



AMPERE Newsletter

Trends in RF and Microwave Heating

<https://www.ampereurope.org/newsletter/>

Issue 100

November 15, 2019

***CENTENNIAL ISSUE of the NEWSLETTER:
The origins of AMPERE and
personal recollections of our field of activity***

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Introduction

In this centennial issue of the AMPERE Newsletter I will look back at my involvement with RF and microwave heating, describe the birth of our association and look forward to AMPERE's next stage of development and future challenges.

ECRC Capenhurst

My earliest recollection with the topic of RF and Microwaves goes back to 1972 when I was first employed by the Electricity Council Research Centre (ECRC) at Capenhurst, Cheshire, as a Research Officer within the Electro-physics section headed by Dr Jim Lawton. Jim was a respected Chemical Engineer, graduate of Imperial College, London, from where indeed many of his first recruits, including myself, came. ECRC was part of the Electricity Supply Industry (ESI) with its headquarters in London which included generation and utilisation. My first assignment was to devise a method for measuring the dielectric properties of paper and board as a back-up to the engineers, such as Peter Jones, within the electro-physics group who

were at the time designing equipment for industrial pilot scale trials.

Roger Meredith and "the Bible"

I met Roger Meredith shortly after my appointment as Research Officer in the Electro-physics section at ECRC, Capenhurst, in 1973. I visited him in Leicester at the headquarters of Magnetronics Ltd, the company he had founded a few years earlier. Roger, after graduating from Bristol University, learned his trade so to speak at the British Thompson Houston Co (later to become GEC) and it soon became apparent that although he was now an industrialist he had a strong theoretical background of the underlying theory, and hence we talked virtually the same language. There followed a joint book venture (Industrial Microwave Heating) published in 1983 which has been dubbed "the Bible" for technologists who are working with microwaves. I handed a signed copy of this book to Jose Daniel Gutierrez who was the first recipient of the Ricky Metaxas Young Researcher Award at AMPERE 2019.

Power Utilities

Before I discuss the genesis of AMPERE it is perhaps important to stress that the history of RF and microwave heating in the UK, and indeed in Europe, was intimately connected with the Power Utilities and the ESI. In the UK at the time the Electricity Council (EC) in London had overall control with the Central Electricity Generating Board (CEGB) being responsible for generation and distribution and the Area Boards being primarily responsible for utilisation and meeting the needs of its customers.

It is important to stress that the 1970's has been the decade which highlighted the problems associated with diminishing fossil fuels and the need to look for alternative techniques for carrying on out many processes in industry. The volatile nature of oil costs coupled with gas unavailability had compelled many industrialists to consider novel electrical techniques. In fact, a large number of the enquiries about the use of electricity in manufacturing and other industries emanated from Area Board engineers who would visit their industrial colleagues and bring back to base requests for trials and purchase of equipment. The British National Committee for Electroheat (BNCE), based at the EC headquarters was cooperating with the Area Boards in mounting short courses and seminars and liaising with ECRC resulting in my colleagues Peter Jones, David Hodgett, Bobby Perkin and myself troubleshooting in industrial premises. Manufacturers of equipment in the UK such as APV-Magnetronics (Roger Meredith eventually selling to APV), Radyne, ROTAX, Strayfield, Petrie, all had strong connections with BNCE and the Area Boards and in monetary terms the Electricity Council had a key role in funding the BNCE and in encouraging such collaborative work. It saw it as its mission to introduce clean and efficient electrical systems in industry and commerce in order to eradicate the inefficient use of conventional fuels. Equivalent centres to ECRC in Europe included Laborelec in Belgium and Les Renardieres in France.

The heyday of such collaborative work in the UK was throughout the 80's which came to a thundering halt with the privatization of the ESI in the early 90's followed by the split of the CEGB and the relentless drive towards mergers and acquisitions. At that time ECRC employed over 1000

staff of which 250 were highly qualified engineers and scientists (presently following many changes as well as its name, to C-Tech Innovation, employs about two dozen staff carrying out specialised consulting services). The Area Boards at the time had development centres all equipped with the most modern electroheat equipment and all these without exception were forced to close signalling in effect the end of the long collaboration between BNCE and the Area Boards (the plc's as they are all called following privatization). After organising the UIE (Union Internationale de l'électricité) Congress in 1996 in the UK, BNCE had scaled down its operations and having failed to meet the fee for belonging to UIE it subsequently ceased to exist. It is fair to say that with the demise of the ESI, the BNCE and the Area Boards as they stood in the early 1990's, the back-up that industry received, all but evaporated and it was left to small university groups to take up the challenge. This is evidenced by the groups that are still active in the field at the universities of Bristol, Birmingham, Cambridge, Cardiff, Edinburgh, Hull, Loughborough, Nottingham, Stafford and a few other collaborating with industrial colleagues such as John Bows, formerly at Unilever Research and now at Pepsico, Gordon Andrews and Lewis Napleton at the Microwave Association, Bob Clarke and the EMMA Group at NPL (National Physical Laboratory, where Barn Wallis tested the bouncing bomb during the 2nd World War) and with a diminishing C-Tech.

