal geology at the University of Bucharest, M. E. Popa (1992, 1998, 2000, 2009, 2014) continues the palaeobotany and coal geology studies, working in the field and in both Bucharest and Bigăr laboratories with new generations of undergraduate and graduate students. Romanian palaeobotanical heritage is indeed exceptional, with at least one fossile-Lagerstatte locality (Anina, South Carpathians) (Predeanu et.al., 2017).

Romanian ICCP members

Ten Romanians were registered as ICCP members between 1968-2017 (Figure 1). Seven associate members were registered by 2000: Cornelia Bițoianu (1968), Cornelia Panaitescu (1971, Krefeld), Călin Dumitrescu (1982), Georgeta Predeanu (1991), Anca Ileana Penu (1991), Costel Nedelcu (1992), Nicolae Țicleanu (2000). After a few years of activity, the first four of them become full members. Three more scientists become ICCP members, Maria Doina Ghiran (2013), Mihai Emilian Popa (2017) and Izabela Mariș (2017).



Figure 1. Romanian ICCP members over the years.

Cornelia Panaitescu was nominated for the Vice-president position of the ICCP in 1994 (Oviedo ICCP meeting) and become Honorary Member in 2010 (Belgrade ICCP meeting).

Nominated in 2003 (Utrecht ICCP meeting), Georgeta Predeanu became Secretary of Commission III in 2004 and was reelected in 2008, so that she was a member of the ICCP Council between 2004-2012. At the same time she coordinated the Microscopy of Carbon Materials Working Group (WG), (2009-present) being a Member of the accreditation Subcommittee between 2007-2012.

The relevance of the ICCP brought by Prof. Emeritus Cornelia Panaitescu for the organic petrology in Romania

Her main aim was to develop in Romania the School of Coal and Organic Petrology within University Politehnica Bucharest and to widen the possibilities of using the applied petrology methods. The petrographically methods introduced in Romania, a country with coal and oil resources, coke making plants, and steel electrode plants to study and control the different technological processes, can be considered a real success for the ICCP activity in Romania and worldwide. Her main goal was to organize a laboratory for microscopic research, where she teached the students and PhD students on Organic Petrology until her retirement.

She carried out a complex activity: Full professor within the University "Politehnica" Bucharest, Department of Fuels and Carbochemistry, teaching the students and PhD students in the field of Pyrogenetic Processing technology Applied to Fuels and Carbopetrography. Researcher and publicist, she started her career as scientific researcher in the Energy Institute of Romanian Academy. Part of her PhD Thesis: "Physical-*chemical changes in the structure of coal's petrographic constituents during coalification and carbonization*" was developed in Bergbaufortschung having Prof. Dr. Marie-Th. Mackowsky as professor coordinator. About a half of her publications (100 publications) were in the field of Coal and Organic Petrology.

The publications include a high number of information provided every year by her input within the Annual ICCP meetings (before and after 1993, Table 1) and a high number of scientifically reports, books and articles in Romanian and international journals, or as Proceedings in the field of Organic Petrology. During over 25 years she supported the university courses of Coal, Coke and Organic Petrology within the University Politehnica Bucharest.

The most important publication for Romanian students, PhD students (over 20) and graduated engineers (over 30 generations coordinated during their graduation thesis) in the field of Coal, Coke and Carbopetrography, is the monographic book *"Petrography of coals, cokes and carbon products"* (420 p., in Romanian). Part of the published studies were written during Prof. C. Panaitescu's working visits to the Bergbauforschung Institute – Essen, coordinated by Prof. Mackowsky and with the help of Dr. E-M. Wolff, Dr. Pfisterer and Dr. Ottenjann. It was also a result of the experience gained in some industrial coke making plants in Chesterfield – England, offered by Norman Kaye. The book was highly appreciated by some of the ICCP members and colleagues, such as: Prof. M. Wolf, Dr. Pfisterer, Dr. Falk and Prof. C. F. K. Diessel. Another book is "Carbopetrographic Atlas" (in Romanian and English) published with Georgeta Predeanu, by the Romanian Academy Ed. 1999.

Contribution to the ICCP working groups

The contribution of the Romanian petrographers Cornelia Bițoianu and Cornelia Panaitescu has been noted since their early registration in the ICCP (1968-1971) by participating in the working groups of their interest, geology and coals chemistry. Unfortunately, we do not have data other than the published works of the two scientists in Romanian and included in the long lists of references of the articles mentioned in some of present bibliography. However, notable contributions can be remarked after the editing of the ICCP News, which only after 1989 provides information in electronic format.

Although it was not possible to attend some annual meetings for objective reasons, including the pandemic, the participation in the working groups was permanent, even on-line, especially regarding the presentation of the results of the Carbon Materials WG, coordinated by Romania.

Cornelia Panaitescu's long-standing activity within the ICCP is well known as she attended most of the ICCP meetings, contributing to all three Commissions, such as: ***Commission I*** (major contributor to ICCP's Working Group on Standardization, e.g. description of "inertodetrinite maceral group" to the inertinite group classification, published by the ICCP in 1994, The new inertinite classification ICCP System 1994, and during 2008-2009 (W. Pickel, I. Sykorova); Pseudovitrinite WG (Lila Gurba). ***Commission II:*** Kerogen characterization WG together with B. Alpern, M. Teichmuller and M. Wolf; Environmental Application of Organic Petrology WG with Lavern Stasiuc. ***Commission III:*** Coal Blends WG (Isabel Suarez Ruiz), Coke Texture WG (with Raphael Javier/H. Eickhoff as conveners) with coke texture photomicrographs and comments, Combustion WG (Ed Lester), Inertinite in Combustion WG with Angeles Gomez Borrego, Carbon Materials (as co-convener).

Romanian ICCP members actively participated in round robin analysis in different WGs, such as: Coal Blends (Isabel Suárez-Ruiz), Coke (D. Voght/J. Havier), Environment application of organic petrology (J. Baily), Fly-Ash (Bruno Valentim), Self-heating (Jolanta Kus, Deolinda Flores, Misz-Kennan), Inertinite in combustion (Angeles Gomez Borrego), Combustion (J. Bailey/D. Alvarez/E. Lester), Pseudovitrinite (L. Gurba), Xylite, others. Through the ICCP WGs Romanian petrologists contributed within the Round Robin analysis on the classification of Char (Lester et al., 2010), Fly-ash (Suárez-Ruiz et al., 2017), Self-Heating (Misz-Kennan et al., 2020), and Carbon materials (Predeanu et al., 2015, 2024). Georgeta Predeanu participated also in sending samples of Tertiary coals for the Coal Blends WG (after 2000).

Due to the expanding applications of carbon materials the ICCP established a working group for the Microscopy of Carbon Materials (CMWG). The CMWG was proposed by Prof. Cornelia Panaitescu and accepted during the 59th ICCP meeting in Victoria, Canada in 2007 within Commission III for the Industrial Application of Coal and Organic Petrology and began its work during the 60th ICCP meeting in Oviedo, Spain, 2008. The aims of the WG were: (1) to identify petrographic textures representing the structural organization of the organic matter and its correspondence to solid carbon precursors from coal and coal by-products, petroleum, and biomass and (2) to consolidate and complete the methods developed for the structural and textural characterization of carbon materials.

Between 2009-2013 were developed four round robin exercises including carbon materials derived from coal and petroleum such as: calcinated anthracite, coal tar pitch, petroleum coke, graphite, and electro graphite. Between 2016-2022 were developed four round robin exercises including activated carbons (of coal and biomass origin) and precursors (chars) of coal and lignocellulosic origin, as well as materials in the stages undergoing pyrogenetic and activating reactions. During the 15 years of activity through the WG exercises were classified carbon materials derived from coal, coal byproducts, petroleum, and biomass treated through different heating technologies, and notable results were published in two papers having all participants as co-authors (Predeanu et al., 2015, 2024).

The ICCP interlaboratory exercises proved that petrographic investigation is clearly emerging as a method of significant importance in applied practice. They demonstrated the performance achieved by skilled petrographers in evaluating different types of carbon materials, as well as the existence of new research directions, considering the enormous potential for the future of carbon-based material utilization.

The results of the ICCP interlaboratory exercises carried out from 2009 to 2022 demonstrated that optical microscopy can be used as a quality control method of carbon materials and as a support for laboratories both for users and production units. All aims specified in the CMWG objectives were achieved. After many years of methodical literature research, rigorous experimental work, international cooperation, and meticulous analysis of all findings, a single, comprehensive assessment system was established for all carbon materials made from coal, coal byproducts, petroleum, and particularly xylite and biomass.

ICCP Annual Meetings organized in Romania

The ICCP meetings in Bucharest, organized in 1999 and 2017 gave us the opportunity to reveal the Romanian scientific research and, to thank equally to all those who have enriched with their work the development of various aspects of coal science and organic petrology in Romania.

1999 Bucharest meeting. The 51st meeting of the ICCP took place at the Faculty of Geology and Geophysics, University of Bucharest, Romania, from September 12 to 18, 1999 (Figure 2). It was attended by the President Manuel J. Lemos de Sousa, and by 32 Members and 20 guests of 19 countries. The meeting was opened by Manuel J. Lemos de Sousa who expressed his thanks to the Organizing Committee and especially to Cornelia Panaitescu and Costel Nedelcu. Costel Nedelcu announced that the ICCP Meeting will be followed by the meeting of United Nations ECE Task Force on the Elaboration of an International Codification for Lignite and Subbituminous Coal Utilization. He welcomed the presence of researchers, representatives from the diplomatic missions accredited in Bucharest, members of the Romanian Academy, professors of the Romanian Academy and the Politehnica University of Bucharest. Costel Nedelcu introduced Gheorghe Udubașa, General Manager of the Geological Institute of Romania who delivered a short speech on Romanian Geological Research, followed by Nicolae Țicleanu, from the Faculty of Geology and Geophysics, who talked about the Study of Geology in Romania.



Figure 2. Group photo, 1999 Bucharest ICCP meeting.

On September 14, the program included a Bucharest sightseeing tour, visits to the Geological Museum, Village Museum, Tombe of Vlad Tepeș King and lunch (Figure 3). The conference dinner was held on September 17 in the old restaurant "Caru Cu Bere". The field trip took place on September 18, guided by Costel Nedelcu, and crossed a part of the Plane of Romania, Subcarpathian area, East and South Carpathian, along of 400 km long trip with a lunch in Brașov (Figure 4).



Figure 4. Fieldtrip to Babele, Bucegi Mountains, Southern Carpathians, Romania during the 1999 ICCP Meeting. Left: Prof. Alan Cook (later President of the ICCP) and Dr. Călin Dumitrescu and Right: Prof. Alan Davis (later President of the ICCP) and Dr. Călin Dumitrescu.

Romanian participants included: Frumuzache Barca (non-member/NM) Cornelia Bițoianu, Magda Ciulavu (NM), Corneliu Dinu (NM), Ovidiu Dragastan (NM), Călin Dumitrescu, Paul Georgescu (NM), Gabriela Hristea (NM), Antonela Neacșu (NM), Costel Nedelcu, Cornelia Panaitescu, Anca Ileana Penu, Gheorghe Popescu (NM), Ion Preda (NM), Georgeta Predeanu, Marin Șeclaman (NM), Nicolae Țicleanu (NM), Gheorghe Udubașa (NM), and Florian Zamfirescu (NM).



Figure 3. Prof. Nicolae Țicleanu, Prof. Cornelia Panaitescu, Prof. Manuel Lemos de Sousa (President of the ICCP) during the sightseeing tour in Bucharest in 1999.

2017 Bucharest meeting. The Romanian Academy and the Library of the Romanian Academy hosted, between September 3-9, 2017, the 69th International Conference of the International Committee for Coal and Organic Petrology: **https://www.iccop.org/documents/iccp-news-no-69.pdf/.** The event was organized under the auspices of the Romanian Academy by the Polytechnic University of Bucharest (UPB), University of Bucharest (UB) and the Ministry of Research and Innovation (MCI) – representing at national level the authority, the competent forums and the university elite associated with the field – worked together perfectly for the smooth running of the event, to support and promote interdisciplinary and exploratory scientific research in Romania and internationally. The ICCP-2017 conference was attended by 126 researchers from 20 countries **(Figure 5).**



Figure 5. Presentation roll-up of the 69th Annual Meeting of ICCP (left side). Group photo, 2017 Bucharest ICCP meeting (right side).



Figure 6. ICCP Members, Plenary Session, Romanian Academy Hall, 4 Sept.2017: Georgeta Predeanu – Chair of the Organizing Committee, member of ICCP (Polytechnic University of Bucharest and the Romanian Academy), (top, left side) and Mihai E. Popa, member of ICCP - University of Bucharest (top, right side). Dr. Angeles G. Borrego – President of the ICCP, Instituto Nacional del Carbón INCAR-CSIC, Oviedo, Spain, (middle left photo). Acad. Bogdan C. Simionescu – Vicepresident of the Romanian Academy, honorary member of the organizing committee (middle, right photo). Dr. Vasile Şindilar (OMV - Petrom, ICPT Câmpina) (bottom left photo). Plenary Session, Aula of the Romanian Academy.

Main objectives of the conference were focused on:

- ***Highlighting the achievements and progress in the field of organic petrography*** in the participating countries and their impact on cutting-edge applications and technologies by presenting and disseminating the current state of knowledge in the field.

- ***Promoting petrography*** by organizing debates to learn about the key themes within the accreditation programs (Single Coal Accreditation Program – SCAP; Dispersed Organic Matter – DOMVR), training (Dispersed Organic Matter – Integrating transmitted and reflected light microscopy), standardization (Commission I), study of source rocks (Commission II), industrial applications (Commission III), microscopic methods for characterizing the texture and structure of materials, characterization of coal and palynofacies/kerogen, others.

- ***Intensifying international collaborations*** and integrating Romanian specialists in the European Research Area as well as in international programs to increase the visibility of the contribution of Romanian petrographic research to the international scientific heritage and international recognition in related fields (geology, mining, energy, advanced materials, waste recycling).

- ***Increasing the awareness*** at the level of society regarding the importance of research and supporting the national strategy of research, development and innovation to increase the scientific and technical level of applied organic petrography in the investigation of advanced materials and opening new research directions on advanced materials for energy storage.
- ***Ensuring the visibility of the works of the scientific event,*** by editing and publishing:

  - ***SDGG, 2017, Heft 92*** (Schriftenreihe der Deutschen Gesellschaft für Geowissenschaften, ISSN 1543-0537, the publication of the German Society for Geosciences, no. 92 of 2017) comprising all oral and poster presentations of the ICCP-2017 scientific event (67 abstracts of max. 2 pages), edited by Schweitzerbart science publishers, Stuttgart, Germany **(https://www.schweizerbart.de/series/sdgg),** 156 pages.
  - ***"Pliocene Coals and Neogene Formations of the Prahova County: Field Trip Guide".*** Authors: Mihai Emilian Popa, Georgeta Predeanu, Maria Doina Ghiran, Izabela Mariş, Roxana Pirnea. University of Bucharest Publishing House, 2017, ISBN 978-606-16-0905-5, 66 pages.
  - "ICCP News" (ISSN 1445-4793) – Publication in four successive issues no. 65-67 (already published) and no. 68 (in preparation December 2017).
  - "Special Issue of International Journal of Coal Geology" by publication of a selected papers, in extenso in a Special Volume – dedicated to the ICCP event **(https://www.journals.elsevier.com/international-journal-of-coal-geology).**

Related activities

a) **Plenary Session** organized on September 4, 2017, to increase the visibility of the Romanian contribution to the international scientific heritage and to present the outstanding achievements of the Romanian industry in the last century and a half. During the Plenary Session, three representative oral papers were presented for the following areas: Romanian strategic resources, coal and crude oil.

b) **Symposium "Advances in Applied Coal and Organic Petrology"** organized on September 8, 2017, to know the achievements and the stage of development in the field of the theme of the event (Organic Petrology), of the integration of the Romanian scientific community in the activities of the international scientific community. During the Symposium, oral papers and posters were presented (the latter were exhibited throughout the event, September 3-9, 2017).

c) **Round table: "Quo Vadis Coal?"** held on 8 September, an attempt to detail, and clarify global trends in the uses of coal in the global context of climate change.



Figure 7. Opening of the General Assembly of the ICCP, "Ion Heliade Rădulescu" Amphitheater, Romanian Academy Library (left side). Participants in the ICCP2017 during the Poster Session organized in the Exhibition Hall of the Romanian Academy Library (3-9 September 2017).

d) **Exhibition of specific materials** organized throughout the event: palaeoflora – unique Romanian samples (University of Bucharest; Figure 8) and by-products obtained from the processing of coal and crude oil (semi-coke, metallurgical coke, briquette coke, pitch coke, petroleum coke, carbon materials) (Polytechnic University of Bucharest). The specificity of the samples taken from the Anina-Banat area was highlighted, as well as of the Romanian fuel processing technologies, developed by specialists in the field and applied in the specialized plants in the country between 1948-2000.



Figure 8. Samples of rocks with Palaeozoic and Mesozoic fossil plants, including holotypes of new fossil plant species (I), collection of Prof. Mihai E. Popa (top photos, left and right). Samples of natural graphite, bituminous shale and precursors of carbonic materials (charcoal type and xylite activated carbon), Carbochemistry Laboratory collection – UPB (bottom, left side). Samples of lignite briquettes and Lupeni oil, metallurgical coke, briquette coke, hard pitch, pitch coke and petroleum coke (crude and calcined), chemical by-products, Carbochemistry Laboratory collection – UPB (bottom, right side).

e) **Exhibition of scientific literature** in the field of coal, crude oil and energy. Books on geology and fuel processing, specialized journals were introduced, results of the pioneering concerns of Romanian geologists and chemists in this field, contributing to the international scientific knowledge and pioneering Romanian petrographic research.

f) **Geological field trip** in order to visit important geological objectives of the Prahova County, including the following field stops: i) the Roşioara lignite quarry in Filipeştii de Pădure, visiting the Pliocene coal deposits in the region; ii) the Slănic Prahova salt mine, the Salt Mountain from Slănic Prahova (geological reserve) and Piatra Verde, for visiting Tertiary formations (Figure 9);

g) **To promote the interdisciplinary scientific research** proven within the Strategy for Romania's development in the next 20 years, developed by the Romanian Academy on fossil fuel resources, through the presentation of the five volumes, Romanian Academy Publishing House, 2015-2017.



Figure 9. Geological field trip - September 9, 2017. Visiting the Roşioara lignite quarry in Filipeştii de Pădure (top photos, left and right). Visiting the "Unirea" salt mine, Slănic Prahova (middle photos, left and right). Visiting the Salt Mountain from Slănic Prahova (geological reserve) - ICCP members (bottom left photo). Organizing Committee (from left to right: Maria D. Ghiran, Jolanta Kus, Izabela Maris, Călin Dumitrescu, Georgeta Predeanu, Romina Mihalache (bottom right photo).



Figure 10. ICCP members visiting the Politehnica metro station in Bucharest, paved with Upper Cretaceous (Maastrichtian) marine fossils (rudists, gastropods, corals, etc.) (https://flickr.com/photos/pachypteris) (left side). Politehnica metro station in Bucharest – examples of Cretaceous marine fossils (right side).

h) **Microscopy exhibition** (Zeiss, Olympus) organized throughout the event to highlight the research equipment used by the specialists and experimental practical sessions carried out on samples and standards brought by participants, for their use to increase the quality and accuracy of the research results. Laboratory equipment used for the preparation of the samples necessary for the microscopic study by the companies Analytik Jena and Nitech (sponsors) was brought.



Figure 11. The microscopy session organized within the Microscopy Exhibition (Zeiss, Olympus) and the laboratory equipment (Analytik Jena and Nitech) organized throughout the event.

i) The participation of undergraduate and graduate students in Geology (Figure 12).



