

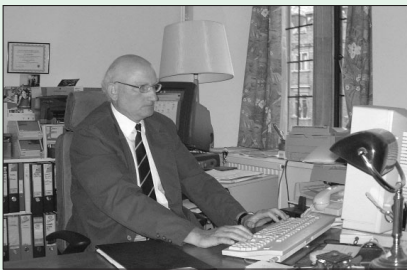


# AMPERE NEWSLETTER

A newsletter devoted to RF & MW heating in the range 1 MHz to 20 GHz Issue 37 ISSN 1361-8598 June 2003

## Before I forget ... A Personal Historical Perspective of Radio Frequency and Microwave Heating

by Ricky Metaxas  
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Ricky Metaxas at St John's

My earliest recollection with the topic of RF and MWs 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 Electrophysics 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 came including myself. 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 electrophysics group who were at the time designing equipment for industrial pilot scale trials. The first encounter I had with fellow scientists and engineers across the 'pond' involved in the same topic was at the 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) and had formed a small committee within the UK of like minded engineers to promote the use of RF and MWs. Two 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 used to organize an annual conference held alternately in Canada and the USA and it was deemed useful to include Europe, so in 1973 the first European-IMPI conference was held at Loughborough which was followed in 1976 and 1979 with other meetings in the series held in Leuven (Belgium) and in Monaco respectively.

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## Editor's Comment

For the benefit of the new and younger fraternity of AMPERE we have decided to write a series of articles bringing to the fore important events in the past thirty years or so thus tracing the history of Microwave and Radio frequency heating worldwide. It will be written by a few grandees and although there are bound to be overlaps this is beneficial to members in that emphasis will be focussed on different aspects and personalities. Bob Schifmann and Bernie Krieger have already accepted to contribute similar articles in this series and others will follow.

The next time members will meet is during the Ordinary General Assembly which will take place on the morning of Thursday 4th September during the 9th AMPERE Conference at Loughborough University. I do hope that by the time you read this editorial you would have registered and that if appropriate you would have sent in your paper manuscript. We also print in this issue a draft programme schedule for members to get a feel of the topics and other events taking place. Remember to log on to

<http://www.lboro.ac.uk/departments/iptme/Ampere9/Index.html>

for all such details regarding this conference.

May I again remind members that if there is anything they wish to express about AMPERE they can contact me and I can arrange for it to be published in the Newsletter. Your views are eagerly awaited.

Ricky Metaxas  
St John's College  
Cambridge, UK

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At the 1973 meeting at Loughborough I first met Bob Schiffman 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 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 Lefeuvre, Nicolas Meisel, Roger Meredith, Herbert Puschner (Peter's father), Ralph Shute, Stan Stucchly, Geoffrey Voss, and many others. Nils and his young *protégé* Thomas Ohlsson were becoming very prominent in the business following their publication in 1971 of the seminal paper on the dielectric measurements of food-stuffs. It was also at that meeting when our Japanese colleagues presented for the first time a new air-cooled magnetron which has subsequently become the standard in microwave ovens. I remember the theatre for this lecture was completely full with many delegates standing and the atmosphere buzzing with excitement because we were all aware that we were witnessing something unique which turned out to be the case.

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 or so with Geoffrey who was then very prominent at IMPI and was based at the University of Alberta, where one of his PhD students was Wayne Tinga.

My recollections of the 1976 meeting are more vague. Suffice to say that the venue in Leuven left an indelible impression following the exquisite dinner in Brussels after the conference with among others Stan and Maria Stucchly, Bob Schiffman and Wayne Tinga. I met other established names in our field such as Dr Van Koughnet and Walter Wyslouzil, the former having switched from microwave heating to communications shortly afterwards. I do not remember meeting Walter van Loock at Leuven but I do remember meeting him two years later in

1978 at the IMPI conference in 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. Nothing changes! At the same meeting I also remember hanging around with Harry Barber who was then at Loughborough University and 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 hazard 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.

I met Roger Meredith shortly after my appointment as Research Officer at the Electrophysics section at ECRC at Capenhurst in 1973. I visited him in Leicester at the headquarters of Magnetronics Ltd, the company he 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 had now become an industrialist he had a strong theoretical knowledge of the underlying theory and we talked virtually the same language. There followed a joint book venture (*Industrial Microwave Heating*) published in 1983 and our long association continues to this day.

After the conference I flew to New York and stayed at Bob Schiffman's Manhattan house, attending a production of *Rozenkratz and Gilberstein are dead* and jogged in Central Park with Marylyn Schiffman. I also remember a very poignant evening at his summer house in New England in the presence of Stan Stucchly who was on a flying visit consulting in New York. It was then that I became aware of Cober Electronics and Bernie Krieger. Alas Bob could not arrange for me to visit Bernie there and then. It was much later at the IMPI conference in Buffalo where Susan and Bernie Krieger and Margaret and myself met socially and such delightful meetings recur worldwide. The theatre outing at Corning, our meeting at Cincinnati where I was introduced to the World Congress initiative, the few days in Maine (what lobsters!) after the 2<sup>nd</sup> World Congress in Orlando, the dinners at the Mid Summer House restaurant in Cambridge, interspersed with some very serious talks about



IMPI, the WG movement and AMPERE, remain indelibly in my memory.