IMPI Europe

The first encounter I had with fellow scientists and engineers across the 'pond' involved a conference on RF and microwave heating organized at the University of Loughborough by Harry Barber, who had a long association with IMPI (International Microwave Power Institute) in the USA. He had formed a small committee within the UK of like-minded engineers to promote the use of RF and microwaves. Two other prominent members at the time were Dr Roy Smith at Bradford University and Percy Giles at Mullard Research based at the time in South London. Up to that time IMPI organized an annual conference held alternately in Canada and the USA and it was deemed useful to include Europe on a three year cycle, so in 1970 the first IMPI-

European conference was held at the Hague, which was followed in 1973, 1976 and 1979 with subsequent meetings in the series held at Loughborough, Leuven (Belgium) and in Monaco respectively.

At the 1973 meeting in Loughborough, I first met Bob Schiffmann who had just been elected President of IMPI. He was wearing a large fur coat, and I remember he was striding up and down the hall before the election took place ready to take the mantle of what was seen at the time as the only major organization which dealt with the topic of microwave heating. Per Risman of SIK, the Swedish Food Institute, was given an award at that meeting for innovative ideas, his study at home being described as a "maze of electrical gadgets". I was invited to give a talk at the short course on dielectric properties, and I remember I was petrified because I was giving it in the presence of such icons of our industry as Nils Bengtson, Serge Lefevre, Nicolas Meisel, Roger Meredith, Herbert Puschner (Peter's father), Ralph Shute, Stan Stuchly, Geoffrey Voss, and many others. Nils and his young protégé Thomas Ohlsson were becoming very prominent in our field following their publication in 1971 of the seminal paper on the dielectric measurements of foodstuffs showing the very real effect of thermal runaway when frozen food exceeds zero degrees while still being subjected to microwaves. I stressed this forcibly at my plenary in Valencia during AMPERE 2019.

It was also at that meeting when a Japanese researcher presented for the first time a new air-cooled magnetron, compared with the cumbersome water-cooled, which has subsequently become the standard in microwave ovens. I remember the theatre for this lecture was completely full with many delegates standing between the aisles and the atmosphere buzzing with excitement because we were all aware that we were witnessing something unique. I met again with Geoffrey Voss at a meeting in Montreux, Switzerland in 1974 organized by Fred Gardiol of the Ecole Polytechnique in Lausanne. He was chairing the session at which I was presenting our findings at ECRC on the effects of high microwave E-fields in a single mode resonant cavity on E-coli bacteria where no non-thermal effects were found. There followed a fruitful collaboration over the next 20 years with Geoffrey who was then very

prominent at IMPI. He was based at the University of Alberta, Canada where one of his PhD students was Wayne Tinga who became very visible at future IMPI venues.

My recollections of the 1976 meeting are somewhat vague. Suffice to say that the venue in Leuven left an indelible impression following an exquisite dinner in Brussels (see Photo 1) after the conference had ended. I met other established names in our field such as Drs VanKoughnett and Wyslouzil, the former switching from microwave heating to communications shortly afterwards. I do not remember meeting Walter Van Loock who was based at the Katholieke Universiteit (KU) in Leuven at the time but I do remember meeting him two years later in 1978 at the IMPI conference in Ottawa, Canada where we were giving a paper in the same session. He came in at the last minute from another session, scruffily attired carrying a rucksack and had an air of being in a hurry; he was very intense and focused.



Photo 1: Dinner in Brussels after 1976 IMPI-Europe conference, from left to right, Zjelko Plavcic, Maria Stuchly, Bob Schiffmann, Stan Stuchly, Margaret and Wayne Tinga

At the same meeting I also remember hanging around with Ken Ike, who by now had left a steady job with an electronics firm in London to set up the company Apollo, who manufactured the small hand held microwave leakage monitor that became prominent in the early 80's. Ken was impatient and full of ideas for new products, which I suspect were the precursor for his huge success with the development of the combination microwave ovens and his move to the USA in the early 90's. It was very

hot and Ken and I were walking the streets of Ottawa finding everything "too much" for us. He has been monumentally successful with his revolutionary ideas about the combination microwave oven that Bob Schiffmann mentioned in his talk at AMPERE 2019 in Valencia. Bob stated that Ken's "magic" oven was full of metal trays, which could heat uniformly all sorts of foodstuffs without the need of mode stirrers, solid state sources or any other gadgets. Photo 2 shows meeting some colleagues after attending a World Congress (the precursor to the GCMEA meetings) in the USA.