Figure 12. Awarding the papers of Geology graduate and undergraduate students from Romania, Portugal and Greece. The prizes included books donated by Nemira Publishing House.

The international conference hosted in 2017 in Romania, held under the auspices of the Romanian Academy, was a par with the most prestigious ICCP conferences organized so far, enjoying the attendance of important experts. This event was perceived as a memorable scientific meeting and a model of successful organizational collaboration. Among the remarkable successes of this scientific event are worth mentioning increased visibility, and quality of the disseminated petrographic results at the ICCP2017, such as the following scientific issues (Popa et al., 2017; Predeanu et al., 2017, 2019; Figure 13).



Figure 13. Scientific issues related to the 2017 ICCP Meeting in Bucharest.

Research papers of the Romanian ICCP members

The successful completion of the industrial facilities of that period and the excellent cooperation between experts from universities, research institutes and production units were achieved by publishing a significant number of books, theses, thousands of studies and of research papers that were published in prestigious Romanian journals, unfortunately many of them not currently having an international visibility before 1989.

Contributions to the ICCP Newsletters:

Some references to relevant petrographic books in Romania have been published in the ICCP Newsletter (Figure 14).

Books review:

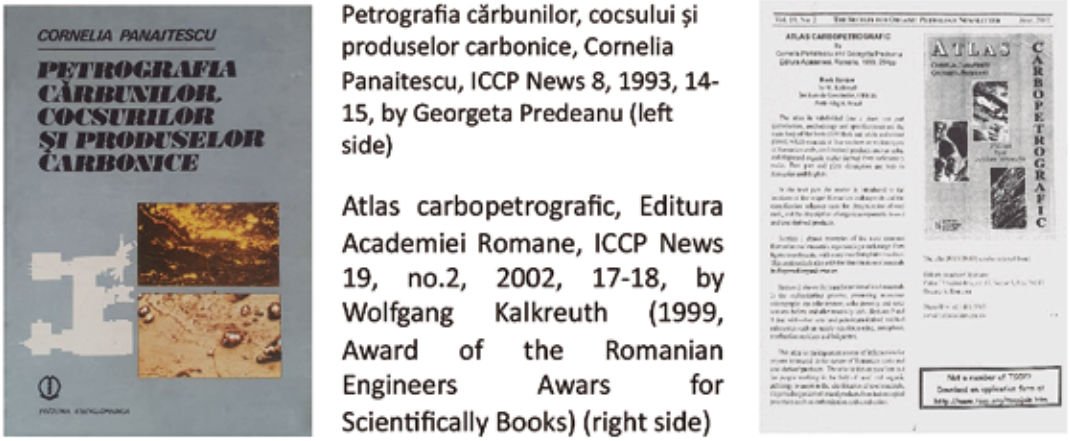

Figure 14. Contributions to the ICCP Newsletter with notice of Romanian publications on organic petrology.

Romanian PhD thesis summaries

From the many PhD theses coordinated by Prof. Em. Cornelia Panaitescu, including other works, and summarized in the ICCP News, some are mentioned in Table 1.

Table 1. Contributio to the ICCP News (PhD thesis summaries, other works).

Nº	ICCP News no.		Contribution
PhD thesis of			
1	ICCP News no. 32, 2004, 21.	Elena Evelina Marinescu	Predeanu G.
2	ICCP New no. 35, 2005, 11 – 13	Gabriela Hristea, Maria Paraschiv, Gimi Rîmbu	Predeanu, 2005a
3	ICCP News no. 37, 2005, 41 – 42.	Gabriela Pleşa, Charlotte Toma	Predeanu, 2005b
4	ICCP News no. 88, April 2024, 14-15.	Maria Doina Ghiran	Ghiran, 2024
5	ICCP News no. 88, April 2024, 16-17	Roxana Pirnea	Pirnea, 2024
Other works			
6	ICCP News no. 67, March 2017, 12-20	Bucharest 69th Meeting	Predeanu G.
7	ICCP News no. 68, July 2017, 5-10	Bucharest 69th Meeting	Predeanu G.
8	ICCP News no. 69, December 2017, 12-20	Bucharest 69th Meeting	Predeanu G.
9	ICCP News no. 88, April 2024, 13.	Mihai E. Popa scientific recognition	Predeanu G.
10	ICCP News no. 88, April 2024, 18-19.	Resume article	Ghiran et al., 2024

Research contributions during the ICCP annual meetings

Romanian petrographers attended 22 annual meetings between 1993-2024 and participated with scientifically works presented in plenary or in the poster sessions. 31 oral and poster presentations were published as summary abstracts in the ICCP News (between 1993-2010) and 20 oral and poster presentations were enclosed as extended abstracts in the ICCP Program & Abstract Book (between 2010-2024), dedicated especially to the symposia organized on each occasion, Table 2.

Table 2. ICCP Meetings after 1993, attended by the Romanian members, with scientifically contributions.

Nº	Year, Place	ICCP Meeting no.	Oral papers/ Posters	ICCP News no., page	Publication mentioned
1.	1993, Chania	45th	2 papers		8, 8-12
2.	1994, Oviedo	46th	2 papers		10, 11-12
3.	1995, Krakow	47th	4 papers		12, 17-20
4.	1996, Heerlen	48th	2 papers		14, 20-22
5.	1997, Wellington	49th	2 papers		16, 13-14
6.	1998, Porto	50th	2 papers		18, 16
7.	1999, Bucharest	51st	3 papers		20
8.	2000, Rio de Janeiro	52nd	1 paper		22
9.	2001, Copenhagen	53rd	2 papers		24, 7
10.	2003, Utrecht	54th	1 paper		30, 44
11.	2004, Budapest	55th	1 paper		33, 10
12.	2005, Patras	56th	2 papers		36, 11
13.	2008, Victoria	59th	1 paper		42, 28
14.	2009, Oviedo	60th	2 papers		44, 13
15.	2010, Belgrade	62nd	2 papers		51, 13
16.	2011, Porto	63rd	1 paper		53, 13
17.	2014, Sosnowiec	65th	4 papers		ICCP Program & Abstract Book
18.	2015, Postdam,	67th	4 papers		ICCP Program & Abstract Book
19.	2017, Bucharest	69th	7 papers		ICCP Program & Abstract Book
20.	2019, The Hague	71st	2 papers		ICCP Program & Abstract Book
21.	2023, Patras	74th	2 papers		ICCP Program & Abstract Book
22.	2024, Oviedo	75th	1 paper		

The participation with research works of the Romanian members of the ICCP were numerous by 2000's, thus being noted the contributions of Cornelia Panaitescu, Călin Dumitrescu, Georgeta Predeanu, Costel Nedelcu, Nicolae Țicleanu and Anca Penu.
After the years 2000 the participation was more the result of the work done by Georgeta Predeanu and Cornelia Panaitescu, that in later years included Maria Doina Ghiran and Mihai E. Popa.

Contributions during the ICCP training, annual meetings and editing

ICCP training courses. 2011, Participation to the ICCP Training Course in Dispersed Organic Matter September 7-9, Porto, Portugal, Maria Doina Ghiran, Daniel Mihăiescu, ICCP News 54, 24-25.

Members within ICCP Advisory Committee/Editors of Abstracts Book and Program. 2015, Kolkata, Member of the International Advisory Committee (Georgeta Predeanu) 2017, Bucharest, Schrifttenreihe der Deutschen Gesellschaft für Geowissenschaften, Hefte 92. *Abstracts Book and Program, 69th ICCP-2017),* September 3 - 9, Ed. Schweizerbart Science Publischers, Stuttgart, 2017, ISBN 978-3-510-49239-8, 153 pp. [G. Predeanu G. (Coord. Edt.), M.E.Popa, R.D. Mihalache, I. Mariș, J. Kus, M.D. Ghiran (Eds.)].

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INVOLVEMENT OF THE SERBIA WITH THE ICCP

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The Serbia has been involved with the ICCP when Dr. Marko Ercegovac from the Faculty of Mining and Geology, University of Belgrade attended the inaugural meeting in 1963. Two ICCP meetings have been held in Belgrade: 1972 (former Yugoslavia); and 2010 **(Figure 1).**



Figure 1. Group-photo 62nd ICCP Meeting, 2010 (Belgrade, Serbia; ICCP News 51, 2010).

Prof. Dr. Marko Ercegovac played an important role in the International Committee for Coal and Organic Petrology (ICCP) and participated in round robin analyses since 1963 in different Working Groups. He was involved in several fields of applied coal petrology in coal preparation, combustion, gasification, and hydrogenation, and applied organic petrology in petroleum exploration and basin modelling. Active participation in several ICCP working groups with other colleagues resulted in joint publications - International handbook of coal petrography (1963, 1971, 1975 and 1988). Marko organized the 62nd ICCP Meeting in Belgrade, 2010. The excursion was organized to visit the Drmno Depression with petroleum and lignite deposits and the Viminacium Archaeological Site.

From 2000 until today Serbian coal and organic petrologist were actively involved in ICCP. Dr. Aleksandar Kostić was actively involved in ICCP from 2003 until 2024. He participates in several working groups and together with Marko Ercegovac organized the 62nd ICCP Meeting **(Figure 2).** The opening remarks were followed by lecture presented by Alexandar Kostić entitled the Fossil Fuels of Serbia. The very interesting presentation gave participant an overview of the main fossil fuel resources in Serbia and the work over the years of the Faculty of Mining and Geology on this issue.



Figure 2. Alexandar Kostić (foreground) and Marco Ercegovac prepare visitors for the trip in the yellow transporters down into the Drmno Mine (below; ICCP News 51, 2010).

Dr. Dragana Životić first as associate member (2005) and later as full member (2015) actively participate in several Working group in Commision I, II III. Her work in ICCP togeter with other colleagues involved in exercises resulting in several publications in Integnational Journal of Coal Geology. Together with Alexandar Kostić, Dragana Životić was involved in organization an 62nd ICCP Meeting in Belgrade (2010). Dragana attend the 1st ICCP Course in Organic Petrology Held at Helmholtz Centre Potsdam German Research Centre for Geosciences (GFZ) Potsdam, Germany, 2009, guided by excellent instructors Dr. Alan Cook and Prof. em. Dr. Claus Diessel. Also, she attends the 4th ICCP Training course in Dispersed Organic Matter on the University of Porto, Portugal lecture by Dr. Alan Cook and Dr. João Graciano Mendonça Filho. She has served on the Council as Secretary (2016-2024; **Figure 3**) of Commission I and gave contribution in development of ICCP and several Working groups.



Figure 3. The 2023 ICCP Council members: L-R: Paul Hackley, Stavros Kalaitzidis, Nikki Wagner, Angeles Gomez Borrego, George Siavalas, Dragana Zivotic, Magda Misz-Kennan, Sandra Rodrigues, Joan Esterle, Jolanta Kus (ICCP News 87, 2023).

Nikoleta Aleksić, a PhD student at the Faculty of Mining and Geology, University of Belgrade, first encountered the ICCP organization. It was actually the 9th ICCP Training Course in Organic Petrology held at Helmholtz Centre Potsdam in 2016. She gained new theoretical knowledge in coal component identification, point-count

analysis, reflectance measurement, and fluorescence analysis as well as practical experience working with the microscope provided by Hilgers Technisches Buro with FOSSIL software for reflectance measurement, guided by excellent instructors Dr. Angeles G. Borrego and Dr. Walter Pickel **(Figure 4).** The following year, 2017, Nikoleta attended the 10th ICCP Training course in Dispersed Organic Matter - Integrating transmitted and reflected light microscopy held at Helmholtz Centre Potsdam in 2017. During the course Nikoleta Aleksić improved theoretical and practical knowledge in dispersed organic matter in terms of palynofacies, identification and quantification of macerals, maturity of organic matter (SCI-Spore Color Index, spectral fluorescence parameters, vitrinite reflectance measurement, identification of indigenous vitrinite) which was very valuable for their further research work, all thanks to the excellent lectures, Dr. Angeles G. Borrego and Dr. João Graciano Mendonça Filho **(Figure 5).**



Figure 4. Group-photo 9th ICCP Training Course in Organic Petrology Geolab, Helmholtz Centre Potsdam in 6-10th June 2016.



Figure 5. Group-photo 10th ICCP Training Course Dispersed Organic Matter - Integrating transmitted and reflected light microscopy held at Helmholtz Centre Potsdam in 2017.

SOUTH AFRICA AND THE ICCP

Nikki Wagner [1] and Henrique Pinheiro [2]

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South Africa's rich coal reserves and long history of coal-powered industries naturally led to its active participation in the ICCP. Over decades, local organic petrographers (Table 1) have contributed to understanding southern African coal deposits, initially focusing on understanding coal formation, the depositional environment, and qualities for combustion, gasification, metallurgical applications, and other processing. Their expertise expanded to include oil and shale gas exploration, environmental studies, and linking geochemical analysis to petrographic composition.

Dr. B. Moodie (FRI, South Africa) was the first South African Corresponding Member of the ICCP, as recorded in ICCP documentation, reflecting his collaboration and participation since 1955. From the late seventies, South African members boast a strong, six-decade presence in all three ICCP commissions. They have actively participated in accreditation programs, working groups (and resulting publications), and even hosted an Annual ICCP Meeting in 2002. Additionally, they hosted an ICCP training course on organic petrology in 2011 and hold leadership positions within the organization.

Willem Smith (ISCOR, South Africa; now deceased) was the first ICCP member from South Africa, possibly attending meetings in the late 1970's, or early 80's. ISCOR promoted the use of coal and coke petrography to predict coke formation and enhance metallurgical applications. Dr. W. H. Smith co-authored with Prof. J.G. Steyn some of the first significant contributions on coal petrography in the evaluation of SA coals, with emphasis on identification and quantification of reactive semifusinite (inertinite) for application in cokemaking.

Prof. Rosemary Falcon, the 'mother and grandmother of coal petrology in South Africa', attended her first ICCP meeting in Porto in 1982, having studied under Prof. Dr. Marie-Therese Mackowsky, and, briefly, Prof. Dr. Marlies Teichmüller, in Germany. Prof. Edna Plumstead of the University of the Witwatersrand (Wits) was an internationally recognised and respected Palaeobotanist in the 1950's – 1970's for her contributions to understanding of coal formation in South Africa. Although never a member of the ICCP Prof. Plumstead mentored Dr. Falcon, who is noted as the South African co-ordinator for the ICCP News from 1992 (No. 6) to 2000. Prof. Falcon has produced many landmark publications on coal formation, coal petrography, and coal utilisation, with many co-authors. Despite not being active in the ICCP since the early 2000s, Prof. Falcon remains active in coal research and the promotion of petrography as an important analytical and predictive tool in the sphere of coal utilisation.

Prof. Carel Syman (University of Pretoria, now deceased) completed his PhD thesis in 1961 under Prof. Erich Stach, researching the comparison between the petrography of South African and some other Palaeozoic coals. He worked closely with Prof. Falcon, publishing a reputed coal petrography atlas in 1986 (Falcon and Snyman, 1986. Prof. Snyman, whilst an avid coal petrographer, researcher, publisher, and lecturer/teacher, was never a member of the ICCP.

Dr. Henrique (Ricky) Pinheiro first trained in coal petrography under Prof. Falcon and began his long-standing relationship (and developed many friendships) with the ICCP in Oviedo in 1983. He was elected to full member in 1988 and was very active until his resignation in 2015. In the 90's, Ricky studied and worked at the University of Porto under the guidance of Prof. Lemos de Sousa and for six years worked closely with Prof. Boris Alpern in organic petrology and geochemistry applied to oil and gas exploration; he concluded his PhD at the same University.

Mr. Henrick Roux (Hennie) was elected as an Associate Member in 1988 (and resigned in 2011 due to retirement). Hennie succeeded Dr. Smith as the inhouse petrographer at ISCOR. ISCOR experienced many changes over the years, but always maintained the petrographic laboratory, specialising in coke petrography. In the 2000's,

the ISCOR laboratory was assimilated by Bureau Veritas, and the commercial petrographic laboratory continues today under Mr. Willem Swanepoel (an accredited ICCP non-member).

Dr. Krystina Kruszewska, resident in South Africa for a number of years, and hence claimed as a South African ICCP member, convened working groups on Saprovitrinite and reactive inertinite, as first documented in ICCP News No 1 (1989). Prof. Dr. Kruszewska returned to her home country (Poland) but maintained a close association with South Africa. She was nominated as Honorary Membership in 2011. Mrs Vivien du Cann worked closely with Dr. Kruszewska and joined the ICCP in 1995, becoming a full member in 1998 (now inactive).

Dr. (now Prof) Nikki Wagner was elected as Associate Member in 2000 and attended her first meeting in Denmark in 2001; she became a full member in 2007. Nikki was part of the first cohort to be awarded Full SCAP Accreditation as announced in ICCP News No 19 (1999) following the 1996 accreditation exercise. She was the Convenor of the ICCP Training Courses along with the ICCP Vice-President (Lopo Vasconcelos), from 2008. Following the successful courses arranged in GFZ-Potsdam, presented by Prof. Claus Diessel and Dr. Alan Cook, Nikki proposed a course to be presented in Johannesburg in 2011: Coal Petrology with a Gondwana Flavour (see report in ICCP News No. 53, p 17) (3rd organic petrology training course, 9 – 13 May 2011, Wits, JHB. Alan Cook, Claus Diesel; Figure 1). Organic Petrology Gondwana flavour). Twenty-four delegates registered from 5 different countries (Mozambique, Turkey, Tanzania, Australia, and South Africa). Three microscopes were set-up in the venue for the practical sessions: 1) a Leica DMP4500 interfaced with a J&M spectrolytic system and fluorescence capability; 2) a Zeiss Universal with a digital camera; 3) a Hilgers system on a Zeiss Axiovision with a monochromatic camera.



Figure 1. Attendees and presenters at the 2010 ICCP Organic Petrology Training Course, Johannesburg. Claus Diesel is missing. ICCP Members present: Stavros Kalaitzidis, Nikki Wagner, Retz Taole, Rosemary Falcon, Alan Cook, Johan Joubert.

Nikki is the current Editor of the ICCP Newsletter and has held this position on Council since 2015. The ICCP Newsletter No.1 was published in March 1989 by Prof. Evamarie Wolff-Fischer and Prof. Dr.-Ing. Hans W. Hagemann, followed by Prof. Dr. Monika Wolf and Prof. Dr.-Ing. Hans W. Hagemann (from No.5 to No. 21 in 2000), after which Dr. Peter Crosdale was elected to this position. Having served as editor for an incredible 16 years (!), Peter turned the reigns over to Nikki, following an election. Nikki has edited the ICCP News since No. 63 and is now serving her 3rd term.



Figure 2. Prof. Nikki Wagner, Mrs Itumeleng Matlala, Dr. Marvin Moroeng at the 2023 Organic Petrology Training Course, Patras.

Over the years, many other South African's have joined the ICCP family (Table 1), for shorter and longer periods. Several other organic petrologists in the country are not members but participate in the accreditation programs. **Mrs Sarah Greef** was the inhouse petrographer at Sasol during the 90's, but there is no record of an ICCP membership. **Mr. Johan Joubert** (Sasol) was elected as Associate Member in 2006 and Full Member in 2009 (now inactive) and contributed to several working groups. **Ms. Trudie Britz** (resigned in 2010) and **Mr. Vongani Chabalala** (still an active member) were introduced as Associate Members in ICCP News No. 48 (2009); Dr. Chabalala was elected to full membership in 2015. **Dr. Marvin Moroeng** was elected as Associate Member in 2019, **Mr. Rets Taole** in 2021, **Miss. Itumeleng Matlala** in 2022 (Figure 2), and **Dr. Sanki Biswas** in 2023 (he is a postdoctoral research fellow from India based in South Africa). All these members have trained with Prof. Wagner, and hence, the South African membership of the ICCP remains vibrant.

Table 1. South African ICCP Members.

Name	Surname	Affiliation	Date of membership	Active / inactive
B	Moodie	FRI	1955	Inactive
Willem	Smith	ISCOR	1970's	Inactive
Rosemary	Falcon	Wits / FRL	1982	Inactive
Henrique (Ricky)	Pinheiro	FRL/Univ Porto	1983	Inactive
Henrick	Roux	ISCOR	1988	Inactive
Vivian	Du Cann	NICR/CSIR/SABS /private	1995	Inactive
Nicola (Nikki)	Wagner	FRL/Sasol/Wits/ UJ	2000	Active
Johan	Joubert	Sasol		Inactive
Trudie	Britz	Sasol	2009	Inactive
Vongani	Chabalala	SABS	2009	Active
Marvin	Moroeng	UJ	2019	Active
Rets	Taole	Wits	2022	Inactive
Itumeleng	Matlala	UJ	2022	Active
Sanki	Biswas		2023	active

FRI: Fuel Research Institute; ISCOR: Iron and Steel Corporation of South Africa; Wits: University of the Witwatersrand; FRL: Falcon Research Laboratory (Pty) Ltd; Univ Porto: Universidade do Porto; NICR: National Institute for Coal Research (formerly the Fuel Research Institute); CSIR: Council for Scientific and Industrial Research; SABS: South African Bureau of Standards; Sasol: South African Synthetic Oil Limited; UJ: University of Johannesburg.

Dr. Moroeng and Miss. Matlala are also active TSOP members, bringing the two organisations together on African soil. Miss. Matlala is pursuing her PhD degree and is most grateful for the opportunities the ICCP has provided to date, including attendance to the ICCP Training Course in Patras in 2022, presentation at the 74th ICCP Symposium in Patras, and she received her SCAP accreditation in 2023. Itumeleng is excited to be part of the ICCP family and in the promotion of organic petrology.

With advancement in organic petrography over the years, Profs. Wagner and Falcon, along with Dr. Nandi Malumbazo, updated and expanded the 1986 atlas, with the production of the Southern African Coals and Carbons book, sponsored by Coaltech (Wagner et al., 2018).

In 2002, Africa hosted its first-ever ICCP meeting, making history as the 54th Annual ICCP took a unique "on tour" format. Held between September 22nd and 30th, the meeting spanned two countries: Mozambique and South Africa. The innovative structure saw each ICCP Commission convene in a separate location, starting in Maputo, Mozambique, then travelling to Kruger National Park's Berg-en-Dal camp, and finally ending in Pretoria, South Africa. This format offered ample opportunities for networking and social interaction, which the 32 attending ICCP members greatly enjoyed. (Minutes can be found in ICCP News No. 27). The meeting also provided a platform to recognize the significant contributions of Prof. Falcon, Mr. Smith, and Prof. Snyman to the field of organic petrology in southern Africa. We look forward to extending a warm welcome to our ICCP colleagues again in the near future.

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SPAIN & THE ICCP. A STORY LINKED TO INCAR

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The organic petrology development in Spain is indissolubly linked to INCAR, that was created as an institute devoted to solid fuels as part of the *Instituto Nacional del Combustible* that also had sections for liquid and gaseous fuels. They all were part of the *Juan de la Cierva* Board that gathered institutes devoted to applied science. At that time, there was a clearer splitting between basic and applied science, no longer relevant in present days. In 1977 the *Juan de la Cierva* Board was broken up, and their institutes incorporated into the Spanish National Research Council (CSIC), which became the largest public research institution in Spain.

The incorporation of Spanish representatives to the International Committee for Coal and Organic Petrology (ICCP), named in its origins International Committee for Coal Petrology occurred at the very beginning in the history of the organization. The process was initiated in July 1953, when Prof. Dr. E. Stach, at that time General Secretary of the ICCP, wrote to the director of the recently created (1947) *Instituto Nacional del Carbón* (INCAR) to invite him to represent Spain in the ICCP. The two representatives of INCAR selected to be part of the ICCP were Francisco Pintado Fe, the director of the Institute, and Victor Hevia Rodriguez who became formally members in November 1953. Since that date on, V. Hevia regularly attended the meetings of the ICCP (Figure 1).



Figure 1. 2nd Meeting of the Nomenclature Sub-commission June 1954, Verneuil, France (3rd ICCP Meeting). It was the first meeting attended by Spanish representatives (V. Hevia, 7th in the second row from the left).

According to the introduction of Hevia's PhD. thesis the microscopic study of coal started at INCAR around 1950 and the first studies were carried out by L.R. Pire (Pire and Hevia, 1953) who became the Thesis supervisor of V. Hevia and encouraged him to get in depth in coal petrology methods (Figure 2). Hevia spent two years (1950-

1952) in the University of Lille under Prof. Duparque guidance and when returning to Oviedo established the organic petrology laboratory at INCAR. At that time, in Spain, it was very uncommon to have firm international relationships with equivalent laboratories and also to spend long training periods abroad. V. Hevia was pioneering in both aspects. There, in Lille, he also got in contact with the project of founding the ICCP, and at the same time the promoters of the project knew about the recently created institute dedicated to coal science and technology, which facilitated the incorporation of INCAR representatives to the ICCP at the end of 1953.



Figure 2. Stereoscopic microscope adapted to microphotograph as described in Pire and Hevia (1953) and illustrated by Alfonso. Right: Microphotograph taken with this equipment showing sporinite and vitrinite in a Pas-de-Calais bituminous coal (340x magnification, dry objective).

Indeed, INCAR was listed as one of the few institutions together with Bergbauforschung and Geologisches Landesamt in Germany, CERCHAR in France, INICHAR in Belgium, National Coal Board in United Kingdom and Staatsmijnen in the Netherlands which favoured the foundation of the ICCP as recorded by Noël in his article on the origin of the ICCP and its lexicon (Noël, 1987), also mentioned in the M. Teichmüller contribution to the 50th Commemorative book (Teichmüller, 1998).

Since the very beginning and with very short delay INCAR was incorporating the new technical advances in the optical microscopes always in close cooperation with the information discussed at the ICCP Meetings and also contributed to develop new procedures as a new immersion system **(Figure 3).** Oviedo and INCAR have been maintained as the reference for Organic Petrology in Spain.

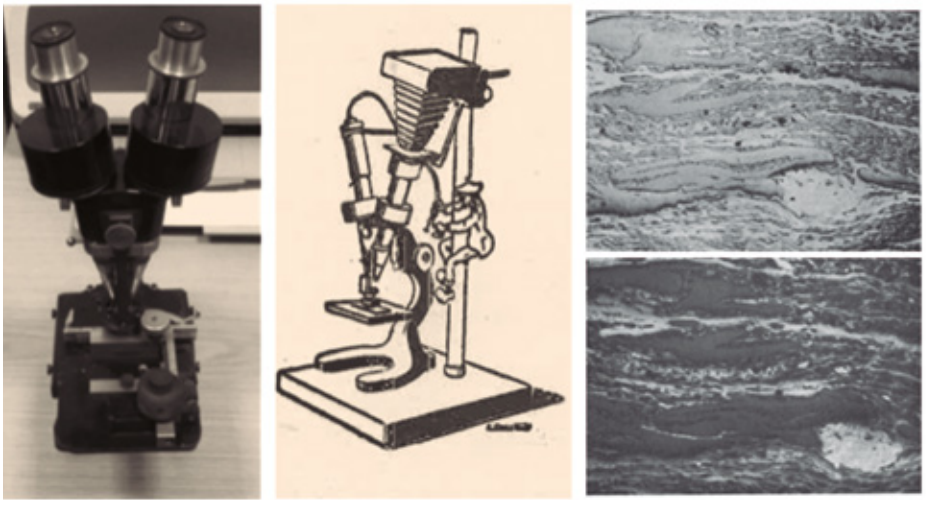

Figure 3. Left: Immersion system developed at INCAR with the corresponding draw of Alfonso appeared in Hevia (1955). Right: microphotographs of a Riosa bituminous coal taken with this device: top (dry objective) bottom (cedar oil immersion) showing macro and micro-spores (340x magnification).

The ICCP Meetings in Spain

In the first five years, the ICCP Meetings were held more than once a year. The first one celebrated in Spain took place in 1955, October 27-29. It was the 4th Meeting of the Nomenclature Commission and the 6th of the ICCP, with the attendance of only 8 participants representing (United Kingdom, Germany, Belgium, France and Spain). The venue was the *Patronato Juan de la Cierva* headquaters close to the location of the CSIC *(Consejo Superior de Investigaciones Científicas)* central services. The venue in Madrid of the first three meetings was on a way part of the INCAR facilities as belonging to the *Juan de la Cierva* Board and more convenient at that time since communication with the north of Spain have been always difficult and only since November 2023 a high-speed train is connecting Madrid with Oviedo.

The next meeting in Madrid, in June 7-10, 1960 (13th ICCP Meeting), counted on more participants with 9 members attending the Analysis Commission created in 1957 at the Meeting in Essen and 14 members attending the Nomenclature Commission. At that time the first edition of the handbook had been released and the Analysis Commision with V. Hevia as secretary was working on preparing the sheets of quantitative measurement of reflectance, analysis of macerals and microlithotypes with the two methods selon-la-ligne (along the line) and point counting using Kötter graticule, all to be published as an annex to the Glossary. The Nomenclature Commission discussed on the concept of rank and coal and the classification of coal in addition to conciliate the Russian and American nomenclatures with the one recently published in the Handbook. This was also the first meeting attended by J.J.G. Prado.

The 19th ICCP meeting was the 3rd time that the community of international petrographers got together in Spain, Madrid **(Figure 4).** It took place in 1966, between the 17th and 21st of October. At that time the second edition of the handbook had been published (ICCP, 1963) and the discussions focused on the sheets of the huminite macerals, the subdivision of vitrinite, and the description of inertodetrinite and liptodetrinite. In 1966 the first results based on microphotographs were presented. This was an exercise organised by Hagemann in which four pages photomosaic were prepared with 220 fields marked in each of them in order to identify low rank macerals. This approach has been later used in many of the working groups of the ICCP with excellent results.



Figure 4. Group photo of the 19th Meeting of the ICCP in Madrid, 1966.

The year 1983 was the fourth time that an ICCP meeting was held in Spain and in this occasion the venue was in Oviedo **(Figure 5).** It was the 36th ICCP Meeting and the dates were 5-9th September. Most of the discussion sessions were held down town in the Bank of Bilbao's conference room and the microscopy session was held at INCAR.



Figure 5. Group photo at the Cloister of the University of Oviedo. 36th Meeting of the ICCP in 1983.

In 1983, the ICCP was already structured in three Commissions. The main discussions in Commission I were dealing with standardization of both reflectance and fluorescence analysis, automation was coming into play and working groups on transitions vitrinite-resinite and vitrinite-inertinite were in operation. Also, lignite microlithotypes and lithotypes were under definition and the working group to microscopically identify coal oxidation presented the final conclusions which were later published in the Journal of microscopy (Prado, 1977). As part of the unfigured liptinite WG in Commission II a first version of the Bituminite and optical analysis of bitumen sheets to be included in the handbook were presented (ICCP, 1993). The samples being analysed within the MOD round robin analysis were MOD 27-29 (Irati and Puertollano oil shales), samples which had been a headache in Commission II until very recently (Borrego et al., 2006). Commission III was working on the preparation of the sheets for hydrogenation and liquefaction residues and a topic which has been maintained over the years as reactivity of inertinite was already under discussion. The meeting ended with a fieldtrip to the Jurassic of Asturias coastal sediments **(Figure 6).**



Figure 6. Left: Claus Diessel, Eva Marie Wolff-Fischer and Zuleika Correa da Silva at the cathedral square in Oviedo in 1983; Right Marie-Therese Mackowsky and Zuleika Correa da Silva sitting on the outcrop with dinosaur footprints in the Jurassic Coast of Asturias during the fieldtrip in 1983.

The 1994 meeting in Oviedo **(Figure 7)** will be always linked to the history of maceral nomenclature because it was at this meeting when the final structure of the classification of vitrinite (ICCP, 1998), inertinite (ICCP, 2001), huminite (Sykorova et al., 2005) and liptinite (Pickel et al., 2017) was approved. The so called ICCP system 1994 that was replacing the previous Stopes-Heerlen system presented in the handbook (ICCP, 1963, 1971, 1975, 1993).



Figure 7. Group photo at the INCAR entrance in Oviedo. 46th Meeting of the ICCP in 1994.

V. Hevia was elected Honorary Member of the ICCP and A. Davis was awarded with the Reinhardt Thiessen Medal. This year a modification of statutes was voted and although the support in favour of modification was massive (31 to 1), it was postponed due to the lack of agreement on the interpretation of the two thirds. Should be two thirds of voting members or two thirds of whole full membership? This is now clarified in the modification of the statutes approved in 2023. In 1994 the single coal accreditation program was also launched and participants in the round 1993-1994 got their provisional certificate. The fieldtrip went to see the Stephanian coal basins in Teverga.

The next meeting in Oviedo was the 60th ICCP Meeting and for the first time in Spain it was a joint meeting with TSOP **(Figure 8)** that met at the Auditorium Principe Felipe **(Figure 9).** ICCP training activities were a significant issue for discussion and this activity was selected to be coordinated by the Vice-president. Registration was also discussed and a it was agreed to put to vote the jurisdiction in which ICCP should be registered. The new layout of the webpage was presented at the meeting indicating the facilities and possibilities and the need to fill of content the various sections in particular those of the WGs. This year the Organic Petrology Award went to A.G. Borrego.



Figure 8. Group photo at the front of the Auditorium Príncipe Felipe in Oviedo. 60th ICCP Meeting and 25th TSOP Meeting in 2008.

Main topics for discussion in Commission I were about the need of incorporating the term degradinite within the liptinite and the possibility of using solid resin for sample preparation, a method to be added into the ISO standard. Commission II was already working on the Atlas and Classification of dispersed organic matter projects that are now being finalized. Within Commission III inertinite in combustion WG (convened by A. G. Borrego) finalised its activities and a new WG was created to work on Identification and Petrographic Classification of Components in Fly Ashes convened by I. Suárez-Ruiz and B. Valentim (Suárez-Ruiz et al., 2017). The fieldtrip went again to the coastal Jurassic sediments and included a visit to the Jurassic Museum of Asturias (MUJA).



Figure 9. Images of the 2008 Meeting in Oviedo. Left: stand for microscopy where the Hilgers system was exhibited: Carl Hilgers with some observers (the Biegs, W. Pickel). Right a General view of the audience.

This year (2024) we are assisting to the 75th ICCP meeting again in Oviedo. I wish you all a fruitful meeting and I expect lively and productive discussions which have been the norm within the ICCP. The fieldtrip this time will be visiting the black shale formations of the Carboniferous. So, we alternate coast and mountain in our meetings.

The ICCP Members from Spain

The first members of the ICCP from Spain were as mentioned F. Pintado Fe and V. Hevia-Rodriguez **(Figure 10),** the first one as director of INCAR organized the hosting of the early meetings in 1955 and 1960 and supported the attendance of INCAR reasearchers to the ICCP meetings. The effective participation in the Commissions of Nomenclature and Analysis was through V. Hevia. He had a relevant role in the preparation of the methodological sheets of the handbook as secretary of the Analysis Commission that was chaired by M.-Th. Mackowsky. Because of this contribution he became an honorary member of the ICCP in 1994 **(Figure 11).** V. Hevia worked in technical improvements specially in aspects dealing with immersion objectives (Hevia, 1955, 1960) and the optical indicatrix of uniaxial and biaxial substances (Hevia and Virgos 1977). He was the founder of the Organic Petrology lab at INCAR, which has been the reference for Organic Petrology in Spain.

J. González Prado incorporated to INCAR in 1963 **(Figure 11).** He was both chemist (1951) and geologist and student of the third promotion of geologist egressed from the University of Oviedo (1965). Although he was participating in earlier meetings of the ICCP, Prado became formally a member in 1966 and took over the leadership of organic petrology lab at INCAR in 1987.



Figure 10. Members of the ICCP from Spain and also members trained in Spain who became members of the ICCP (Name and period of ICCP membership). Year and location of the ICCP Meetings held in Spain. Image following the design of the front cover of the ICCP News 44 prepared by Peter Crosdale.

Prado attended regularly the ICCP meetings and participated in many working groups of the ICCP but his contribution as convener of the Oxidation of Coal WG was particularly relevant (Prado, 1977). He also worked actively in the development of automated systems for maceral analysis. His system was particularly elegant in the recognition of maceral shapes when most of the systems focused just on the grey level reflectance (Catalina et al., 1994). Prado was well-known for asking intriguing questions at the meetings some of which remain unsolved nowadays. He was awarded the Reinhardt-Thiessen Medal in 1998 and became Honorary Member of the ICCP in 2001 **(Figure 12).**



Figure 11. Left: Victor Hevia with Ivonne Sommers and Boris Alpern at the 34th ICCP Meeting in Pau, 1981, France. Courtesy of Manuel Lemos de Sousa. Right: Zuleika Correa da Silva, Manuel Lemos de Sousa and Javier G. Prado at the 50th Meeting in Porto, 1998, Portugal. Courtesy of Deolinda Flores.



Figure 12. Javier G. Prado receives the Thiessen Medal from the President Manuel Lemos de Sousa at the Meeting in Porto in 1998. From Left: Manuel Lemos de Sousa and Javier G. Prado Courtesy of Manuel Lemos de Sousa.

Prado formed a school to which I. Suárez-Ruiz and myself belong since we both developed our PhD Thesis under Prado's supervision.

Suárez-Ruiz started her contact with organic petrology working with Jurassic black shales (Suárez-Ruiz and Prado, 1995) to then expand to many other basins in Spain (i.e. Alastrue et al., 2001; Colmenero et al., 2008; Piedad Sánchez et al., 2004; Ribeiro et al., 2016) and out of Spain (Izart et al., 2012; Julia et al., 2015). She has been a very active member of the ICCP for many years in which she has convened the WGs in Commission III dealing with coal blends and Fly-ash classification (Suárez-Ruiz et al., 2017), the white paper on dispersed organic matter and classification of dispersed organic matter in Commission II and has been part of the handbook editorial group in Commission I. This variety of subjects are in consonance with the broadness of her interest in the different topics of organic petrology from the applied aspects of organic petrology witnessed by the books she edited (Suárez-Ruiz and Crelling, 2008; Suárez-Ruiz and Mendonça Filho, 2017; Suárez-Ruiz et al., 2019), through palaeoecological and thermal history of conventional and unconventional resources (Suárez-Ruiz et al., 2012), to organic petrology as forensic tool for environmental applications for highlighting some of them (Suárez-Ruiz et al., 2023). Her contributions to organic petrology made her to deserve the Organic Petrology award of the ICCP in 2006 and the John Castaño award of TSOP in 2021.



Figure 13. Left: Image from the ICCP Meeting held in Kolkata, India, 2014 (From Left Polla Khanaqa, Magda Misz-Kennan and Isabel Suárez-Ruiz). Right: A session of Commission III at the Oviedo Meeting 2008 (From Left Chair-Isabel Suárez-Ruiz and Secretary-Georgeta Predeanu).

An extraordinary contribution to the ICCP was her leadership for 13 years of the Coal Blends Accreditation Program. Isabel has been in Council for eight years as Chair of Commission III **(Figure 13).** She has been strongly involved in training activities both within the ICCP teaching in the Industrial applications of organic petrology course and as Thesis supervisor of students who later became members of the ICCP as Amalia Jimenez Bautista, Noe Piedad Sánchez (Mexico) and Rolando Carrascal Miranda (Peru), who have participated in various WGs within Commission I and II. Amalia regularly attended the meetings between 1994 and 2001. Isabel is nowadays responsible of the organic petrology laboratory at INCAR and She has established liaison through internship periods with Orleans (France), Carbondale in Illinois and Lexington in Kentucky Universities (USA) and have solid cooperation links with many international groups.