Photo 2: Meeting colleagues after a World Congress, from left to right Wayne Tinga, a colleague, Bob Schiffmann, Gill and Ken Ike and myself

Genesis of AMPERE

Alas, I did not attend the 1979 conference in Monaco, which turned out to be the last European-IMPI collaborative meeting. Also, like myself, many of my European colleagues could not attend the annual IMPI meetings in Canada or the USA because of lack of funding. In fact, the birth of AMPERE can be traced following my secondment to Cambridge University Engineering Department (CUED). "Go and teach the bright young undergraduates all about electroheat and stress the importance of electricity in industrial processing" was my Director's comment after I had agreed to a period of 18 months. The aim was simple enough. I will be interacting with students who one day will be the leaders in academe, industry and commerce and the more they knew of the advantages of the use of electricity the better for

the country as a whole. I was assigned to teach at undergraduate and postgraduate level. I hasten to add that the 18-month stint became "a permanent stint" as I am still in Cambridge.

Given the energy crisis of the 1970's which I referred to a little earlier, during my first lecture on Energy to second year engineers at Cambridge I discussed the well-known Hubbert bell-shaped curve. M King Hubbert, a Shell geophysicist published a paper in 1956 on *Nuclear Energy and Fossil Fuels*, which in essence stated that the amount of oil in the ground in any geographical region is finite and although following its discovery the rate of production increases eventually it reaches a peak and then it starts to decline. That was meant to shock the undergraduates forcing them to think of electrical techniques!

Following my move to Cambridge, I set up the Electricity Utilisation Group, my Research Group at CUED, in order to expand my ideas about electroheat, which of course included RF and microwaves, and prompted by my inability to attend any IMPI meetings. I started thinking seriously of resurrecting the notion of a conference in Europe on this topic. Having discussed this with the then BNCE Executive, Mike Thelwell, it culminated in the conference at St John's College in 1986, which is now regarded as the first in the series of AMPERE conferences on Microwave and High Frequency Heating although at the time the name AMPERE had not been suggested. At that meeting at St John's, Geoffrey Voss presented the keynote speech highlighting some seminal events that were taking place in Europe and the Americas at that time. At the conference dinner, I sat opposite a very likeable Frenchman, ex CNRS (Centre National des Reserches Scientifiques), with whom I have forged a life-long collaborative relationship. His name is Andre Jean Berteau, who had founded MES, the prominent manufacturer of microwave industrial equipment in France. Also I recollect meeting the youthful Jean Paul Bernard who was keen to show me lots of impressive photos of the equipment he manufactured at SAIREM. It was shortly afterwards that Jon Binner, who was then based at the University of Leeds, contacted me with a view to writing a joint chapter on microwaves in a book he was editing about ceramic processing.

Following the success of the 1986 conference at St John's College, a small group of colleagues, principally Serge Lefeuvre, Will Boone, Thomas Ohlsson, Geoffrey Voss, Mike Thelwell and myself met to decide where we were going to meet next and this culminated in the conference at KEMA (Keuring van Elektrotechnische Materialen te Arnhem) in Arnhem in 1989 and Nice 1991. By that time, it was evident that Europe had a dedicated group of people who were willing to devote a considerable effort in establishing RF and microwave heating as an academic discipline as well as promote it in industry and commerce. I recollect a very pleasant dinner with Daniel Van Dommellen, who was based at the KU Leuven, during the Nice meeting where many issues concerning our topic area were aired. Following Nice, I flew to Toulouse to meet Serge Lefeuvre and talked about formalising our little ad-hoc group of individuals into an association. The conclusion of our deliberations was to announce the formation of the new European association at the next conference on this topic, which was held at Göteborg in 1993. The host was SIK under the chairmanship of Thomas Ohlsson. The name of the association, AMPERE, was suggested by Serge Lefeuvre and it stands for Association for Microwave Power in Europe for Research and Education, although it includes industry and indeed it also covers radio frequencies. Following Göteborg Serge was the first President and myself assumed the role of Secretary. It was then that I started a fledging one-page AMPERE Newsletter in January 1994 (see next page).

My group, the EUG (see Photo 3), hosted the 5th in the series of meetings, back at St John's College in 1995, where at the closing ceremony Serge Lefeuvre simply raised my hand and asked me to succeed him as President. At the time my group numbered ten strong students so there was sufficient back-up for assisting in organising this venue which turned out to be very successful with over 250 delegates and their partners attending. Special thanks

ought to go to Bob Gale, Wai Fu and Ann Martin of the EUG, for their unreserved willingness to help render this a successful venue. Photo 4 shows some of the delegates outside the Fisher building where the main conference auditorium was housed.



Photo 3: The EUG Group at Cambridge in the mid-1990's from left Richard Ehlers, Hugo Malan, George Georghiou, Mark Marshall, Bob Gale, Ann Martin, Wai Fu, David Dibben, Regas Neophytou and myself.



Photo 4: Delegates at the 1995 AMPERE conference at St John's



AMPERE NEWSLETTER

Issue 1, January 1994

Chairman's Welcome

It gives me great pleasure to address you as the founder Chairman of **AMPERE** and to introduce to you what I hope will become a familiar and worthy flysheet on our mutual interests.

For over ten years now, the European heating community has been gathering in various parts of the Continent. Four successful conferences on Microwave and High frequency processing have been held, which were always well attended, interesting and above all else innovative. It was felt to be about the right time that such a vital initiative was given formal recognition and as a result AMPERE was born. The first recruits of this new Association will have a unique opportunity to guide it in a direction that broadly meets its members' aspirations.

AMPERE is our association to shape and mould as we wish. We intend to maintain good contact with our many colleagues in Europe and further afield through various meetings, European networks, contracts and technical committees together with the exchange of professors and students as well as software.

If AMPERE sparks off an interest in you, please write to our secretary with your suggestions.

Serge LEFEUVRE
Chairman

Editor's Comment

At the recent microwave and radio frequency Symposium in Göteborg, Sweden, a new association called **AMPERE** was formed to co-ordinate its multifarious activities. AMPERE stands for **Association for Microwave Power in Europe for Research and Education**. Although it is a European based association it does not exclude members from other continents. The word microwave in this case is used in its broadest sense which includes high frequency electromagnetic energy within the frequency range 10 MHz to 10 GHz. Professor Serge LEFEUVRE, of **ENSEEIH**T in Toulouse, France is AMPERE's first Chairman, Dr Thomas Ohlsson of the **SIK** food research institute in Sweden its treasurer and Ricky Metaxas of the **Electricity Utilisation Group**, at the **University of Cambridge**, will be Secretary. The next Symposium in the series will be held at St John's College, Cambridge, in September 1995 under the auspices of AMPERE. To-date nearly two hundred people have expressed an interest in joining AMPERE and the numbers are growing steadily.

We intend to extend this Newsletter to cover short articles on various aspects of radio frequency and microwave energy usage in industry, commerce or the domestic fields and to this end I would welcome suggestions for inclusion in future issues.

Ricky Metaxas
Secretary and Newsletter Editor

In the early 90's, I visited the late Alberto Breccia in Bologna. He came to Cambridge a few years earlier to present an invited talk, and we forged a long-standing association. He was instrumental in the Academy of Science in Bologna electing me a corresponding member. I recollect with fondness our meeting at the impressive Bologna's Academy of Sciences, when over a drink we discussed the future of AMPERE and the directions we wish our association to follow (see Photo 5).



Photo 5: Myself and Alberto Breccia at Bologna's Academy of Sciences

He was keen to host the next conference in the series, and indeed, in 1997 the 6th AMPERE conference was held at Fermo, chaired by Alberto Breccia. The evening at his ancestral home in Fermo was memorable. Photo 6 shows a typical open forum where questions from the audience were posed, and the panel attempted to answer. I chaired the panel and from my left we had Jean Paul Bernard, Alberto Breccia, Thomas Ohlsson, Georges Roussy, Bernie Krieger, a colleague and Marco Garuti.

Shortly afterwards, when I was actively looking for a new venue after Fermo, Serge Lefeuvre suggested Professor Elias De Los Reyes' group at the Universitat Politècnica de València, in Spain. I flew to Valencia to meet Professor De Los Reyes and his group, and it became very apparent that Elias, aided by David Sanchez and Jose Catala-Civera, would play a prominent role in the activities of AMPERE in the years ahead. This turned out to be the case, as the Valencia group was in charge of the website (www.ampereurope.org) for the next ten years. AMPERE is indebted to the Valencia group for

devoting a great deal of effort towards ensuring the organization's world-wide profile. Following our meeting in Valencia (see Photo 7) Elias' group staged the 7th AMPERE conference which culminated in a memorable Gala dinner at the Santa Maria, a Gothic style church and Renaissance Monastery at El Puig and where Elias in a more relaxing mood impressed us all with his guitar mastery. The monastery was made a Monumento Histórico-Artístico Nacional in 1969.