R. Menéndez **(Figure 14)** got in contact with the ICCP during her stay (1987-1989) in the Northern Carbon Research Laboratories of Newcastle upon Tyne where she had the opportunity to be trained in some aspects of organic petrology in the nearby Newcastle Research Group in Fossil Fuels and Environmental Geochemistry leaded by D.G. Murchison.



Figure 14. Left: Rosa Menéndez takes office as President of the CSIC at the Central Headquaters of CSIC. The event was chaired by the Minister of Economy, Industry and Competitiveness, Luis de Guindos, and was attended by the Secretary of State for Research, Development and Innovation, Carmen Vela. Right: Rosa Menéndez with the Mayor of Oviedo Alfredo Canteli below street name plate in the street dedicated to her.

She became a member of the ICCP at the meeting in Aachen in 1988, the first one she attended. Menéndez's contact with organic petrology have been always through industrial applications, coke and char petrology as part of the performance of coal upon carbonization and combustion. Accordingly, Commission III was her main area of activity from which she was first Secretary (1997-2000) and then Chair (2000-2007). These were also the topics she was dealing with when she took over the leadership of the organic petrology laboratory of INCAR in 1992 (Vleeskens et al., 1993). Around 2000, R. Menéndez focused on carbon materials and carbon composites, field in which she has developed a successful research career (i.e. Sierra et al., 2016; Roldan et al, 2011; Granda et al., 2014; Alvarez et al., 2012). Rosa has reached the highest responsibilities at CSIC becoming the first lady being President of the largest research public institution in Spain with over 14,000 workers. Her merits have been also locally recognized naming a street in Oviedo with the name of Rosa Menéndez **(Figure 14).**

D. Alvarez was R. Menéndez's first PhD student with a thesis on relevance of char structure in the combustion process determined through image analysis techniques (Alvarez et al., 1997). His contributions to describe char structure and optical texture are recognized as relevant in various reviews on this topic (Alvarez et al., 1997, 1998; Borrego et al., 1997). This was also the research topic to which I incorporated when returning from a three years post-doctoral stay in Germany **(Figure 15).** A number of students carried their PhD Thesis having as central topic the structure of char as intermediate in the combustion process (Alonso et al., 1999; Milenkova et al., 2003; Méndez et al., 2003; Alvarez and Borrego, 2007; Borrego and Alvarez 2007). D. Alvarez became member of

the ICCP in 1994, and was very active for over 10 years in Commission III as convener of the Combustion WG together with Ed Lester from Nottingham University (Lester et al., 2003) and attended regularly the meetings in the period (1994-2007; Figure 15). He also contributed to aspects of organic petrology as the volume-to-weight transformation of coal blends (Alvarez and Borrego, 2005).



Figure 15. A group of attendees to the ICCP Meeting in Rio de Janeiro in 2000. First row from left to right: Alan C. Cook, Cristina Rodrigues, Angeles G. Borrego and Rosa Menéndez. Second row: Raphael Javier, Diego Alvarez, Ricky Pinheiro and Walter Pickel.

The convenorship of the Inertinite in combustion WG **(Inertinite in Combustion | ICCP (iccop.org))** that I was holding since the reactive inertinite WGs focused on combustion in 1995 also can be framed in this research line. A classification based on fusibility of macerals was developed and also a training material, which is available from the webpage. Also related to industrial application of organic petrology is the work of M. Díez, another senior researcher of INCAR, whose research career has been linked to properties of coke (Diez et al., 2002, 2007, 2017; Diez and Borrego 2013; Flores et al., 2017). She has also participated actively in coke petrology and carbon materials WGs for many years. Lily Beth Méndez Forero (Colombia) became member of the ICCP during her PhD training under R. Menéndez supervision.

I started my involvement with ICCP in 1993 and Chania (Greece) was my first meeting. I travelled to Chania from Aachen where I was doing a postdoctoral stage with a Marie Curie grant of the European Union. Since that year I only missed one meeting in 1999 in Bucharest. There in the organic petrology lab of the RWTH Aachen, I got in contact with many petrographers worldwide that passed interim periods there. My first responsibilities within the ICCP were as convener of the inertinite in combustion WG, although soon (1999) I assumed the convenorship of the Qualifying Vitrinite for Reflectance WG (Borrego et al., 2006). These two topics exemplify the main focus of my research over the years: relationships between organic petrology and geochemistry in organic sediments, both fossil (Borrego et al., 1996; Borrego et al., 2018) and recent (López-Dias et al., 2013), and plastic properties of macerals upon coal utilization (Borrego et al., 2000; Guerrero et al., 2013). The Qualifying WG has been active for seven years producing a well-cited publication and a CD with training material **(Qualifying Vitrinite for DOM Reflectance Analysis | ICCP (iccop.org)).** This activity coincided with my period as Secretary of Commission II (1999-2002).

Later as Chair of the same Commission (2003-2007), I committed myself to review the work done in Commission II over the years (Borrego, 2009) and made it available through the webpage on an easy to find form comprising the

samples which have been analysed over the years in microscopy tests **(DOMVR and Component Identification Results on microscopy samples in Commission II of the ICCP | ICCP (iccop.org)).** This is an on-going project. As Chair of this Commission, I had the privilege to assist to the initiation of the DOMVR Accreditation Program in 2006 which was coordinated by Alan C. Cook and also to organize the coordination of the three accreditation programs which were active in the three commissions as Chair of the Accreditation Sub-Committee.



Figure 16. Leave-taking of Angeles as president of ICCP with the entire Council at the end of the Meeting in Patras, 2023: From left: Paul Hackley, Stavros Kalaitzidis, Nikki Wagner, Angeles G. Borrego, George Siavalas, Dragana Zivotic, Magda Misz-Kennan, Sandra Rodrigues, Joan Esterle, and Jolanta Kus.

At that time, I didn't know that the sudden loss of Alan Cook in 2010 will bring me into the organisation of the DOMVR Accreditation Program for eight years. I have been in Council a total of twenty-seven years **(Figure 16).** I remember with fondness and emotion the eight years as General Secretary during Petra David presidency and I hope I have been of use to the ICCP as President **(Figure 17).** I feel particularly proud of having re-installed the formal liaison with ISO TC27/SC5 **(Figure 18)** that will review in the forthcoming years the ISO7404 standards for petrographic analysis of coals.



Figure 17. At the Meeting in Potsdam 2015: Last year of Petra David as President (right) and of Angeles G. Borrego (Left) as General Secretary before initiating her first term as President in 2016.



Figure 18. Attendees to the TC27 Coal and Coke ISO Meeting in Delft, The Netherlands in 2023, where the ICCP was represented by Angeles G. Borrego (ICCP President).



Figure 19. Images of personnel working in the organic petrology lab at INCAR in different periods. Those unpixellated are the technical staff at that time: 1990: Felix Díaz García, Manuel Rodriguez Fernández and Cristina Fernández Amado; 1997: Luis Fernández González and José Ramón Montes Sánchez; 2008; Juan Villanueva y José Ramón Montes Sánchez; 2016: Dionisio Luis García; 2023: Carmen Niembro.

The laboratory at INCAR would not have been the same without the enthusiastic work and support of the technicians **(Figure 19).** They provided nicely polished blocks for the petrographic work and were proficient in coal petrographic analysis. The most recent persons occupying this position also became members of the ICCP (J.R. Montes and D. Luis) and successfully participated in SCAP (Single Coal Accreditation Program) and CBAP (Coal Blends Accreditation Program). Carmen Niembro has recently incorporated to the laboratory and has applied for associate membership and actively participated in the organization of the 75th ICCP Meeting in Oviedo.



Figure 20. Two images of the ICCP Courses in which Angeles G. Borrego participated as trainer in Potsdam in 2017 and in Patras in 2022.

The training activities in the ICCP courses have brought a lot of fun. It has been for me a privilege to teach the Dispersed Organic Matter Course with João Graciano Mendonça Filho after having had the sad and challenging task of replacing Alan Cook. João and myself changed not much the content but the structure of the course to make more integrated the transmitted and reflected light. We kept this structure with Carolina Fonseca last year. It has been also a pleasure to teach the General Organic Petrology Course with Claus Diessel and Walter Pickel in Potsdam and later with Stavros Kalaitzidis and Nikki Wagner in Patras, the sad part in the course in Patras was that Walter was no longer with us. I have great memories of every course both at the venue in Potsdam, Germany and at the most recent venue in Patras, Greece **(Figure 20).**

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THE NETHERLANDS: THE DIMINISHED GLORY OF ICCP'S CRADLE. IS IT ALL OVER?

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Introduction

The Netherlands has been one of the most important countries in the history of ICCP, particularly before and during the early years of the organization. Except for being both the founding place (1951) and host of the first ever meeting in 1953, the country is also known amongst organic petrographers for the first maceral classification. The Stopes-Heerlen System was finalized and approved in Heerlen, in 1935, well before the foundation of ICCP. The country can rightfully claim the titles of birthplace and cradle of both ICCP and the first maceral classification adopted by petrographers for nearly 60 years until its modification by the ICCP System-1994.

Except for locations that hosted several pivotal meetings, the country also provided numerous influential individuals, who often served as officers in the ranks of the organization, helping setting the foundations and shaping what ICCP has become today, through technical excellence, development of nomenclature and standards and inspired leadership. The accounts of the early years of the Committee are given in great detail elsewhere (Nöel, 1987).

This article attempts to give a brief overview of the activities that took place in the country of the Netherlands and culminated in the foundation of ICCP but also of the Committee's activities in the country from the first historical years to the modern era. The first author of this article is the last active ICCP member residing in the country and even though his tenure in ICCP counts 20 years already, this period is still very short compared to the history of the organization. Therefore, the article is a result of recollections from old reports, historical archives and newsletters and not that of personal experience or memories. As such, it may contain inaccuracies or information that others may recollect differently. Should readers wish to have a more personalized view of those accounts they are encouraged to perform their own search in the archives cited here and references therein. The same applies to the search for photographic material from the first ICCP meetings hosted in the Netherlands as none is reproduced here.

The role of the Netherlands in the genesis of the International Committee for Coal & Organic Petrology

The province of Limburg, covering parts of NE Belgium and the south of the Netherlands (Province of Zuid Limburg), is one of the oldest coal mining regions in the World in post-medieval years. Historical archives indicate that coal mining in the area was taking place since the 16th century through the activities of the local Abbey of Rolduc. First industrial scale mining activities commenced in 1870 and gradually increased in the first half of the 20th century in order to meet growing energy demands. Coal mining in the country was at its apex in the 1920s with 13 underground mines in the Lower Carboniferous Basin of Limburg (Figure 1). Coal mining was hampered by the great recession and the Second World War but after the end of the latter, it boomed again until the mid-1950's (van Wanrooij, 2021).

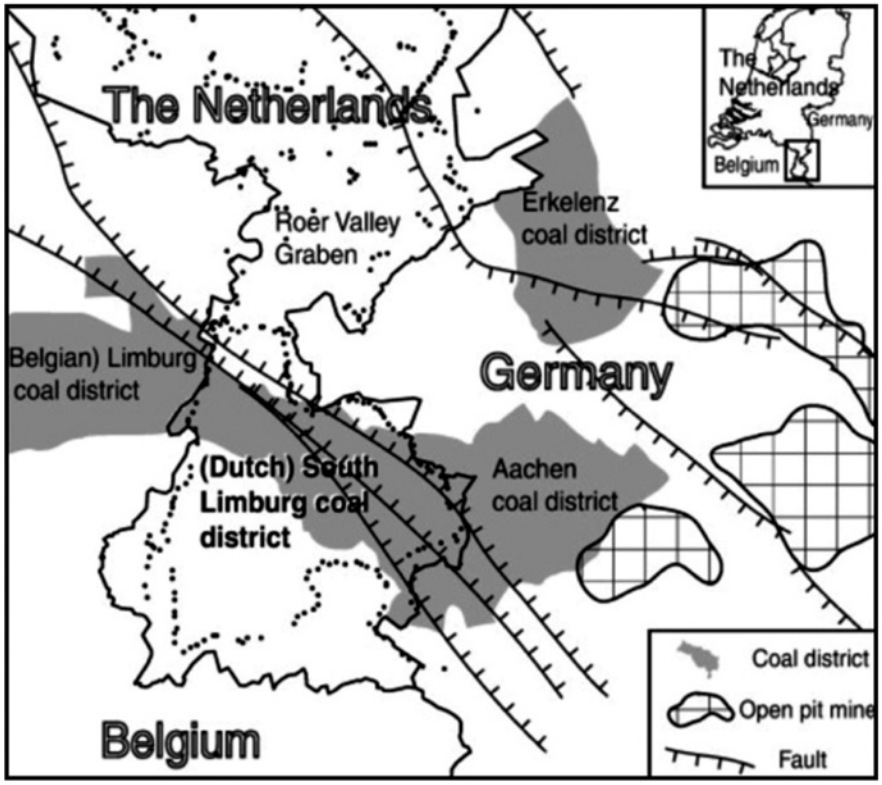

Figure 1. The Lower Carboniferous coal basins in the Netherlands and the neighbouring countries of Germany and Belgium (TNO, 1999; Cuenca et al., 2013).

The post-Second World War mining boom resulted in the foundation of the Centraal Laboratorium Staatsmijnen (Central Laboratory of the Dutch State Mines) in Geleen, an important research centre in the country. At the same time and for the same reasons, institutes of similar importance were founded in several other European countries including the Bergbau-Forschung (Essen, Germany), INICHAR (Liege, Belgium), CERCHAR (Verneuil, France), INCAR (Oviedo, Spain) and BCRA (Great Britain), together with the establishment of petrology laboratories in national geological surveys (Alpern, 1998). This resulted in the formation of several groups working on the subject of coal petrology and inevitably in turn, in the need to adopt a common technical language as a means of mutual understanding, thus setting the foundations of internationalisation of coal petrology.

Because of the state-of-the art facilities and research that was taking place in the Dutch Geological Survey and the Central Laboratory at Geleen (see **https://www.demijnen.nl** for photographs of the facility) between the 1920's and the 1960's, as well as the proximity to their Belgian and German counterparts in Liege and Essen, respectively, Heerlen and its immediate surroundings was the hosting location of multiple important international conferences on the subject of coal science. Admittedly, the most pivotal among them for ICCP and the broader community of organic petrology were the 2nd and 3rd Congresses of the Stratigraphy of the Carboniferous in 1935 and 1951, respectively, both held in Heerlen. The former was the very historic meeting where the Stopes-Heerlen system was agreed to be adopted, while in an evening session organized during the latter, a Round Table Conference with the title "The Future of Coal Petrography", the representatives of the different countries in the International Committee of Congresses on Stratigraphy of the Carboniferous approved the creation of a separate entity that would be responsible for more frequent meetings on the subject of Coal Petrology. This entity would be named International Committee of Coal Petrology (van Krevelen, 1997).

After two years of preparation, the first meeting of the newly formed ICCP would take place in June 1953 in Geleen, at the facilities of Centraal Laboratorium. Representatives of 10 countries, including the Netherlands were invited, and the organizer was Prof. Dr. D.W. van Krevelen (Nöel, 1987). The objectives of this first meeting included the composition of a glossary of coal petrography, the comparison of results between analysis on thin sections and polished specimens of coal, the theoretical background of Dr. Seyler's observations on the relationship between optical reflectance of vitrinite and rank, and the organization of future meetings. It is evident that the objectives of this first meeting largely shaped not only the fundamentals of coal and organic petrology but also the workflows that modern day petrologists follow. The meeting was attended by 15 ordinary members

and 11 guest members, and Professors R. Potonié and E. Stach were elected as president and general secretary, respectively. The rest, including multiple ICCP meetings that would be hosted in the Netherlands between 1958-2019, is history.

Table 1. ICCP Meetings hosted in the Netherlands.

Date	Meeting number	Location	Host Organization
1953, June	1st	Geleen	Central Laboratory of the Dutch State Mines
1958, September	11th	Heerlen	Central Laboratory of the Dutch State Mines
1964, September	17th	Hoensbroek	Central Laboratory of the Dutch State Mines
1996, September	48th	Heerlen	Dutch Geological Survey
2003, September	55th	Utrecht	National Institute of Applied Geoscience-TNO
2019, September	71st	The Hague	Royal Dutch Shell

ICCP Meetings in the Netherlands

Except for the inaugural 1953 meeting, the Netherlands has hosted ICCP meetings on 5 more occasions (Table 1, Figure 2). The 6 total times that the country has hosted an ICCP meeting ranks 3rd in all time history, only behind Germany which has hosted a meeting 9 times and Spain with 7 times (including the 75th meeting of 2024). Moreover, the Netherlands together with the neighbouring provinces of Limburg in Belgium and North Rhine-Westphalia in Germany have hosted a combined 17 ICCP meetings (Figure 2), 11 of which took place until 1971, during the early years of the organization. The fact alone that one of ICCP's greatest milestones the International Handbook of Coal Petrology (ICCP, 1971), was the result of the activities carried out between 1953-1971, highlights the importance of those 11 meetings hosted in a piece of land covering an area not larger than the urban Bay Area in California (24,000 km^2).

The 11th overall ICCP meeting, but only the third formal plenary meeting, was hosted again in the birthplace of Heerlen (1958), with 74 attendees from 21 countries (van Krevelen, 1997). The meeting was primarily dominated by the activities of the Nomenclature Commission and of the then recently formed Analysis Commission (Smith, 1998). It was also the first meeting during which the two sister committees of ICCP and MCIP (international committee for palynologists) would present their reports in a joint session of the Carboniferous Congress (Alpern, 1998).

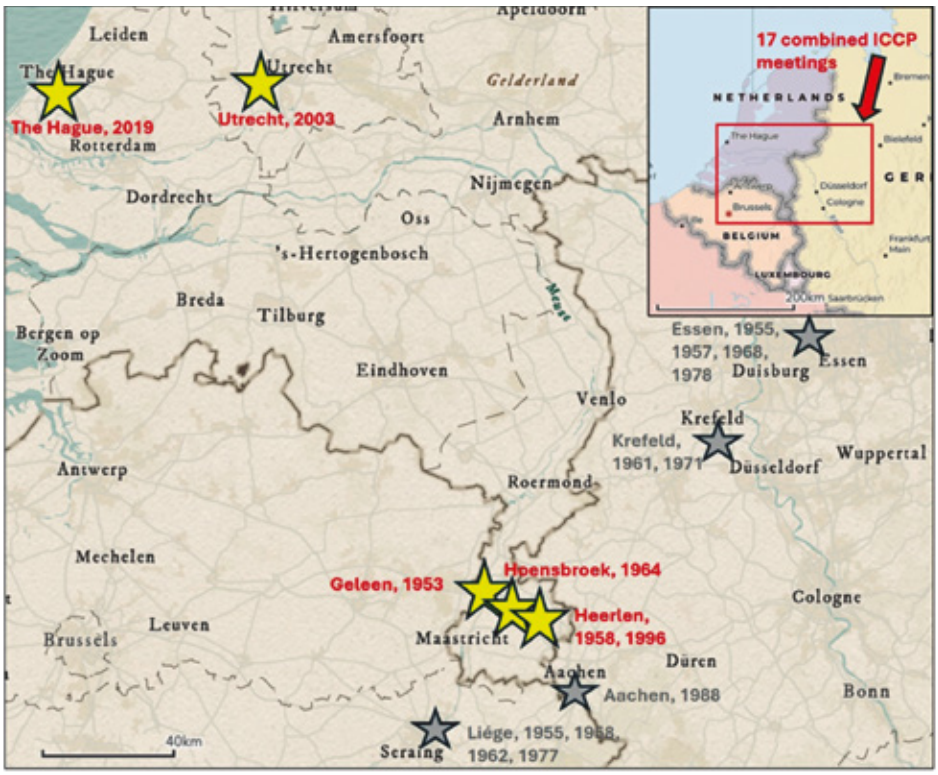

Figure 2. Map showing the locations of the host places of ICCP Meetings in the Netherlands (yellow stars), combined with those in the neighboring provinces of Limburg in Belgium and North Rhine-Westphalia in Germany (gray stars).