Photo 6: Open forum at the 1997 Fermo conference



Photo 7: MC members in Valencia in 1998, from the left a colleague from the local group, Wim Jansen, Serge Lefeuvre, Alberto Breccia, Guglielmo d'Ambrossio, Elias De Los Reyes, myself, two local colleagues from Elias' group and Walter Van Loock.

Early in 2001, I attended a meeting relating to microwaves and chemistry in Antibes, France, where I first met Prof.ssa Cristina Leonelli, who was making her name in this area, and was based at the

Dipartimento di Ingegneria "Enzo Ferrari" Università degli Studi di Modena e Reggio Emilia. When I suggested that she join AMPERE, she was very humbled and surprised. She was elected a member of AMPERE's Management Committee (MC) at the next conference at Bayreuth in Sept 2001.

At that time, it became obvious that our little organisation was becoming quite established, and was handling substantial funds in subscriptions. Therefore, at the suggestion of Walter Van Loock, AMPERE acquired a non-profit company status registered in England in 2003. It changed its official name to AMPERE EUROPE LIMITED, and was governed by a President and a Committee of Management (MC). The photograph I took (photo 8) captures the newly formed Committee for AMPERE EUROPE LIMITED during its February 2003 meeting at the UKRO office in Brussels. It has subsequently been registered in France, and is under the jurisdiction of French law. The whole procedure was overseen by our Treasurer Professor Koen Van Reusel of the KU and Laborelec.



Photo 8: Members of MC at the Brussels meeting from left Jon Binner, Walter Van Loock, Alberto Breccia, Cristina Leonelli, John Bows, Monika Willert-Porada, David Sanchez-Fernandez, Peter Püschner, Jose Catala-Civera and Georges Roussy

After the AMPERE conference in Valencia (1999), I was contacted by Peter Püschner, who in Valencia had just been elected to the MC, and was alerted to the fact that Professor Monika Willert-Porada at Bayreuth University had a very active group using microwaves at the Department of Materials, and may be keen to stage the next AMPERE

meeting. I flew to Germany and met Peter and Georges Roussy of the University of Nancy, who was also a member of the MC, and discussed with Monika the possibility of staging the next biennial AMPERE meeting. She was indeed very keen and Bayreuth, Germany (2001) became the 8th in the series. I recollect vividly the gala dinner at the Schlossgaststätte Eremitage in Bayreuth, where we were entertained by a wonderful display of Baroque dancing led by our host Monika Willert-Porada and ably supported by Bob Schiffmann, Jon and Jane Binner. Then followed the 9th conference in the series, at Loughborough University (2003), under the chairmanship of Professor Jon Binner. Unbeknown to me, Jon had contacted my wife, Margaret, and got hold of some photos when I was an adolescent in Alexandria and formed a poster (see Photo 9) commemorating my birthday which fell during our conference. It was a nice gesture at the time particularly when it was kept from me and came as a complete surprise.

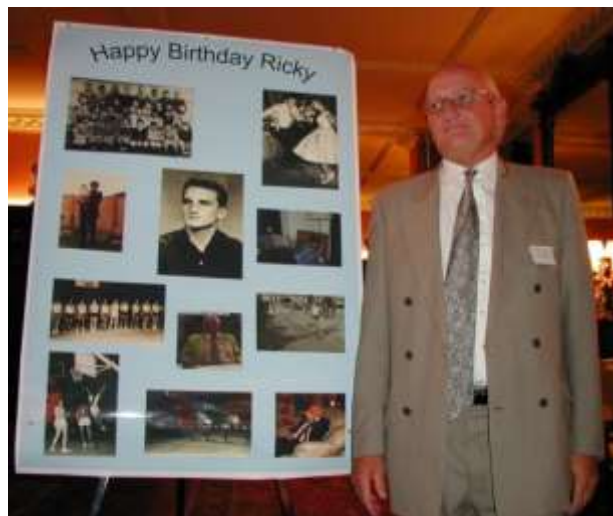


Photo 9: Standing sheepishly by my birthday poster

Finally, Juan Monzó-Cabrera on the piano and Sebastien Vaucher singing entertained us all with a marvelous repertoire of songs (see Photo 10). Following this conference AMPERE staged the next in the series in Modena, Italy in 2005 under the Chair of Prof.ssa Cristina Leonelli.



Photo 10: Sebastien Vaucher and Juan Monzó-Cabrera performing at Loughborough

End of an Era

At the OGA meeting of the members in Modena, I announced that I was stepping down as President following 20 years since the inaugural meeting at the 1986 at St John's. It was time to bring younger people to the fore and with some trepidation I stepped down as President and was succeeded by Professor Elias De Los Reyes of the Technical University of Valencia. He held the Presidency for the following four years and passed the baton to Prof.ssa Cristina Leonelli in 2009 at the OGA meeting at Karlsruhe. Cristina steered the organization for the next ten years. I recollect the horror in her face when I suggested that she might put her name forward for the Presidency, fearing that the task was too awesome for her. Everybody at AMPERE is indebted to Cristina for all the work in guiding the organisation to its present healthy state. From the very beginning of the formation of our association, my moto has been very simple. Spot the best talent in Europe in our subject area, invite them to join us, and from there some have emerged to hold important positions within the MC such as President, Secretary, Treasurer, and indeed Newsletter Editor in Chief. Apart from the visit to the balsamic vinegar distillery, there was a rich programme for accompanied persons to Reggio Emilia, Parma, famous for its cheese and ham and the historic centre of Modena itself. After the conference ended, a visit was also organised to the Ferrari museum nearby

showing a host of the well-known cars. The author is shown standing by a car on Photo 11, wishing he owned it!



Photo 11: Standing alongside a Ferrari dreaming of a ride

Following Modena, the next biennial conference was staged at Oradea, Romania under the Chair of Prof Marius Silaghi where, at the suggestion of our President Elias, Jean Paul Bernard and myself conducted the first SWOT debate involving RF and microwave heating. Gala dinners were always special at our AMPERE conferences such as that at Oradea where Photo 12 shows three grandees of the AMPERE community with their wives.



Photo 12: The three grandee couples of AMPERE from left to right, Jeanine Roussy, Marie-Claude and Serge Lefevre, George Roussy, Therese and Walter Van Look.

Prof.ssa Leonelli Presidency

After Oradea we moved to Karlsruhe, Germany in 2009 under the Chair of Lambert Feher, ably assisted by Guido Link and their very prominent group at the Karlsruhe Institute of Technology, (KIT). Photo 13 shows participants gathering at coffee break to discuss issues arising from the talks or visiting the various exhibitors' booths.

A year after Oradea, the Newsletter reported on the 1st Global Conference on Microwave Energy Applications (IGCMEA) which was hosted in Japan and was the brainchild of the Microwave Working Group, headed by Bernie Krieger. At that meeting, Professors Leonelli, De Los Reyes and Feher were the representatives of AMPERE. The Committee were kind enough to instigate the Ricky Metaxas Pioneer Award with Lambert Feher the first recipient.



Photo 13: Delegates networking during a break in AMPERE-2009

It was time to return the conference to France and our MC colleague Junwu Tao, who worked closely with Serge Lefeuvre for many years at the École Nationale Supérieure d'Électrotechnique, d'Électronique, d'Informatique, d'Hydraulique et des Télécommunications (EINSEEIHT) in Toulouse, chaired the 13th in the series, and very ably helped by Dr. Vuong who appeared everywhere unexpectedly and took lots of photographs with his super camera. A memorable visit was at Airbus where we saw the assembly of the impressive A380 plane.

The Newsletter also reported many special events such as the series of seminars on "Computer Modelling in Microwave Engineering and Applications" organized annually by the Industrial

Microwave Modelling Group (IMMG) of Worcester Polytechnic Institute, Worcester, MA. One such meeting, the 14th in the series held during 5-6 March 2012 in Bayreuth, Germany. The event, sub-titled "Multiphysics Modelling in Microwave Power Engineering", was organized in cooperation with Society for Industrial and Applied Mathematics (SIAM) and in partnership with University of Bayreuth's Chair of Materials Processing. The seminar was made possible due to sponsorship by AMPERE, DFG – Deutsche Forschungsgemeinschaft and two industrial companies – Püschner GmbH and SAIREM SAS.



Photo 14: Delegates and lecturers at the Multiphysics Modelling Seminar in Bayreuth



Photo 15: George Dimitrakis chairing an open forum at the Nottingham conference in 2013

Photo 14 shows participants and lecturers in front of Püschner's microwave system in Eckart GmbH. These series of seminars were instigated by Prof Vadim Yakovlev who has pioneered computer modelling for microwave heating over 25 years. Peter Püschner is on the extreme left, Vadim fifth

from the left, Monika Willert-Porada, 8th and Marilena Radoiu, 10th. Seven from the left stands Thorsten Gerdes.



Photo 16: Delegates on their way to the Gala Dinner in AMPERE-2013 with Jose Catala-Civera staring menacingly at a colleague

Nottingham 2013 was the venue for the 14th in the series of AMPERE conferences under the chair of Professor Sam Kingman ably supported by Prof George Dimitrakis, another member of the MC. In Photo 15 above George is directing yet another industrial panel on the future of industrial applications. By that time the MC was expanding and numbered some 17 persons from industry and academe. Photo 16 shows the Gala dinner reception area with participants and their partners mingling while anticipating another paunch- beguiling dinner.