The third time the Netherlands hosted a plenary ICCP meeting was in 1964, in Hoensbroek, a small town right between Geleen and Heerlen, the important coal science centres in the country. The activities and discussion revolved around microlithotypes and low rank coal macerals of the liptinite and inertinite groups, the techniques of reflectance measurements, a series of round robin maceral analysis results and how to differentiate reactive from inert inertinite (Davis, 1998). In that article Alan Davis quoted that “some things change, but others remain the same even after thirty-four years”. Today, one could argue that those “other things” remain the same even after sixty years.

There would be a gap of thirty-two years until the Netherlands would host another meeting in 1996. And that would be again in the area of *Coriovallum* (Roman Fortress in the vicinity of Heerlen), the Leather Valley, as the name translates from Latin. It was no coincidence that it took such a long time for one of the founding and most influential countries in ICCP’s history to host a meeting again. In 1965, one year after the Hoensbroek meeting, the Dutch Government announced the plan to completely terminate coal mining following the discovery of the giant Groningen gas field. The last mine closed its shafts in 1976 and the facilities in Limburg were slowly decommissioned. To this date, very few buildings remain in the area as relics of the once glorious past of coal mining and associated research **(https://www.demijnen.nl).** However, despite the decline of the coal business in the country, another sector would rejuvenate the dynamics on the discipline of organic petrology. The application of its techniques in the field of hydrocarbon exploration during the 1970’s and the discovery of oil and gas fields in the country, both onshore and offshore, led to the demand for more analysts. The two leading organisations, hosting groups of organic petrologists, were the National Institute for Applied Geoscience (TNO) generating a huge amount of organic petrographic data **(https://www.nlog.nl/en/boreholes)** and Royal Dutch Shell.



Figure 3. Willem Fermont (standing) during the Utrecht meeting, 2003. Photo courtesy of A.G. Borrego.

Coal geology (and petrology) was re-activated in 1981, when the Dutch Government initiated a program for assessment of remaining coal reserves in the Netherlands. Between 1983 and 1985, 6 wells were drilled in Limburg, Gelderland and Overijssel. The characterization of the coals was mainly done at the Dutch Geological Survey in Heerlen. The organic petrographical and (later) organic geochemical characterization of the coals were performed by Willem Fermont and his colleagues. In this period, Willem joined the ICCP and attended several meetings (Figure 3). After the coal program was finalized, he started to build the organic geochemical laboratory. In 1992 Petra David joined his laboratory. In 1997 the Geological Survey became part of TNO and the organic geochemical laboratory was moved to Utrecht. Willem left TNO and activities were continued by Petra David and Harry Veld.



Figure 4. Group photo of the 1996 Meeting in Heerlen.

The 1996 meeting was attended by 54 members and 15 guests from 23 countries **(Figure 4).** In the meantime, during the one third of the century between this and the last meeting in the country in 1964, the structure of ICCP had changed to resemble more what it is today with the three Commissions and the various working groups specialized on specific aspects. The full minutes of that meeting were published in ICCP Newsletter #14 (1996). One of the 'highlights' of the meeting was the attendance of Dick van Krevelen. Besides that, Marlies Teichmüller (1998) remembers the social events of the Heerlen meeting: the conference dinner at the old Hoensbroek Castle and an "Invitation to Willem Fermont's farm".



Figure 5. Willem Fermont (right) and John Vleeskens (middle) during the Utrecht meeting in 2003.

Two more meetings of the modern era would follow in Utrecht (2003; Figure 5), hosted by TNO and in the Hague (2019, Figures 6, 7 & 8), hosted by Royal Dutch Shell, interestingly enough the two leading organizations on the field of hydrocarbon exploration in the country. The full minutes of those meetings can be found in ICCP Newsletters #30 (2003) and #75 (2019), respectively.

Distinguished Individuals

This section contains honourable mentions to individuals who have been instrumental for the foundation and development of the ICCP not only through their leadership, vision and technical contribution, but also for their long-tenured voluntary service in the working groups and officer positions of the organization. It is impossible to list all of the past members associated with the country of the Netherlands either Dutch nationals or foreigners working for a Dutch-based organization, and the authors apologize upfront for omissions, which are rather the result of ignorance than a deliberate act of downplaying an individual's contribution.

- **Dr. W.J. Jongmans,** Director of the Dutch Geological Survey and organizer of the 1st and 2nd Congresses on the Stratigraphy of the Carboniferous in 1927 and 1935, in Heerlen. Visionary of an independent entity dedicated to organic petrology.
- **Dr. A.A. Thiadens,** Director of the Dutch Geological Survey, successor of Dr. Jongmans, and organizer of the 3rd Congress on the Stratigraphy of the Carboniferous in 1951, in Heerlen, where the proposal for the foundation of ICCP was approved.
- **Prof. Dr. D.W. van Krevelen,** Director of Research at the Central Laboratory of the Dutch State Mines, Professor of Chemical Technology at the Technical University of Delft. Founding member of the ICCP, organizer of the 1st ICCP meeting in Geleen, in 1953.



Figure 6. The meeting venue of the 2019 meeting in the Hague. Photo courtesy of A.G. Borrego.

- **Dr. R. Schwab,** Royal Dutch Shell. Long-tenured ICCP member (active), former Honorary Treasurer and Returning Officer.
  Dr. P. David, TNO. Long-tenured ICCP member (active), served over two decades as member of the ICCP council, holding among others the General Secretary (2000-2008) and President (2008-2016) positions.
- **Mr. K. Kommeren,** Royal Dutch Shell. Long-tenured ICCP member (retired), member of the Accreditation subcommittee.
- **Dr. John Vleeskens**, Netherlands Energy Research Foundation ECN, Petten, mainly active in Commission III and Combustion W.G. He attended regularly the meetings in the 80s-2000s and was elected Honorary member in 2004.
- **Dr. Willem Fermont,** Dutch Geological Survey, mainly active in Commission II, convened a working group on Basin Modeling and Secretary of Commission II in 1995.



Figure 7. Microscope session during the 2019 meeting in the Hague. Photo courtesy of A.G. Borrego.

Current Status and Future Insights

Similar to the mid-1960s announcement of the termination of coal mining in the country, the signing of the Paris Agreement by the Dutch Government in 2015 and the subsequent Carbon Net Zero commitment for institutes and companies brought a new wave of moving away from the study of fossil fuels and the exploration for new resources. Production and exploration for hydrocarbons has reduced rapidly (the recent closure of the giant Groningen gas-field as the most prominent example). Important institutes such as universities and research centres transformed themselves and reoriented their research goals to alternative energy sources and net zero strategies. This has reduced the demand for organic petrology on the research front as well in the oil & gas industry. The first author of the article is the last active ICCP member associated with the country, and one of the very few persons to practice organic petrology in the Netherlands. Does it mean that it all slowly goes to the end?



Figure 8. Group photo during the field trip of the 2019 Meeting. Visit to one of the few mining facilities in the province of Limburg in Belgium (Blegny Mine). Photo courtesy of A.G. Borrego.

Despite the diminishing shine of the once glorious past, the discipline of organic petrology in the country of the Netherlands has seen at least two cycles of peaks and troughs over the last century. The development of new organic petrology techniques and their application in the disciplines of New Energies, Nature-based Solutions and Net Zero strategies, including among others the microscopic study of biochar, flyash and the thermal modelling for geothermal energy, has the potential to rejuvenate the demand for microscopy analysis of organic matter once again, potentially leading to the growth of a third generation of domestic organic petrographers. The scope of the analysis might be completely different to what it was some 75 years ago when it all started, but the principles and tools will remain the same. The near future will tell whether this is coming to an end or to a new beginning. In any case, it is the hope and aspiration of the authors that it will not take another third of a century before one more meeting is held in the birthplace and cradle of the International Committee for Coal and Organic Petrology.

Acknowledgements

The authors are grateful to Angeles G. Borrego, for the invitation to contribute to the special occasion of a commemorative book and for kindly providing photographic material from the Utrecht and The Hague meetings. Special thanks to Hemmo Bosscher (Shell Global Solutions Int.) for reviewing the article.

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ICCP AND HISTORY OF COAL PETROGRAPHY STUDIES IN TÜRKIYE

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The geological evolution of Türkiye allowed the formation of peatlands during the Late Carboniferous in NW Anatolia and particularly, throughout the Cenozoic in western, central, and eastern Anatolia and throughout Thrace. Although the Tethyan Ocean covered the majority of the Turkish territory, peat-forming environments were developed in limited areas during the Jurassic in NE Anatolia. Hence, the majority of the coal resources of Türkiye are mainly located in the Mio-Pliocene sequences in western and central Anatolia, the Oligocene sequences in Thrace, and the Late Carboniferous sequences in NW Anatolia (Figure 1). The recent exploration data of the General Directorate of Mineral Research and Exploration (MTA) shows that the total coal resources of Türkiye are c. 21 Gt. The coal deposits are mainly exploited by Turkish Hard Coal Enterprises, Turkish Coal Enterprises, and several private companies for electricity generation, domestic heating, and supporting the cement and steel industries. The share of local and imported coals is still high (36.3 % of electricity generation) in the Turkish energy sector; therefore, coal exploration is still ongoing in various Cenozoic sedimentary basins, and interest in coal petrography data has increased in the last decades.

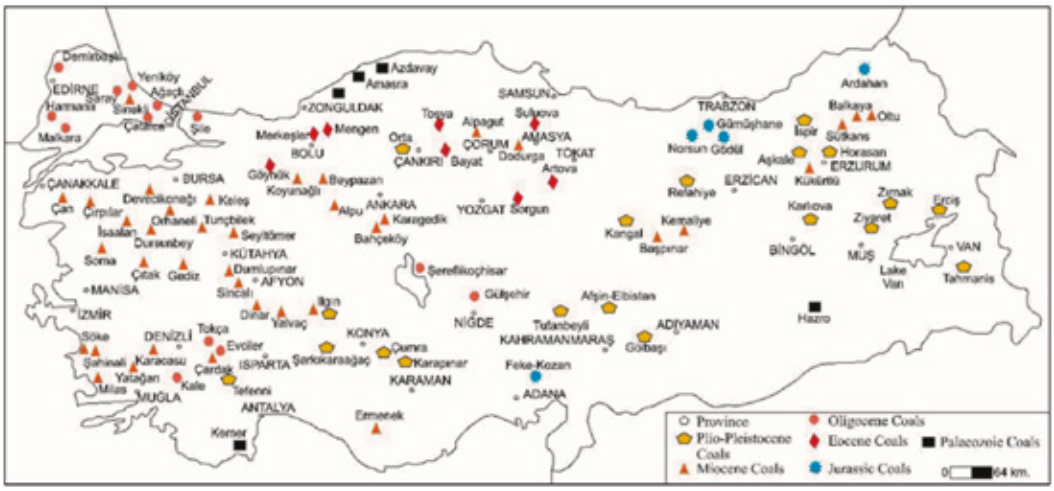

Figure 1. Important coal deposits of Türkiye (after Oskay et al., 2019).

Although the early coal mining activities commenced in late 1800s from Late Carboniferous coal seams in the Zonguldak Basin (NW Anatolia), and in early 1900s from Middle Miocene coal seams in Söke Graben (W. Anatolia), coal petrography studies have been started in mid 1950s. Fatma Samime Artüz conducted the earliest coal petrography studies during her PhD thesis at İstanbul University (Artüz, 1959). This PhD dissertation focused on the palynological and petrographical features of Late Carboniferous coal seams (Alimolla, Sulu, and Büyük seams) in the Zonguldak Basin. After her PhD studies, Dr. Artüz gave coal petrography classes at İstanbul University and made several correlations for Late Carboniferous coal seams in the basin in combination with palynological and coal-petrography data until her retirement (e.g., Artüz, 1963, 1971, 1974). Besides Dr. Artüz's studies between the 1960s and 1970s, Dr. Rezzan Doğru also focused on the petrographical features of some Turkish coals during her PhD studies at Hacettepe University. She has published two fundamental studies about

maceral compositions of Tunçbilek, Seyitömer, Çan, and Elbistan coalfields (Doğru and Gökçen, 1980; Doğru et al., 1988); furthermore, the contributions of Drs. Monica Wolf, Alec F. Gaines, and Yuda Yürüm were also remarkable in understanding Turkish Cenozoic coals' petrographical and chemical features during this time.

At the beginning of the 1980s, Dr. Ali İhsan Karayiğit began focusing on the petrographical features of Miocene Bahçeköy (central Anatolia) during his MSc studies (Karayiğit, 1983) and the Late Carboniferous coal seams in the Zonguldak and Amasra coalfields during his PhD studies at Hacettepe University in Ankara (Karayiğit, 1989). After finalizing his PhD thesis, Dr. Karayiğit established a coal petrography laboratory at Hacettepe University. In addition, he consulted on steel factories in Türkiye for establishing coal-petrography laboratories during the late 1980s and early 1990s. He published highlighted studies on the petrographical features of thermally affected coals in western Anatolia and the characterization of Turkish feeding coals in power generation (e.g., Karayiğit, 1992, 1998; Karayiğit and Whateley, 1997; Karayiğit et al., 2000). In addition, during this period, Dr. Selami Toprak did his post-graduate studies on coal petrography. His MSc studies at the University of Pittsburg focused on petrographical features on Late Carboniferous coal seams in the Zonguldak Basin (Toprak, 1984), while he conducted petrographical analyses on Miocene Alpagut-Dodurga coals during his PhD studies at Hacettepe University (Toprak, 1996). Dr. Toprak contributed by establishing the coal-petrography laboratory at MTA, published the first overview of Turkish Cenozoic coals and performed coal-petrography analyses in several coal exploration studies on Turkish Cenozoic coals until his retirement (e.g., Querol et al., 1999; Toprak, 2009; Toprak et al., 2015). Moreover, Dr. Zühtü Batı also used coal-petrography data in his PhD dissertation focused on palynoflora from the Oligocene coal-bearing Danişmen Formation at Middle East Technical University in Ankara (Batı, 1996).

The most productive period for Turkish coal-petrologists started in the late 1990s and early 2000s due to increased interest in domestic fossil fuel resources. The majority of these studies were led by Drs. Karayiğit and İnaner. During this period, Drs. Emine Sütçü-Cicioğlu, Yılmaz Bulut, Rıza Görkem Oskay, and Zeynep Büçkün also conducted their post-graduate studies on the petrographical features of various Turkish Cenozoic low-rank coals. As a result, several studies have been published dealing with coal petrography, geochemistry, and mineralogy of Turkish Cenozoic low-rank coals, and these studies also combined coal-petrography data with paleontological, sedimentological, and mineralogical data of coal-bearing sequences (e.g., Bechtel et al., 2014, 2016; Bulut and Karayiğit, 2006; Büçkün et al., 2015; Çelik et al., 2017; Karayigit et al., 1997, 2017, 2018; Oskay et al., 2016; Tuncer et al., 2023).



Figure 2. Current ICCP members from Türkiye (from www.iccop.org).

Even though coal-petrography studies in Türkiye date back to the late 1950s, the majority of coal petrography studies addressed Hacettepe University and MTA, with researchers from the Dokuz Eylül University in Izmir also made contributions during the last decade. Several coal technology labs of Turkish steel companies also have coal-petrography microscopes; however, they mostly perform ordinary petrography analysis for metallurgical coke. Up to date, no ICCP meeting has been held in Türkiye, but there are 5 ICCP members from Türkiye **(Figure 2).** They have presented their studies at several ICCP Annual Meetings (e.g., 57th, 69th and 74th). Recently, Drs. Karayiğit, Oskay, and Akbulut remain active in providing coal petrography courses, supervising undergraduate and postgraduate theses in coal and organic petrography, and performing scientific research.

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A CONTRIBUTION FROM THE UK

Ed Lester

University of Nottingham, UK.

The UK is similar to many countries that were fortunate enough to have large coal reserves insomuch as it was able to use them to build the country that it is today. In the 1920's the coal industry in the UK employed over 1 million people (my own family were Derbyshire coal miners). The journey to this point has involved coal mining, beneficiation and utilisation and significant amounts of coal research to underpin it's effective use, including coal petrography. Various centres of excellence for coal research have existed in the UK for the longest time including Newcastle, Sheffield, Cardiff, Imperial, Leeds and Nottingham. This is not an exhaustive list and not all worked with petrography directly, but I can say there have been three UK Reinhardt Thiessen Medallists from the UK. As members know, this is the highest honour offered by the ICCP and recognizes "significant achievements and outstanding contributions in the fields of coal and organic petrology".

- 1956 Dr. Clarence A. Seyler
- 1987 Prof. Dr. Duncan G. Murchison
- 1990 Dr. A. Harold V. Smith

Clarence Seyler 1866(!)-1959 was born in London but worked in South Wales for almost 50 years developing fundamental understanding in of coal properties moving into microscopy early in the 20th Century using oil immersion lenses developed by Kuhlwein and Stach. Seylers coal chart remains a key contribution to coal science mapping out the relationship between coal rank, CV and C/H ratios.

Duncan Murchison (Figure 1) 1928-2013 was based in the northeast of England, in Newcastle. He moved from Durham University after finishing his PhD with Stanley Westoll and published his first paper on vitrinite reflectance in 1958. How important is this subject to petrographers, so many years later?

Harold Smith (Figure 1) 1923-2023 won the Thiessen Medal in 1990, just one year before I met him for the first time. This would have been just into his retirement, although (like most petrologists/academics) he didn't really retire. Harold Smith lived in Sheffield with long standing roots around South Yorkshire and Wath. One of his specialisms was Palaeozoic palynology and he still enjoyed an emeritus relationship with Sheffield University where he'd had a long-standing collaboration. I will be forever grateful for training me in coal petrography in 1991.



Figure 1. Duncan Murchison and Harold Smith at the ICCP Meeting in Aachen 1988 (Harold never seemed to age!).

Three of us travelled from Nottingham to Sheffield for a week to be trained in petrography. It was an invaluable experience, but I'm ashamed to say I did struggle to stay awake in an afternoon session in paleobotany, which was heavy going. He also made an interesting comment about how petrographers exist all over the world and their style of analysis tends to follow their 'teacher'. This was a particularly important observation at the time. With the rise in coal imports into the UK for the power stations highlighted how different petrographies in steam coals could be. It was now critical to understand what types of 'inertinite' was actually inert. That said, he didn't seem to be particularly interested in these low rank high volatile coals, unless they had interesting spores in them, and (even then) only if they were reasonably fluorescent. He must have trained a lot of petrologists over the years, one of the most notable being Pam Alexander.

Alan Cook (1935-2011) also won the Thiessen medal in 1996. I'm not sure if Alan would have allowed me to 'claim' him - as he was born in the UK - but lived in Australia from the late 1950's. I met Alan at several ICCP meetings and he still had a semi-British accent, as well as a love of Monty Python. From this first meeting, he decided to call me Teddy, although I never knew why.

The ICCP has always been a prolific organisation in terms of meeting together on a regular basis- which is a healthy sign on how active its members are. Harold Smith notes in his review from 1998 that hosting organisation generally funded these meetings in the early days. The ICCP was hosted 5 times in the UK - London 1956, 1959; Sheffield, 1967; Newcastle upon Tyne 1976; Doncaster 1986.