Photo 17: The Rynek Glowny Square in Cracow. AMPERE-2015

The next venue was Cracow, Poland, in 2015 chaired by Prof Dariusz Bogdal at the Dept. of

Biotechnology and Chemistry. The memorable gala dinner took place deep in an underground salt mine. The iconic Rynek Glowny Square shown in the photo was much visited on our way to the conference venue where well-earned refreshments were consumed late in some evenings after the proceedings of the day had ended.

The 16th in the series was held at Technical University of Delft under the joint Chair of Profs. Andrzej Stankiewicz and Georgios Stefanidis. Delft is renowned for its pottery (see Photo 18) and historical buildings and canals. Photo 19 shows delegates attending one of the many plenary and other lectures. A memorial lecture was presented by Thorsten Gerdes, a moving tribute to Monika Willert-Porada following her untimely death. After the presentations, attendees were able to take a boat tour of historic downtown Delft, with insights in to the fascinating history of this beautiful city.



Photo 18: Much sought-after Delft blue souvenirs



Photo 19: Attendees prior to a plenary lecture in AMPERE-2017

The boat tour (see Photo 20) ended at the city centre where there was a reception at City Hall. Inside this wonderful venue, there were historical surprises around every corner, including an exact

replica of Anton von Leeuwenhoek's historical first microscope.



Photo 20: The canal through Delft

The Newsletter has also reported on the 2GCMEA (2012) and 3GCMEA (2016) Global Microwave Energy Applications meetings held respectively at Long Beach, California and Cartagena in Spain. The Group in Spain sprung out of the Group at Valencia where researchers David Sanchez, Diaz-Morcillo, Juan Monzó-Cabrera and José Fayos-Fernández set up a very prominent group to the south in Murcia and staged a wonderful meeting with a memorable Gala dinner at the Príncipe Felipe 5* Hotel in La Manga in 2016. Photo 21 shows an ecstatic John Gerling receiving the Ricky Metaxas Pioneer Award flanked by Juan Cabrera and myself while Cristina is on the far right. Shortly afterwards, Dr Marilena Radoiu received the Rustom Roy Innovator Award for her work in promoting microwaves into the industrial sector. A great innovation at this meeting was the tour in town, in small groups, of various restaurants testing tapas and local wines.

Finally, the latest conference, the 17th in the series, was held at Valencia in 2019 under the joint direction of Professor Jose Catala-Civera and Felipe Laureano Peñaranda Foix. At the OGA in Valencia Prof.ssa Leonelli stepped down and Prof. George Dimitrakis of Nottingham University was duly elected AMPERE's next President, Prof. Koen Van Reusel remains as Treasurer, and Prof. Jose Fernandez Fayos was voted in as Secretary. Juan

Cabrera will report on this venue in the 101 issue of the Newsletter.



Photo 21: John Gerling receiving his well-deserved Pioneer Award at the 3GCMEA Gala dinner in Cartagena

Also at the OGA in Valencia this year a major change in the management structure of AMPERE was initiated, prompted by Koen who, in discussions with the French authorities and our bank in Belgium, suggested that in order to facilitate the association's transactions from now on there will be three formal positions: President, Treasurer and Secretary. Instead of the existing much-enlarged MC there will be instead a Scientific Committee with each member assigned specific tasks, which will be posted online on our website.

Another major change that took place during the Cracow meeting was my stepping down as Editor of the Newsletter which I had undertaken for 20 years and coordinated 78 issues. Prof. Eli Jerby of the Tel Aviv University took over as Editor in Chief for two years, and forged a quantum leap, so to speak, in the status of our Newsletter raising its standard enormously by introducing a number of peer-review articles in each issue with myself continuing to contribute the Afterthought article. The Newsletter was also subtitled, "Trends in RF and Microwave heating" to reflect on the latest developments that each issue was reporting on. Eli Jerby was succeeded by Guido Link who is based at KIT and who in Valencia has kindly agreed to retain his position for a further two years.

A few important landmarks remain clear in my mind: the final lunch at St John's in the Great Hall during the 1995 venue: the evening reception at

Alberto's ancestral home during the Fermo conference in 1997; the grand opening of the 2001 venue at the Markgräfliches Opernhaus in Bayreuth; the visit to the balsamic vinegar distillery in Modena; the gala dinner deep in the salt mine at Cracow during the 2005 venue; the gala dinner at the Oceanogràfic aquarium in Valencia, during this years' conference; Georges Roussy's mesmerizing talks and Serge Lefeuvre's entertaining presentations at our conferences. I hope you all have memories that you are very fond of and cherish. I trust like me there have been significant contacts and/or memorable moments you will hold dear for years to come.