Notable British contributions to the life of the ICCP include Duncan Murchison serving as President of ICCP (1979-1983), as did Alan Cook and Alan Davis. The UK has provided some great petrographers over the lifetime of the ICCP but it's clear that they have a habit of leaving and settling elsewhere. Alan Davis and Alan Cook both 'upped and left' for the USA and Australia, respectively. As far as I know Harry Marsh remained in the UK, but was also well known and he had a long-standing love affair with Spain. Migration wasn't all one way, however. The UK did manage to 'acquire' Rudi Schwab many years ago. Rudi Schwab (Figure 2) served as Treasurer for many years, as did Duncan.



Figure 2. Nikki Wagner and Rudi Schwab in 2023 at the joint TSOP/ICCP meeting in Greece.

I first joined the ICCP at the start of the 1990's **(Figure 3),** mainly through a collaboration with Rosa Menendez and the highly successful INCAR group. Diego Alvarez **(Figure 4)** was at a similar stage in his PhD and working on a similar field i.e. trying to understand how coal characteristics (including petrographics) linked to combustion. We spent several years collaborating, with exchange visits. One particular visit to Oviedo combined with the 1995 ICCS&T meeting, which was really well attended and well-funded. I remember that there was also a lot of fine Spanish wine marinating the event.

This point, in the early 90's, felt like the birth of the Digital age, moving away from 35mm slides and film-based photography. Megapixel cameras and colour image analysis was developing rapidly making microscopy and the capture of images much easier. It was this point where we met Judy Bailey at a Commission III workshop, who had created a comprehensive and excellent char classification system to describe the complexities of chars produced from all types of coal. 30+ years on, this has never been bettered. It had 16 types with an additional division between isotropic and anisotropic, making 32 types in total. Diego and I took over as joint convenors for the working group on Combustion. We worked on how to simplify it (to give mere mortals a chance). Despite reducing the number of types down to three, it was still difficult to get good agreement between participants. In the end, Diego and Angeles Borrego captured some incredibly high-quality images (170 in total). This gave a really interesting opportunity to share the images on CD (which was just becoming an established technology). This was a game changer, not least because there was no question about what the operator was looking at. Everyone was looking at the same thing! With over 20 participants from around the world, we managed to find decent levels of agreement in terms of identification of char types, and this helped establish a char atlas, that served as a training tool for new analysts. Each operator performed the task of identification and then sent back a simple data file back for analysis. However, Diego and I kept a secret from the analysts. The program did record their answers- as the analyst pressed classification buttons- but it also recorded how long the analyst took to make a decision. By analysing the data and isolating the 'correct' from 'incorrect' answers, there was a clear trend that operators took (on average) twice as long to make an incorrect decision compared to a correct decision. As with most psychology studies, this outcome seems quite obvious and logical, but it was interesting to see that time was an indicator that the analyst was struggling. These days, in the age of AI, there is perhaps scope for a microscopy system that monitors progress during training or an analysis, and steps in to help make decisions (perhaps by offering options or comparative images?).



Figure 3. Dirk Prinz and Ed Lester sharing some ICCP gossip in Utrecht 2003.



Figure 4. Diego Alvarez (in Utrecht in 2003) looking distinctly unconvinced by something during a field trip.

This step forward was only possible with the many participants in that pivotal exercise for Commission III and it established a good footing for future work in the combustion space. At the end of the 1980's the national 'scene' was changing dramatically. Whilst thermal coals in the UK were relatively predictable, and similar to steam coals from Poland and other northern hemisphere nations, the Central Electricity Generating Board was privatised and split into two countries – National Power and PowerGen. This kick appeared to accelerate the demise of coal mining in the UK once it became clear that coals from overseas, including South Africa, Australia, Colombia and Russia were much cheaper to import. This created an interesting challenge for coal petrographers who had spent much time analysing just UK coals, which were relatively predictable.

Number of petrographers in the UK over time has no doubt decreased although it's not possible to know exactly how many remain. With a quick scan, there are over 100 petrographers accredited to SCAP at the moment, with members from all over the world. Alas, only one appears to be in the UK. So far this year, there have been no papers from the UK mentioning macerals at all.

As mentioned at the start of this article, the UK coal industry employed more than a million people 100 years ago. By the 1980's this number had dropped to 200,000 but 40 years on, this number is closer to 200-300. The picture isn't entirely clear since there are still two large steel producers in the UK and, until recently, both were making their own coke. Tata Steel is now moving towards electric arc furnaces, and British Steel only import coke from overseas, so the decline in coal/coke use continues. In addition, Ratcliffe on Soar is the last remaining coal fired power station in the UK at 2000MW and this is due to close at the end of 2024. In the last 15 years or so, biomass has replaced coal (at most modifiable power stations that previously burned coal), although this path has been far from smooth.

That said, and rather unexpectedly, a new coal mine recently appeared to be in development in Cumbria, with low volatile bituminous coal, fit for steel making. This has been a distinctly controversial opportunity with many arguing for less imports from Australia by using local coal, but others pointing out that coal should just stay in the ground, regardless.

Two observations to close this report. Harold Smith noted in his review in 1998 that he wondered if anyone would provide a new review in 50 years time. 25 years have passed since his wonderful commentary on the founding and growth of the ICCP. This overview marks the halfway point, but I have doubts that someone will follow this up in 25 years time. Only time will tell. Secondly, I've noticed how many coal petrologists appear to live long and successful lives, some living almost as long as some of the specimens that they put under the microscope. I do wish such a long life to all members of the ICCP!.

INVOLVEMENT OF THE USA WITH THE ICCP

Alan Davis

Emeritus Professor Penn State University.

The United States has been involved with the ICCP since its inception when Dr. Gilbert Cady of the Illinois State Geological Survey and B.C. Parks of the US Bureau of Mines attended the inaugural meeting in 1953. Three ICCP meetings have been held in the USA: 1979 in Urbana, IL **(Figure 1);** 1992 in University Park, PA; and 2016 in Houston, TX.

One of the early classifications of the petrographic constituents of coal was that of Reinhard Thiessen at the Bureau of Mines based upon the study of thin sections. This classification came to be regarded as the U.S. or American system and was in use until the Stopes-Heerlen maceral terminology based upon the European use of polished samples became generally accepted.



Figure 1. Group-photo 32nd ICCP Meeting, 1979, held in Urbana, IL (USA).

The pioneering role played by Thiessen in our science was recognized by the ICCP when it created a medal in his name to be awarded for significant achievements and outstanding contributions in the fields of coal (and subsequently also organic) petrology. The Reinhardt Thiessen Medal was first awarded in 1956. Recipients from the United States have been Gibert H. Cady in 1963, William Spackman in 1984, Alan Davis in 1994, Ralph J. Gray in 2000, James C. Hower in 2003, John C. Crelling in 2007 and Maria Mastalerz in 2020 **(Figure 2).** Maria was also the first recipient of the Organic Petrology award created in 2003 to acknowledge significant contributions to this science at an intermediate state of career. Paul C. Hackley received this award in 2019.



Figure 2. US Recipients of the ICCP's Reinhardt Thiessen Medal and Organic Petrology Award.

William Spackman of Penn State University developed a classification system for macerals in the late 1950s. In it, he considered that each of the conventional maceral terms really represented a suite of materials of varying chemical and behavioral properties reflecting their extent of metamorphic change during coalification. Although this system subsequently dropped out of use, a modified version was employed within a major system of coke strength prediction, as described below, and is still in use. In 1980 Spackman became the founding editor of the International Journal of Coal Geology, a journal in which many articles referencing ICCP research and by individual ICCP members were published.

Spackman's notable ability as a communicator led to his selection as Chairman of the Nomenclature Commission in 1964. During his time in this role, work was begun on the creation of a new edition of the ICCP Handbook of Coal Petrology (ICCP, 1963).
Two entries for new maceral names were contributed to the new Handbook by Paul Lyons of the US Geological Survey; they were for the inertinite macerals funginite and secretinite, which were accepted for inclusion in 1999 (ICCP, 2001).

In 1971 the so-called MOD-Group (for Dispersed Organic Matter) was established as a new Commission; Commission II eventually became referred to as the Application of Coal and Organic Petrology to Geology,

including the Prospecting for Oil and Gas. The first Secretary of this Commission was Neely Bostick of the Illinois Geological Survey and later the US Geological Survey. Bostick distributed a broad suite of rock samples containing various types of organic matter to interested parties for study and analysis, and then assembled and reported on their results (Bostick and Pawlewicz, 1984). This early effort has since expanded into a wide range of working group activities including the Dispersed Organic Matter Vitrinite Reflectance Accreditation Program.

Beginning in the late 1950s, a major focus of petrographic studies was on the behaviors of coal during coking. A method of predicting coke strength was published in 1961 by Ralph Gray and Norman Schapiro of the US Steel Corporation. It employed a variation of the classification of macerals proposed by Spackman mentioned above, but in which the vitrinite was broken down into V-types based upon their level of reflectance. Such calculations, some incorporating further modifications, became used worldwide in the steel and associated industries. Another method of predicting coke strength using petrographic data was published by Louis Benedict, Richard Thompson and others of Bethlehem Steel Corporation in 1968; in it, an allowance is made for the poorer caking properties of "pseudovitrinite," which is visually distinguishable from other vitrinite. The ICCP's Commission II currently has a Working Group concerned with the nature and properties of "pseudovitrinite".

The Penn State University played a role in conducting the exercises beginning in 1993 which led to the ICCP's Single Coal Accreditation Program. Also, exercises conducted within the Coal Blends Working Group using samples circulated and evaluated at Penn State beginning in 1995 (Davis, 2000) provided the basis for the formation of a Coal Blends Accreditation Program.

Following research at Penn State University into the microscopy of residues produced during coal hydrogenation, a number of terms for such materials were accepted for the ICCP Handbook in 1993. The Liquefaction Residues Classification Working Group has continued to review this terminology.

From the mid-1950s until the 1980s American coal petrologists were meeting as an informal group which finally became known as the North American Coal Petrographers. It was this group that seeded the creation of The Society for Organic Petrology. Many petrologists in the USA were skeptical that their professional needs were best met by the ICCP; its perception as a Eurocentric organization and of having a time-consuming emphasis on nomenclature were factors in this. So, whereas the ICCP has 22 US members at the time of writing, TSOP has slightly more than twice this number. The two organizations have held joint meetings and their overall objectives are very similar. The worldwide spread of venues for ICCP meetings compared to the early years and the breadth of nationalities in its membership demonstrates that it is no longer Eurocentric. The terminologies, classifications, analytical methods and reports of the ICCP are available for all, members and non-members alike.

I hope that the foregoing record has demonstrated that US petrologists and the ICCP have a clear history of mutual support.

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Chapter 5

MEMBERS CORNER

MOST LOYAL NON-MEMBER

Julito Reyes

Natural Resources Canada/Geological Survey of Canada.

It was in Victoria British Columbia, Canada in 2007 where I first attended an ICCP meeting. However, as member of the organizing committee, I never fully experienced all the proceeding as I was preoccupied with assisting fellow attendees. It was in Oviedo Spain in 2008 where I first truly experience the full scope of an ICCP meeting **(Figure 1).** The exchange of thoughts and ideas during committee meetings and the application Organic Petrology through the symposiums. The Oviedo meeting is also where I made my first oral presentation in a room full of people smarter than me. That is why Oviedo Asturias Spain will forever be etch in my memory. Since then, I have been attending ICCP meeting almost every year, with a few breaks here and there. I also participate in accreditation program, committees, working groups, and Round Robin exercises. However, unbeknownst to most member, I am not an ICCP member. Nevertheless, I am one of the most active non-members of the ICCP, more so than most ICCP member. I am proud to say that I finally became an ICCP member in 2023 **(Figure 2).** Thanks to the encouragement and support of *Dr. Angeles G. Borrego* and *Dr. Petra David* whom, after knowing them for more 17 years, I now consider friends.



Figure 1. Julito Reyes in the centre in animated discussion with Hamed Sanei (Left) and Thomas Gentzis (Right) at the 2008 Meeting in Oviedo.

Over the last seventeen years, I have learned lot from every person that I conversed with while attending the ICCP meetings, be it while drinking coffee during breaks, listening to exchange of thoughts and ideas in the committee meetings or while attending the symposiums. First, they were fellow attendees, then they became

colleague and over time they became friends. Because of ICCP, I now have colleagues and friends from around the globe, not to mention, I am little bit smarter. I want to wish you all good health and a bright future, wherever you may be. And to ICCP, Happy 75th Anniversary, I wish you the very best as you traverse into the new era clean energy and environmental responsibility.



Figure 2. From left to right, Henrik Petersen, Dirk Prinz and Julito Reyes toasting the success of the Meeting at the 2023 Conference dinner in Patras and maybe also welcoming Julito in the ICCP Membership.

PERSONAL REFLECTIONS ON ICCP

Paul C. Hackley

U.S. Geological Survey, Reston, Virginia, USA.

Thank goodness the meeting is held in English! My first attendance to an ICCP meeting was in 2005 encouraged by Deolinda Flores and Dave Pearson whom I had met at USGS in Reston and at Pearson Coal Petrography in Sophia, respectively. Coming to the meeting in Patras (my second trip abroad), I was worried about all kinds of things related to the travel—but knowing that the meeting would be in English was a reassurance. Of course, the travel was flawless, and the meeting was …. interesting. I suppose as a typical reaction to one's first attendance to ICCP, I had simply no idea what these strangers were arguing about. I'd heard rumors that the ICCP meetings were like this, and it lived up to the expectation—a lot of drama about (what seemed like) nothing. At least there was no shouting at my first General Assembly—that wouldn't come until later. And at least the shouting has always been in English! Should the ICCP conduct their meetings in other languages (as I understand was done in the past) I wouldn't be able to participate.

After being a part of ICCP for 19 years, I've almost come to accept that the progress comes at a glacial pace. This was another rumor I'd heard about the ICCP—all this discussion way down in the weeds about silly details and, still, nothing ever happens. It's not quite that way, but sometimes it feels so. What I have come to accept is that the ICCP has a particular charge which cannot be rushed: formulating and maintaining a global uniform terminology for sedimentary organic matter, standardizing its analytical techniques, and finding the resolution for common problems. And this charge is accomplished through volunteer working groups whose members also have day jobs. Thus, the slow pace. More than once, I've thought I could see the clear way to a resolution of nomenclature or method and then have felt the frustration of watching the organization consider yet another adverse opinion … and the delay continues. Thus, the occasional shouting. But there is occasional shouting in families, and that is what the ICCP is: a family of friends and colleagues who care deeply about the science of organic petrology and who meet to discuss its rules, definitions, and methods. And those rules, definitions, and methods are provided for all the world to use, and they are used by the organic petrology community, and that is why the work cannot be rushed.

Despite the delays, some elements of progress occur accidentally. For example, in Patras in 2005 there was an extensive discussion of the formal registration of ICCP, with the pros and cons of registration in different countries debated. To me, this was an interesting discussion because I was peripherally involved in the incorporation of TSOP (which was finalized from 2008-2010). But this conversation about registration was still ongoing in ICCP a decade later with no progress. At one point, the Council dropped the item from its agenda only to have it returned by protest from the General Assembly. At last, to see the ICCP become a registered organization in Australia, albeit accidentally, and by virtue of the need for the treasurer to keep the accounts legally.

To be successful as a contributor to ICCP, I found the solution was to adapt my official work duties to be in alignment with the objective of a working group (WG). Or vice versa. For example, the aim of the Identification of Thermal Maturity Relevant Organic Matter WG is to provide guidelines for identification and reflectance measurement of the thermal maturity relevant population in dispersed organic matter. And my work duties include a task named 'standardization,' with the objective to improve reliability of petrographic measurements of thermal maturity, including reflectance and fluorescence of sedimentary organic matter. Easy, right? Likewise, another of my official work duties labeled 'thermal indices innovation' focuses on utilization of correlative microscopy and spectroscopy techniques for innovative approaches to advance thermal indices development. And the Confocal Laser Scanning Microscopy (CLSM) WG of ICCP investigated use of CLSM-based fluorescence spectroscopy as a thermal proxy.

Some favorite moments from attending 13 meetings over 19 years: my lovely wife (then girlfriend) Nadine joining for a holiday after the 2005 Patras meeting in the Grecian countryside **(Figure 1A, B);** the floppy eared bunnies on the Victoria UBC campus in 2007 and the curry that Paddy made in our graduate student dorm **(Figure 1C).**

Rooming with Alan Cook on the Porto meeting fieldtrip in 2011–we were kept awake until the wee hours by the nearby festival-goers, who then followed the field trip the next morning on their motorbikes. Imagine standing on the outcrops straining to hear the fieldtrip leader speak while 100 motorbikes roar past. And once the motorbikes were past, there was the foghorn ….

Drinking the bar out of beer with Walter and others at the 2012 Beijing meeting **(Figure 1D).** Beers after touring the Tyskie bottling plant and brewery during the 2013 Poland meeting and dancing at the family dinner **(Figure 1E).** Celebrating my birthday with my ICCP family during the Commission II meeting in Potsdam in 2015 **(Figure 1F)** and, again, in a Romanian tavern during the 2017 meeting fieldtrip **(Figure 1G).** The Run in the Parks at the 2018 meeting in Brisbane, and the bar-hopping after the fieldtrip before fireworks on the river. There is a theme here – the 2019 meeting was actually held in a tavern **(Figure 1H)** at The Hague. And then in 2023 back to Patras where it started for me **(Figure 1I).** The best part of ICCP is the family of friends I've made over the last 19 years and the opportunity to make new friends at each new meeting. See you soon, friends!



Figure 1. A-B. Touring the Grecian countryside with Nadine. C. With Paddy Ranasinghe, Mike Avery, and Alan Cook in Victoria. D. The end of the evening in Beijing. E. Dancing in Sosnowiec. F. Blowing out the candle in Potsdam. G. Birthday in Romania. H. The ICCP meets in a bar in The Hague. I. Cultural tour to Mycenae.

REMINISCENCES OF ICCP'S PAST

Dave Pearson and the Pearsons

David E. Pearson & Associates Ltd. #105 4343 Tyndall Avenue,
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My first ICCP was in 1979 at the University of Illinois campus in Champaign Urbana. It was the first meeting held outside of Europe and was well attended by a mainly coking coal crowd. Although I was a neophyte petrographer, I was in the company of other newly recruited Canadians trained by Claus Diessel, Duncan Murchison, and other pillars of the science, so I was accepted into the inner sanctum. The plenary session filled a large hall, and at the front were, Murchison, M-T Mackowsky, Alan Davis, and other luminaries. I felt comfortable in obscurity at the back of the room. My other recollection was of the presentation of the Reinhardt Thiessen Medal to Hacquebard.



Figure 1. At Diessel's House in Wollongong, 1990. Claus and Louise received at his home the attendants to the Wollongong Meeting.

Several years later Jen and I attended the 1990 Wollongong meeting (Figure 1), important for establishing the ICCP Accreditation program during the Commission III and closing Plenary, and proximity to Non-recovery coke ovens at Port Kembla. The two-day field trip was led by Claus Diessel, and was memorable because of the Newcastle earthquake debris, but at an open cast mine in the Upper Hunter Valley, kangaroos were wandering about the site! Our late arrival at the motel in Pokolbin left only 30 minutes to shower and change before wine-tasting at the adjacent vineyard. Liberal imbibement caused many of us to forget bags of purchased

Hungerford wines which we left behind in the French restaurant. Marlies Teichmuller shared her table with Jen and I that evening, but the following day hurried arrangements were made by Claus to recover the wine from the closed restaurant!

The 1991 Porto Alegre meeting was also memorable for the field trip. This was a Caipirinha-infused visit to an UNDP-funded underground drift mine where the owners switched on the lights for us to see the 1-foot seam!

At the 1993 Chania meeting, we forgot to attend many of the sessions because of the weather. Nevertheless, at the Conference Dinner Alan Davis presented Jen and I with a traditional Cretan embroidered loaf of love bread, *gamokoulouro,* because someone discovered that day was also our 25th wedding anniversary. The well preserved three-decade loaf is shown in Figure 2.



Figure 2. Loaf of bread – ICCP 25th wedding anniversary gift! At the Meeting in Chania (1993).

The Limburg Mining Museum was the location of the ice-breaker at 1996 Heerlen meeting. To the delight of all delegates Professor Dirk van Krevelen joined us to enjoy beer from the small Dutch beer glasses.

Rich Pearson's first ICCP was 2007 Victoria meeting, at which his mother, Jen was voted as the third ICCP Honorary Treasurer succeeding Duncan Murchison and Rudi Schwab. The meeting was at the University of Victoria campus, Rich's alma mater. At the meeting, Jack Crelling from Carbondale, Illinois, was awarded the Thiessen Medal, and the symposium was held in honour of fellow Canadian, Fari Goodarzi.



Figure 3. From left: Dave Pearson with Alan C. Cook and Alan Davis at the Utrecht Meeting, 2003.

Of the twenty or so ICCP meetings that we attended we met many delightful organic petrographers and these are just a few of the recollections of interactions with other delegates. Doubtless, now that Rich is more involved in the affairs of ICCP, you'll see more of his dance moves!



Figure 4. Two Pearson's generations at the ICCP Meeting in Potsdam 2015. From left Rich, Jen, Dave (all Pearson) and Paddy Ranasinghe focused on a very relevant topic: Beer tasting.

COOPERATION WITH ICCP SINCE 2004

Hilgers Technisches Buero

Hilgers Technisches Buero e.K., Hauptstrasse 82,
53639 Koenigswinter, Germany.

Hilgers Technisches Buero (Figure 1) maintains a long-lasting and fruitful relationship with the ICCP. Representatives of the company have been participating regularly in ICCP Meetings since 2004 and Carl and Britta Hilgers have become members of the organization.



Figure 1. Logo of Hilgers Technisches Buero company.

The company has been also providing support and sponsorship for the training activities developed by the ICCP. Table 1 contains the ICCP Courses in which Fossil system was available for the practical training. Some images of the courses with Hilgers' staff is shown in Figure 2.

Table 1. Participation of Hilgers Technisches Buero in the practical sessions of the ICCP training courses on different topics.

Date	Location	Course
2009-06	Potsdam	1st General Organic Petrology
2010-06	Potsdam	2nd General Organic Petrology
2011-06	Porto	4th Dispersed Organic Matter
2012-06	Brisbane	5th General Organic Petrology
2013-06	Potsdam	6th General Organic Petrology
2014-06	Potsdam	7th Dispersed Organic Matter
2015-06	Potsdam	8th Organic Petrology for Industrial Applications
2016-06	Potsdam	9th Organic Petrology
2017-06	Potsdam	10th Dispersed Organic Matter. Integrating transmitted and reflected light microscopy
2019-06	Potsdam	13th Organic Petrology and its Applications

Table 2 shows the contributions through presentations and talks to the ICCP meetings since 2004 showing the main developments in the Fossil system.

Table 2. Participation of Hilgers Technisches Buero in different activities in the ICCP Meetings since 2004.

Meeting		**Presenter**	**Type of Contribution**
Hungary, Budapest Greece, Patras	2004-09 2005-09	Carl Hilgers	Talk: Software Diskus „Fossil“ Microscope Leica DM LA, motorized monochrome camera
Canada, Victoria	2007-08	Carl Hilgers	Microscope used for the microscopy session Software Siskus „Fossil“ Microscope Leica DM 4000, motorized monochrome camera
Spain, Oviedo	2008-09	Carl Hilgers	Microscope used for the microscopy session Talk: Software Diskus „Fossil“ Microscope Leica DM4000, motorized with structured LED, fast autofocus, with motorized polarizer
Brazil, Gramado	2009-09	Carl Hilgers	Talk: Microscope Leica DM4000, motorized with support of Prof. Kalkreuth **new:** calibration standard with NG1-Black-Reference; **new:** LED for fluorescence with DM4000
Serbia, Belgrade	2009-09	Carl Hilgers	Microscope used for the microscopy session Microscope Zeiss Axio Imager M2m motorized
Portugal, Porto	2011-09	Carl Hilgers	Support ICCP Training course on Dispersed Organic Matter Talk: Microscope Leica DM4000, motorized **new:** two cameras monochrome for measurements, color for fluorescence
Poland, Katowice	2013-08	Carl Hilgers	Microscope Leica DM4000, motorized
The Netherlands, The Hague	2019-09	Carl Hilgers	Participation in the Meeting
Greece, 2023-09, Patras	2023-09	Britta Hilgers	Microscope used for the microscopy session and for a pre-meeting short course Talk: Microscope Leica DM4000, motorized **new:** Walters-Lamp, only one camera for measurements and fluorescence



Figure 2. Left: Image of the practical session during the 2019 Course in Potsdam with Carl Hilgers behind the screen doing a demonstration of Fossil system work. Right: Britta Hilgers during her presentation at the meeting in Patras 2023.

ICCP-FOREVER, A JOURNEY THROUGH THE TIME

Fariborz Goodarzi

FG & PARTNER, Energy and Environment Research Groups
Calgary, Canada.

The ICCP meeting in 1976 was held in Newcastle-Upon-Tyne, and I participated as guest by invitation of Professor Duncan Murchison, the organizing committee chair. I found the meeting very useful since I was planning to equip my Energy Research Laboratories in Arya-Meher University of Isfahan, Iran, with specialized reflected light microscopes for feed coal-coke microscopy to help the production of suitable coke for Iranian Steel and also reflected white light and fluorescent light for source rock evaluation and thermal maturity determination. Professor Duncan Murchison invited me to attend the subsequent ICCP meeting in Liège-Wégimont, Belgium, in 1977 to meet with international experts in both fields and ask for their advice. He introduced me to Dr. Marie Therese Mackowsky a tall, regal lady who was very knowledgeable about the subject; she invited me to visit her laboratory in Essen and sent me details of their microscope and other equipment for furnishing Coal-coke petrology laboratory. Duncan, introduced me to Marlies Teichmüller, was gentle, soft speaker with impressive knowledge of coal and dispersed organic matter. She was already familiar with my paper on molecular structural changes during the carbonization of various ranks of coal (Goodarzi and Murchison, 1972, 1973a, b); she thought it was fundamental research to understand coalification-maturation, which for the young fellow was a great compliment. Dr. Teichmüller also invited me to visit her laboratories in Krefeld, Germany, and indicated that they are trying to use fluorescent microscopy to identify kerogens. It sounded like a very exciting and useful method; she encouraged me to get a microscope with a fluorescent attachment. I was also introduced to Dr. Monika Wolf, of the Geological Survey of North Rhine-Westphalia in Krefeld, she was very knowledgeable about bitumen petrology, and helped later on when, I used bitumen as thermal indicator.

There were many other well-known petrologists, including Drs. Boris Alpern, France, and Raymond Noël, Belgium who were involved in thermal maturity studies, with whom I discussed the situation of my laboratories and asked for their advice. Both complied and invited me to their respective laboratories.

Both Drs. Mackowsky and Teichmüller suggested Zeiss microscopes for my laboratories. Both kindly informed the Zeiss head office in Oberkochen of my wishes, which helped me a lot and facilitated the types of appropriate equipment required.

The next ICCP meeting was held in Essen, Germany, in 1978, which I attended. Drs. Mackowsky and Teichmüller inquired about the progress of equipping my laboratories. They were pleased to see both laboratories almost functional and indicated that their laboratories were ready for collaboration and exchange of scientific staff.

Unfortunately, the Iranian revolution of 1979 put an end to our possible collaboration. I moved back to the University of Newcastle-Upon-Tyne, started research on coal lignites in Indonesia, and continued with the development of Bitumen as thermal indicator following advice from two friends, Dr. Jacob (Jacob, 1975) and Monica Wolf. In 1981, I joined the United Nations Development Program (UNDP) as an expert assigned to Ankara to help in training and developing the thermal maturity laboratories in Turkish Petroleum Central Laboratories in Ankara in October 1981. The areas of interest for hydrocarbon exploration in Turkey include the Silurian and Ordovician strata. The sedimentary rock in the area contained bitumen, chitinozoan, and graptolite, so an attempt was made to determine the thermal maturity of the microfossils mentioned above; Bitumen was a good indicator following a typical % BR_o determination, which was satisfactory, indicating a marginally matured source rock.

I joined the Institute of Sedimentary and Petroleum Geology, Geological Survey of Canada, as a research scientist in June 1982 and started my research in organic fossils as indicators of the thermal maturity of Paleozoic rocks. My research indicates that Dr. Teichmüller and my friend, Australian Dr. Alan Cook, were interested in graptolite and published brief papers on the subject (Kurylowicz et al., 1976; Clausen and Teichmüller, 1982). I contacted

both and with their help started my research with first detailed study of organic fossils (Goodarzi, 1984a; 1984b; 1985; Goodarzi and Norford, 1985; Goodarzi and Higgins, 1987), which set a base of use of organic fossils as thermal indicator worldwide (see graptolites chapter in this book).

I became a member of Canadian Society of Coal and Organic Petrology (CSCOP) in 1982, and a few years later of the American Society Organic Petrology (TSOP) and participated in a number of joint meetings with ICCP. The 57th annual ICCP meeting in Patras, Greece, was particularly memorable, since I was presented with the highest award offered by ICCP, the Reinhardt Thiessen Medal **(Figure 1a, b).** I came to know that I was nominated by Dr. Alex Cameron, seconded by Professor Mark Bustin (Canada), and supported by Professor Murchison (UK), Dr. Monika Wolf (Germany), and Dr. Alan Cook (Australia), all were Reinhardt Thiessen Medal awardees, which was a great honour.



Figure 1. a) Dr. Alan Cook giving the citation he just presented to Fariborz Goodarzi; b) I am showing the Reinhardt Thiessen Medal to the colloquies, after being presented by ICCP General Secretary Dr. Petra David.

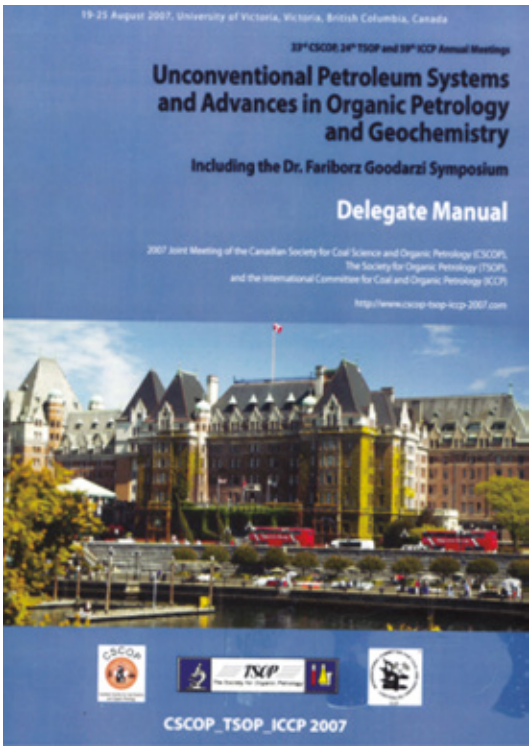

Figure 2. Cover of Delegate manual, joint CSCOP, TSOP, ICCP.

A few months later, I was nominated by Professor Duncan Murchison and Dr. Alex Cameron, supported by Dr. Mark Bustin, all ICCP members, and a number of other colleagues, and was inducted as a Fellow of the Royal Society of Canada (FRSC).

Finally, in the joint meeting of CSCOP, 33rd, ICCP, 59th, and TSOP, 24th, held in Victoria, British Columbia, Canada on August 19-25, I was honoured in a Technical Session IV "Advances in Organic Petrology and Geochemistry" on August 23rd, with presentations by friends and colleagues worldwide **(Figure 2).**

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REMINISCENCES OF ICCP 1973 – 2009

Wolfgang Kalkreuth

UFRGS, Porto Alegre, Brazil.

My activities within ICCP are spanning 36 years. The early years taking part as student in Germany (1973 to 1979), followed by work as research scientist in Canada (1979 to 1996) and as Professor of Geology since 1996 in Brazil. Below, from memory, I have listed a few events I encountered by participating in the ICCP meeting.

ICCP Meeting **Paris**, France, **1973.** It was in 1973 that I moved from Berlin to Aachen to start a PhD project at the RWTH Aachen, Germany involving organic petrology and geochemistry under the guidance of Prof. D. Welte. Shortly after arrival it was recommended to me to participate at the ICCP 1973 Meeting to be held in Paris of that year and I followed that suggestion happily.

The number of participating ICCP members was small, not more than 20, all sitting at a huge round table, but with many "big names" being around, such as Teichmüller, Jacob, Mackowsky, Prado, Bostick, Alpern, Noël and others. There was also a member from Russia participating, closely watched by two KGB agents. Before the discussion started everyone had to get up to identify him/herself and inform on affiliation. Discussed was in 4 languages (English, German, French, Russian). If I remember correctly it was Mackowsky taking care of translation of German and French to the other languages and viceversa and Bostick translating the Russian to the other languages and viceversa. Time has changed and ICCP meetings are now dominated by English, which in my opinion is a pity, since for example many of our colleagues still can express and discus better in other language than English.

ICCP Meeting, **Calgary,** Canada, **1984.** The first ICCP meeting hosted by the Canadian Coal Petrographers Group was held at the University of Calgary, Alberta, Canada in 1984. It was organized by scientists at the Institute of Sedimentary and Petroleum Geology, Geological Survey of Canada (Alex Cameron, Wolfgang Kalkreuth, David Marchioni).

Fieldtrip. During the ICCP 1984 meeting a 1-day fieldtrip was organized to visit a nearby lignite mine. The objectives were to describe macroscopically the lithotype variations in a lignite seam and to evaluate if the 3sections could be correlated on the basis of lithotypes. For that purpose, 3 groups were formed from the fieldtrip participants, headed by Teichmüller, Jacob and Cameron to create 3 seam profiles from base to top of the seam based on lignite lithotype nomenclature and to compare the results of the 3 examinations. It was a hot and sunny day, but on arrival at the mine site and starting the exercise one could see in the distance a huge dark cloud approaching rapidly. We decided to cancel our activities, heading back to the bus, but before reaching the bus we got all pretty much soaked. That was the end of the exercise. Since that time 40 years have passed and the exercise remains to be done.

ICCP Meeting, **Pau,** France, **1981.** Arriving at the meeting place it was found that hotel rooms were scarce, and my colleague from Nova Scotia Peter Hacquebard and myself decided to share a room. When coming back late to the hotel, I found my colleague profoundly sleeping, accompanied by an incredible noise from snoring. After unsuccessful tries to fall asleep for a couple of hours (the beds being French style, that means side by side), I went down to the lobby to see if a room was available. I was lucky I got a room and had a restful time for the remainder of the night. My colleague upon awaking did no see me and got really worried, only to find me well alive at the breakfast table.

ICCP Meeting, **Wollongong,** Australia, **1990.** The stolen car. On my way to the meeting place in Wollongong I stopped by in Sydney to see my friend Peter. He insisted that I would take his car to get to the meeting. After some discussion on the pros and contras I gave in and had an uneventful drive, although being a bit nervous in places such as crossing the huge Sydney Harbour Bridge in heavy traffic and all on the wrong side. In Wollongong I parked the car in front of the hotel, only to see that it was gone when I looked out the window

in the next morning. It was clear that it had been stolen and the police was called. I was embarrassed since I could not present any documents, nor did I know the license plate and the model of the car. We had to call my friend in Sydney to get these informations. In the meantime A. Hutton was waiting for me with a busload of ICCP members ready to head out for a visit to the nearby oil shale deposits. So, nothing more to do, a said goodbye to the friendly police officers and went on the excursion. The car was actually recovered the same day on the roadside, with empty gasoline tank and a message scribbled inside “we were here”. From the police officers I understood that two young aboriginal girls were responsible for the theft, too young to be charged. Other than that the car was not demaged and I could drive back to Sydney when the meeting ended. Since the ignition key had been lost, the police officer showed me how to start the engine without ignition key.

Joint ICCP/TSOP meeting, **Gramado/Porto Alegre,** Brazil, **2009**. The meeting was hosted by the Universidade Federal do Rio Grande do Sul, with W. Kalkreuth as chair of the organizing committee. The meeting was attended by 101 ICCP members and guests, representing close to 30 countries.

The conference dinner took place at a Churrasco Restaurant, typical for the area, accompanied by local music and dances. ICCP members were invited to participate and I remember our colleague Henrik Petersen from the Geological Survey of Denmark and Greenland being in excellent shape to adapt to the local Gaucho traditions. On the occasion of the TSOP business lunch W. Kalkreuth was presented the Peter Hacquebard Award by the Canadian Society for Coal Science and Organic Petrology in recognition of his contributions to Organic Petrology in Canada

The meeting offered two 1-day fieldtrips, one to the coal mines in the Leão-Butía Coalfield, the other to the nearby wine producing area, to test wine quality in relation to climate and soil type.
My input to ICCP, besides participating in a number of meetings, consisted of commission work and participating in working groups, which is compiled in the Canadian chapter in this book.

Chapter 6

ANNEXES

STATUTES OF THE ICCP

The first process of significant revision of the statutes was carried out between 1990 and 1991 as recorded in the newsletter. In the issue 5# of ICCPNews (1991), the main changes incorporated to the statutes were collected: i) the association name was changed to International Committee of Coal and Organic Petrology, however the acronym will remain as ICCP; ii) the long-standing relationship between the ICCP and the International Carboniferous (and Permian) congress was discontinued; iii) The Thiessen Medal could be awarded annually at the annual meeting; iv) The number of vice-presidents was reduced from two to one; v) the revised statutes contained provision for the appointment of a Newsletter Editor and the publication of a Newsletter; vi) the cumbersome pre-election procedure previously employed by the ICCP for officers election has been replaced by one in which a list of candidates is proposed by Council and General Assembly prior to a mail ballot; vii) the requirements for election of Associate Member have been made easier, whereas those for election of Full members have been done more stringent; viii) The President report, one every four years and the text of the Laudatio on the occasion of the Thiessen Medal Award will be published in an appropriate international scientific journal instead of the Compte Rendu of the Carboniferous Congress.

D.G. Murchison and Dean Ashley Winton of the Faculty of Law of the University of Newcastle upon Tyne were thanked for their assistance in drafting the new statutes which entered into force in 1991.

Three years later the need for statutes revision was evidenced and the process to modify the Statutes began again. At the Meeting in Oviedo in 1994 a proposal was ready and put to vote. Although it was massively supported the number of members emitting a vote did not reach the two/thirds and disagreement occurred on the interpretation if the 2/3 should be of eligible votes or of valid votes emitted. Therefore, the implementation of the changes was postponed.

The topics under discussion were: i) incorporation of new membership category of Institutional member because a number of companies manifested interest in becoming institutional member; ii) incorporation of a friendship scheme to sponsor other members for whom the membership fees are too expensive; iii) Alteration of the period of expiring membership from four to two years; iv) to define the meaning of the term “secret ballot” by the appointment of a returning officer; v) Revision of the number of nominations that the Council is required to place before the Plenary Session prior to the holding of Elections.

The proposed wording of the above points of the statutes were presented to the General Assembly at the meeting in Porto (1998) and were put to vote during the first trimester of 1999. The number of votes received was over the 2/3 of eligible votes required and an overwhelming majority voted in favour and therefore the changes were implemented. Since 1999 two returning officers have been in duty Harold Smith and Rudy Schwab to whom the ICCP is deeply in debt. The approved text is essentially the one which forms the actual statutes of the ICCP (see below).