But let me tell you a well-guarded secret: there cannot be an AMPERE conference in the future without the iconic photo of our association's most magnetic trio taken at the Gala dinners as shown in Photo 22 below.



Photo 22: AMPERE's, Marileana Radoiu, Jean Paul Bernard and Cristina Leonelli

Challenges ahead

AMPERE faces many challenges as we progress forward to a turbulent Europe in an uncertain global economic cycle where the major powers are vying for political and economic prowess. Although our topic represents a niche area in a huge industrial sector every now and then a major application turns up demanding careful nurturing in order to facilitate its entrance into the market and render it a routine application.

Looking specifically at AMPERE, our organizational model works well because we are all volunteers and carry on the task of directing its path alongside our parallel duties, be it in academe or the

industrial sector. Members of the newly formed Scientific Committee need to fulfil the tasks assigned to each one in order to ease the burden on the three elected members of the recently adopted management committee structure.

One clear message is that AMPERE members must assist the Editor in Chief in the production of the quarterly Newsletter in readily submitting technical articles and other newsworthy items. The website must be kept regularly up to date with news of functions in our field. Members must think well into the future of whether they are willing one day to host our biennial conference at their bases in Europe.

Let me end with a positive comment. Reflecting back to the 1986 venue at St John's where we had just 50 attendees, it gives the utmost satisfaction to see young colleagues taking over the mantle so to speak and making a great success of our venues, evidenced by the 250 or so attending the Valencia meeting and guiding AMPERE along its evolutionary path. Long may that continue!

About the author



Andrew C (Ricky) Metaxas was born in 1942 in Cairo and completed his school studies in 1960 in Alexandria, Egypt. He graduated with a BSc in Electrical Engineering in 1965 and a PhD in Plasma Physics in 1968

from the University of London and following a 3-year postdoctoral study on fusion research at Swansea University in Wales he joined the Electricity Council Research Centre (now C-Tech Innovation) specialising on the use of RF and microwave for processing various materials and troubleshooting in the industrial sector. In 1982 he joined the Engineering Department at the University of Cambridge where he founded the Electricity Utilisation Group. He co-authored *Industrial Microwave Heating* (1983) and authored *Foundations of Electroheat: A Unified Approach*, (1996) spanning topics from ohmic heating to laser welding. He was the prime mover behind the

eventual formation of AMPERE, its President from 1995 to 2005 and from 2002 Director of AC Metaxas and Associates. He has in his name two awards: the *Ricky Metaxas Pioneer Award* which was established at the inaugural Global Congress on Microwave Energy Applications (1GCMEA) held in Japan in 2008 and the *Ricky Metaxas Young Researcher Award* which was formally established at AMPERE2019 in Valencia, Spain. He was the recipient of the *Lifetime Achievement Award* bestowed on him at the 2GCMEA in 2012 held under the auspices of the Materials Research Society in Long Beach, USA. He is a Fellow of IET and IMPI, corresponding member of Bologna's Academy of Sciences, member of the Scientific Committee of AMPERE and Life Fellow at John's College, University of Cambridge, UK.

About AMPERE Newsletter

AMPERE Newsletter is published by AMPERE, a European non-profit association devoted to the promotion of microwave and RF heating techniques for research and industrial applications (<http://www.AmpereEurope.org>).

Call for Papers

AMPERE Newsletter welcomes submissions of articles, briefs and news on topics of interest for the RF-and-microwave heating community worldwide, including:

- Research briefs and discovery reports.
- Review articles on R&D trends and thematic issues.
- Technology-transfer and commercialization.
- Safety, RFI, and regulatory aspects.
- Technological and market forecasts.
- Comments, views, and visions.
- Interviews with leading innovators and experts.
- New projects, openings and hiring opportunities.
- Tutorials and technical notes.
- Social, cultural and historical aspects.
- Economical and practical considerations.
- Upcoming events, new books and papers.

AMPERE Newsletter is an ISSN registered periodical publication hence its articles are citable as references. However, the Newsletter's publication criteria may differ from that of common scientific Journals by its acceptance (and even encouragement) of news in more premature stages of on-going efforts.

We believe that this seemingly less-rigorous editorial approach is essential in order to accelerate the circulation of ideas, discoveries, and contemporary studies among the AMPERE community worldwide. It may hopefully enrich our common knowledge and hence exciting new ideas, findings and developments.

Please send your submission (or any question, comment or suggestion in this regard) to the Editor in the e-mail address below.

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AMPERE Newsletter

ISSN 1361-8598

<https://www.ampereurope.org/newsletter/>