Discussion on the convenience of modifying the statutes is always open, the most serious attempt was leaded by Lopo Vasconcelos as Vice-president in 2003 the questions open in this occasion were: i) convenience of having different individual membership categories (Associated and Full); ii) whether the restrictions imposed for honorary member election are necessary or not; iii) excessive and detailed description of voting procedures forcing to vote by postal ballot; iv) clarification is needed on the splitting of decision-making between General Assembly and Council; v) clarification is needed the creation or disbanded of commissions.

A group for discussion was formed (Lopo Vasconcelos, Peter Crosdale, Kimon Christanis, Walter Pickel) and the proposed changes were communicated to the membership through the newsletter (ICCPNews34, 2005). The process was postponed because the on-going registration of the ICCP was under development and that would required an amendment of the statutes in any case.

The pandemic covid-19 had a great impact in the way the organizations were operating, also in the ICCP. Meeting scheduled for 2020 in Beijing had to be cancelled and the next meetings in 2021 (Prague) and 2022

(New Delhi) were carried out in hybrid format. As an emergency measure because postal services were not working, elections for Secretary of Commission I in 2021 were carried out through and internet portal. Mária Hámor-Vidó, General Secretary at that time was key for reaching this milestone.

A proposal for limited modification of the statutes was presented to the General Assembly in 2019 (The Hague) and again in 2022 (New Delhi) to (i) allow for any procedure for voting and; (ii) clarify that the required majority for modifying the statutes is two-thirds of the full members casting a vote. The ballot was carried out in 2023 and the proposal was practically unanimously supported. Afterwards, the elections for Secretary of Commission III and Chair of Commission I were successfully carried out in electronic mode being the General Secretary Paul Hackley.

The text of the current statutes of the ICCP is included below **(https://www.iccop.org/about/statutes/):**

Statutes of the ICCP as approved by postal ballot April, 1999. Modified in April, 2023.

1. The Association shall be called the International Committee for Coal and Organic Petrology (ICCP).

2. OBJECTS

The Association shall be a non-profit making body. Its objects shall be

a. to secure the continuing international exchange of scientific information relating directly or indirectly to organic petrology and
b. to develop and publish definitive descriptions and methods in furtherance of object 2(a).

3. MEMBERSHIP

a. There shall be five categories of membership: Associate, Full, Retired and Honorary and Institutional Members.
    1. ASSOCIATE MEMBERSHIP: shall be the first category in which organic petrologist may participate in ICCP activities. An Associate Member shall pay an annual fee determined in accordance whith Statute 4.
    2. FULL MEMBERS: shall be experts in organic petrology with long-standing experience and participation in ICCP activities. A minimum of five years experience in organic petrology shall be required before an Associate Member may be elected to Full Membership. A Full Member shall pay an annual fee determined in accordance with Statute 4.
    3. RETIRED MEMBERS: Associate and Full Members may exercise the option to become Retired Members and shall then retain their former rights including voting rights on payment of a reduced annual fee determined in accordance with Statute 4.
    4. HONORARY MEMBERS: shall be those, if any, drawn from the Full and Retired membership in accordance with Statute 3(b)(iv) below. An Honorary Member shall not be liable to pay an annual fee. Honorary Members shall retain the rights of Full Members.
    5. INSTITUTIONAL MEMBERS: Institutional Members shall be those firms, institutions of higher learning, or other organisations interested in fostering the science of organic petrology. Institutional Members shall have the right to appoint a person as their designated representative. Such a person does not have to be a member. Institutional Members shall enjoy all the privileges of the Society except that they, or their representatives, shall not hold office or vote. Notwithstanding any of the above limitations, a designated representative of an Institutional Member, who is also an individual member, may so continue to exercise his/her membership rights and privileges on his/her own behalf.
b. Election to Membership
    1. ASSOCIATE MEMBERS: Proposals for election to Associate membership or Institutional Membership shall be sent to the General Secretary on an approved form which may be obtained from any of the officers of the ICCP. The application shall be supported by a sponsoring Full Member. The Council of the ICCP shall consider the application together with the sponsor?s statement, and then, on behalf of the General Assembly, determine whether it is to be accepted or rejected.
    2. FULL MEMBERS: To attain Full Membership candidates must demonstrate their level of experience by sending to the General Secretary a curriculum vitae comprising a candidature letter, a list of their publications and the name of one sponsoring Full Member. The Council of the ICCP shall consider

the proposal together with sponsor's statement, and then, on behalf of the General Assembly, determine whether it is to be accepted or rejected.

3. RETIRED MEMBERS: Full and Associate Members shall inform the General Secretary and the treasurer of the date of their retirement and shall then be deemed elected as Retired Members.
4. HONORARY MEMBERS: Proposals for the nomination of Honorary Members shall be made by the Council of the ICCP and determined by the General Assembly.
5. INSTITUTIONAL MEMBERS: Proposals for the nomination of Institutional Members shall be made by the Council of the ICCP and determined by the General Assembly.

4. MEMBERSHIP FEES

a. Membership fees shall be determined by the General Assembly of the ICCP taking into account the advice of the Treasurer to the Council.
b. Annual fees shall be due on 1st January of each year.
c. In addition to normal payment of membership fees, the ICCP runs a Friendship Scheme, where financial members sponsor a petrographer by paying their membership dues. Existing rules for applying for membership still apply. Potential candidates can be nominated by any member or the sponsoring member. In the former case, the Council can allocate funds to petrographers on the waiting list. The Treasurer shall indicate to the Council any money that has been collected through this scheme.

5. LOSS OF MEMBERSHIP

a. Members who have not paid subscriptions for two or more years shall no longer be considered as members of ICCP.Note: during the transitional period from the present rule that allow a four years period of grace, those members who have not paid for between two and four years will no longer receive full mailing lists but will be warned in advance of this decision by a message attached to the next copy of the ICCP Newsletter.
b. Any member may resign from membership by giving 30 days notice in writing to the General Secretary.
c. Expulsion
The Council shall have power to expel a Member when, in their opinion, it would not be in the best interests of the Association for him to remain a Member. A member shall not be expelled unless he is given 60 days written notice to attend a meeting of Council and written details of the complaints made against him. The member shall be given an opportunity to appear before the Council to answer complaints made against him and shall not be expelled unless at least two thirds of the Council then present vote in favour of his expulsion.

6. GENERAL ASSEMBLY

The General Assembly shall be the supreme body of the ICCP and shall be convened in plenary session at least twice on the occasion of full meetings of the Association. Full meetings normaly shall be held once a year. All Member who meet in plenary sessions comprise the General Assembly which shall only be quorate if 10 Full Members are present. The General Assembly shall be chaired by the President of the ICCP. The General Assembly shall be responsible, amongst other matters, for defining the number of Commissions in the ICCP and their fields of activity, confirming the election of the Executive Committee of the ICCP, confirming the election of members to the Association, determining the programme for the full meeting of the ICCP and deciding the membership subscription. The proceedings and decisions of the General Assembly shall be recorded in Minutes kept by the General Secretary. The minutes shall be confirmed at the commencement of the next Plenary Session by all members attending this meeting.

7. COMMISSIONS

The technically oriented work within the ICCP shall be conducted by the different Commissions which, when necessary, may establish Subcommissions and Working Groups to deal with parts of the general programmes. At present the ICCP has three Commissions:

I. General Coal and Organic Petrology
II. Application of Coal and Organic Petrology to Geology, including the Prospecting for Oil and Gas
III. Application of Coal Petrology to Utilization

Each Commission shall be presided over by a Chairman. Minutes of the work of each Commission shall be kept by its Secretary. The minutes of each meeting shall be confirmed at the beginning of the next meeting of the relevant Commission.

Other Commissions may be formed as necessary. The number of Subcommissions and Working Groups may vary. The Commissions, Subcommissions and Working Groups are competent to answer questions

within their field, including those dealing with nomenclature and analysis. General problems of nomenclature and analysis within Commissions II and III also should be referred to Commission I. At the final plenary session of the full meeting of ICCP, the Commissions shall report generally on the results of their work and, in particular, the activities of the Working Groups.

Normally, any Full or Associate Member is eligible to become a member of a Commission, Subcommission or Working Group. However, the membership of some Subcommissions or Working Groups may be appointed by the Chairman of the appropriate Commission upon approval by Council. Membership requires active contribution to the work of that particular body; Members who do not participate for two years may be excluded from further activities.

8. COUNCIL

The Council of the ICCP shall consist of the following officers:

- President (who shall be Chairman)
- Vice President
- General Secretary
- Treasurer
- Chairmen of the Commissions
- Secretaries of the Commissions
- Editor

The Council shall normally meet before each annual meeting of the Association. Council shall only be quorate if 6 such officers are present. The Council will manage the affairs of the ICCP and be responsible for submitting proposals on various topics to the General Assembly, inter alia:

- formulating the programme for ICCP meetings,
- maintaining regulations for membership,
- considering and making recommendations on applicatioons for membership,
- nominating candidates for election to Council,
- approving methods of election,
- determining financial policy, and
- recommending subscription rates to the General Assembly on the advice of the Treasurer.

9. EXECUTIVE COMMITTEE

The Council may delegate to the Executive Committee any of its organisation and administration functions. The Executive Committee shall consist of the following officers:

- President (who shall be Chairman),
- General Secretary, and
- Treasurer

10. INDEMNIFICATION

The officers of the Council shall be indemnified by the Association against all liabilities properly incurred by them in the management of the affairs of the Association.

11. ELECTION OF OFFICERS

a. Period of Office
   - The President, Vice President and General Secretary of the ICCP and the Chairmen and Secretaries of the Commissions of the ICCP shall be elected normally for periods of four years. All officers may be reelected for only one further period of four years except that the Treasurer and the Editor may remain in their posts as long as the Council agrees.
   - No officer other than the Editor may hold more than one Council post at any one time.
   - As a general principle it is in the interests of continuity of the work of the International Committee that the offices of President and General Secretary of ICCP and the offices of Chairman and Secretary of individual Commissions should not fall vacant at the same time.

b. Voting eligibility
   - Executive Committee

   Only FULL MEMBERS of the ICCP shall be eligible to vote in elections for the offices of President, the Vice President, the General Secretary, the Treasurer and the Editor.
   - Commissions

The Chairman and Secretary of any Commission may be elected only by the FULL MEMBER and ASSOCIATE MEMBERS of that commission.

- Subcommissions and Working Groups

No formal elections shall be held to select members of Subcommissions and Working Groups, but care should be taken to ensure that as wide a spectrum of opinion as possible is represented on such groups. The progress of a Subcommission or Working Group shall be subject to regular (not greater than four years) reviews by the Council on the basis of recommendations by the Chairman of the Commission.

c. Voting procedures

- All elections shall be conducted by secret ballot. The Council shall invite a member of long standing, who is not currently associated with any elective position, to act as Returning Officer for elections to elective positions. The duties of the Returning Officer shall be to confirm votes sent in by members, and to send a summary of the votes cast to the General Secretary.
- The Council shall prepare a list of candidates for any vacancy on the Council. The list of candidates will normally contain two names, but the Council may, at its discretion, submit one or three names for any given position. All candidates for Council office should be Full Members. Normally, candidates will be selected so as to ensure that the President, Vice President and General Secretary on one hand, and the Chairmen and Secretaries of Commissions on the other hand, will be of different nationalities. The list of candidates shall be presented to the General Assembly at a plenary session. Eligible members may then nominate no more than two additional names for election to any office except that of Editor. The votes of more than 10 % of eligible members present at the plenary session shall be required for nomination of candidates from the floor of the General Assembly.
- The General Secretary shall ascertain that all candidates nominated are willing to stand for election.
- All members eligible to take part in the election shall receive voting information from the General Secretary. This information shall contain the names of all candidates duly nominated. The vote will be made by clearly indicating the name of the preferred candidate. Completed election forms shall be sent to the Returning Officer.
- Where the General Secretaty stands for re-election or as a candidate for the Presidency, the President of the ICCP shall act in place of the General Secretary for the elections for those offices.
- Subject to Rule 11(c)(v), the election results shall be communicated to the candidates in writing by the General Secretary. All results shall be presented orally at the closing plenary session of the General Assembly next following the date of the election. Members shall also be notified of the results in the ICCP Newsletter and in the Minutes of the General Assembly.
- Where the General Secretary is elected as President, that person shall also act as General Secretary until the election of a new General Secretary.

12. THIESSEN MEDAL AWARD

- There shall be established a Committee to consider the award of the Thiessen Medal. The Award Committee will consist of the five most recent and available past holders of the Medal, one of whom will be elected Chairman.
- At any time, the Thiessen Medal Award Committee or any other Full Member of the ICCP may propose a name of a person for the award. In the case of nominations by persons who are not members of the Thiessen Medal Award Committee the reasons for and justification of the proposal shall be forwarded to the Chairman of the Award Committee. The nominee need not be a member of the ICCP.
- The Award Committee shall consider all proposals and make a recommendation to the President six months before the following ICCP General Assembly meeting. Council will decide whether or not to make the award. Not more than one Medal may be awarded annually. The presentation of the Medal will take place at any full meeting of the ICCP.
- The Medal shall be awarded by the President and the Chairman of the Award Committee of the ICCP during the closing plenary session of the General Assembly.The text of a “laudatio” shall be prepared by the Chairman of the Thiessen Medal Award Committee and incorporated in the ICCP “Compte Rendu” for publication in an appropriate scientific journal with which the ICCP is linked.

13. NEWSLETTER AND GENERAL INFORMATION ON ICCP ACTIVITIES

In pursuance of the objects of the Association, the following publications shall be prepared.

- A “Compte Rendu” shall be prepared during the President’s fourth year of office for submission to Council and publication in an appropriate scientific journal.
- Two Newsletters shall be produced between successive Annual meetings, one based on the Minutes of the past Meeting and the second announcing the next Meting of the ICCP.

- A Brochure shall be edited and maintained in up-to-date form for general distribution.A Newsletter Editor shall be nominated by Council and confirmed by the General Assembly in accordance with Rule 11(c)(ii). The Editor shall become a Member of Council.

14. ALTERATION OF STATUTES

These statutes may be altered by resolution proposed at a General Assembly provided that the resolution is carried by a majority of at least two-thirds of all Full and Honorary Members who cast a vote by ballot.

15. DISSOLUTION

- A resolution to dissolve the Association shall only be proposed at a meeting of the General Assembly and shall only carried by a majority of at least three-quarters of the Full and Honorary Members present and voting.
- The dissolution shall take effect from the date of the resolution and the members of the Council shall be responsible for the winding-up of the assets and liabilities of the Association.
- ny property remaining after the discharge of the debts and liabilities of the Association shall be given for such scientific or educational purpose as is charitable as determined by the last Committee.

16. The law governing these rules and rights of the members of this Association shall be the Law of England.

ICCP MEETINGS

As stated in the 50th Commemorative Volumen (Lemos de Sousa, 1998), the 1st Meeting in Geleen (The Netherlands) corresponds to the 1st formal plenary ICCP Meeting. The second plenary meeting was the one held in Liège in 1955 (listed as the 5th in the table below). The 3rd formal ICCP plenary meeting was held in Heerlen in 1958 (listed as the 11th in the table below) and coincided with the First International Congress on Coal Petrology. In some of the meetings in between, the Commissions of Nomenclature or Analysis were meeting independently. In the first 20 years the association with the International Carboniferous Congress was quite frequent, whereas in recent years the association with TSOP (The Society for Organic Petrology) occurs from time to time.

N	month	Year	Location
75th	September	2024	Oviedo, Spain
74th	September	2023	Patras, Greece– Joint with TSOP
73rd	September	2022	New Delhi, India – Hybrid Meeting
72nd	September	2021	Prague, Czech Republic– Hybrid Meeting
		2020	Beijing, China – Cancelled due to Covid 19 Pandemia
71st	September	2019	The Hague, The Netheralnds
70th	September	2018	Brisbane, Australia
69th	September	2017	Bucharest, Romania
68th	September	2016	Houston, USA– Joint with TSOP and AASP
67th	September	2015	Potsdam, Germany
66th	September	2014	Kolkata, India
65th	August	2013	Sosnowiec, Poland
64th	September	2012	Beijing, China– Joint with TSOP
63rd	September	2011	Porto, Portugal
62nd	September/October	2010	Belgrade, Serbia
61st	September	2009	Gramado, Brazil– Joint with TSOP
60th	September	2008	Oviedo, Spain– Joint with TSOP
59th	August	2007	Victoria, Canada– Joint with TSOP and CSCOP
58th	September	2006	Bandung, Indonesia
57th	September	2005	Patras, Greece
56th	September	2004	Budapest, Hungary

N	month	Year	Location
55th	August	2003	Utrecht, The Netherlands– on the occasion of an International Carboniferous Congress
54th	September	2002	Maputo-Pretoria, Mozambique – South Africa
53rd	August	2001	Copenhagen, Denmark– Connection with TSOP
52nd	August	2000	Rio de Janiero, Brazil
51st	September	1999	Bucharest, Romania
50th	September	1998	Porto, Portugal
49th	October	1997	Wellington, New Zealand
48th	September	1996	Heerlen, The Netherlands
47th	August	1995	Krakow, Poland
46th	October	1994	Oviedo, Spain
45th	September	1993	Chania, Crete, Greece
44th	July	1992	University Park, Pennsylvania, U.S.A. – Joint with TSOP
43rd	September	1991	Porto Alegre, Brazil
42nd	February	1990	Wollongong, Australia
41st	September	1988	Aachen, Germany
40th	August	1987	Beijing, China– on the occasion of an International Carboniferous Congress
39th	September	1986	Doncaster, U.K.
38th	September	1985	Dubrovnik, Yugoslavia
37th	August	1984	Calgary, Canada
36th	September	1983	Oviedo, Spain
35th	April	1982	Porto, Portugal
34th	April	1981	Pau, France
33rd	April	1980	Ostrava, Czechoslovakia
32nd	May	1979	Urbana, U.S.A. – on the occasion of an International Carboniferous Congress
31st	April	1978	Essen, Germany
30th	April	1977	Liège-Wégimont, Belgium
29th	September	1976	Newcastle-upon-Tyne, U.K.
28th	August	1975	Moscow, U.S.S.R. – on the occasion of an International Carboniferous Congress
27th	September	1974	Ustron-Jaszowiec, Poland

N	month	Year	Location
26th	September	1973	Lille-Paris, France
25th	September	1972	Belgrade, Yugoslavia
24th	August	1971	Krefeld, Germany – on the occasion of an International Carboniferous Congress
23rd	September	1970	Liège, Belgium
22nd	September	1969	Varna, Bulgaria
21st	September	1968	Essen, Germany
20th	September	1967	Sheffield, U.K. – on the occasion of an International Carboniferous Congress
19th	October	1966	Madrid, Spain
18th	October	1965	Budapest, Hungary
17th	September	1964	Hoensbruck, The Netherlands
16th	September	1963	Paris, France– on the occasion of an International Carboniferous Congress
15th	September	1962	Liège, Belgium
14th	May	1961	Krefeld, Germany
13th	June	1960	Madrid, Spain
12th	September	1959	London, UK
11th	September	1958	Heerlen, Netherlands – on the occasion of an International Carboniferous Congress
10th	May		Liège, Belgium
9th	October	1957	Paris, France
8th	January		Essen, Germany
7th	June	1956	London, UK
6th	October	1955	Madrid, Spain
5th	May		Liège, Belgium
4th	January		Essen, Germany
3rd	June/July	1954	Paris, France
2nd	January		Verneuil-Paris, France
1st	June	1953	Geleen, The Netherlands

References:

Lemos de Sousa J.M., Ed. 1998. The 50th ICCP Meeting. A Commemorative Book. 116pp.

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(2024-2027)

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