Alas, I did not attend the 1979 conference in Monaco which turned out to be the last European-IMPI collaborative meeting. Also many of my European colleagues could not attend the alternative IMPI meetings in Canada and the USA because they were too expensive. When I was then invited by my industry, the electricity supply industry (esi) in 1982 to set up the E.U.G. at Cambridge University and expand my ideas about electroheat, I started thinking seriously of resurrecting the idea of a conference in Europe on this topic. Having discussed this with the then Executive of the British National Committee for Electroheat (BNCE), Mike Thelwell, who was based at the Electricity Council in London, it culminated in the conference at St John's College, which is now regarded as the first in the series of AMPERE conferences on *Microwave and High Frequency Heating* although at the time AMPERE had not been formed. 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 (Center 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. 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. Our paths have kept crossing ever since.

Perhaps I ought to stress that the history of RF and MW heating in the UK and indeed 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 local customers. In fact a lot of the enquiries about the use of electricity in manufacturing and other industries emanated from Area Board Engineers who would visit their local customers and bring back to base requests for trials and purchase of

equipment. BNCE 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 industry. Manufacturers of equipment in the UK such as APV-Magnetronics (Roger Meredith eventually selling to APV), Radyne, ROTAX, Strayfield, Petrie, had all strong connections with BNCE and the Area Boards and in monetary terms the Electricity Council had a key role first in funding the BNCE and also 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.

The heyday of such collaborative work 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 (now following many changes as well as its name, 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\* 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 EC, the BNCE and the Area Boards as they stood in say 1990, 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, Cambridge, Edinburgh, Loughborough, Kingston, Nottingham, Stafford and a few other collaborating with industrial colleagues such as John Bows at Unilever Research, 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 2<sup>nd</sup> World War) and with a diminishing C-Tech.

Returning to my theme, following the success of the 1986 conference at St John's College, a small group of colleagues, principally Serge Lefeuve,



Will Boone, Thomas Olhsson, Geoffrey Voss, Mike Thelwell and myself met to decide where we were going to meet next and this culminated in the conference at KEMA near 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 developing RF and MWs for academe and industry. I recollect a very pleasant dinner with Daniel van Dommellen during the Nice meeting where many issues concerning our topic area were aired. Following Nice, I flew to Toulouse to meet Serge Lefeuvre and we decided to formalize our adhoc group and at the Goteborg conference in 1993 AMPERE came into being. The Newsletter started, Serge became the first President and I succeeded him in 1995 at the AMPERE conference at St John's. In the early 90's I visited Alberto Breccia in Bologna who came to Cambridge a few years earlier to present an invited lecture, and we forged a long-standing association which remains to this day. He was instrumental in the Academy of Science in Bologna making me a corresponding member. Shortly afterwards when I was actively looking for a new venue after Fermo, Serge Lefeuvre suggested Elias de los Reyes' group at Valencia. Ann Martin, the AMPERE administrator at the time, and I flew to Valencia to meet Elias and his group and it became very apparent that Elias, more than ably aided by David Sanchez and Jose Catala-Civera, would play a prominent role in the activities of AMPERE. This turned out to be the case as the Valencia group is in charge of our website and we are all indebted to them for devoting a great deal of effort towards ensuring the organization's world-wide profile.

A few important landmarks remain clear in my mind: the reception at Stan and Maria's house in Ottawa during the 1988 IMPI conference where I remember chatting amongst others to Geoffrey Voss, Stuart Nelson and George Freedman; the Sunwapta agreement forged between myself and Geoffrey Voss at the Sunwapta Falls in Alberta during my research visit to the University of Alberta (a kind of loose cooperative agreement); meeting Monika Willert-Porada at the MRS conference in San Fransisco in 1994 (that convinced me that I was dealing with a lady of substance); the drive from Melbourne to Sydney in the presence of Nguyen Tran and the Schiffmans in 1996 at which Nguyen was cunningly trying to convince me that the car was about to explode..; the delicious *moules marinières* during the numerous short courses in Amsterdam in the presence of John Zimmerly, the the Kriegers and Bob Schiffman; the evening

reception at Alberto's ancestral home during the Fermo conference in 1997; the party at Monika's house during the Bayreuth meeting 2001 and Georges Roussy's mesmerizing albeit all absorbing talks at the AMPERE conferences.

\* Union International d'Electrothermie based in Paris and comprises all the national Committees worldwide, such as Laborelec in Belgium and the former BNCE in the UK.

## 9th International Conference on Microwave and High Frequency Heating

Preparations for the 9th International Conference on Microwave and High Frequency Heating (1st - 5th September, Loughborough University, UK) are progressing well. 140 abstracts have been received and these have been allocated across the sessions that are shown in the attached draft programme. More abstracts are continuing to trickle in, though these are now being placed directly into the Poster Session since all the oral slots are now filled.

The conference will start with a short course on microwave and RF heating and related topics. The morning will consist of a series of introductory lectures at Loughborough University covering the basics of dielectric heating, equipment design and dielectric property measurement, whilst in the afternoon, there will be a chance for some 'hands on' experience of microwave processing and dielectric measurement equipment at Nottingham University. A bus will take the short course delegates from one site to the other, a distance of only about 20 km, and then bring them back again in the evening for the opening drinks reception for the conference itself.


After an opening ceremony and a Plenary talk to be given by Prof Monika Willert-Porada of the University of Bayreuth in Germany, the conference will consist of 2 parallel sessions covering a wide range of topics, from electromagnetic modelling, to equipment design and the processing of a very wide range of different materials, food, timber, minerals and waste products. A poster session with over 60 posters will be held on the Wednesday of the conference and through the first 3 days there will be an equipment exhibition covering a range of different products associated with dielectric heating. The posters, industrial stands, lunches, teas and coffees will all be located in a single large hall that

## PROVISIONAL PROGRAMME

Monday 01/09/03	Tuesday 02/09/03	Wednesday 03/09/03	Thursday 04/09/03	Friday 05/09/03
08.00 – 08.30 Short course registration	08.00 – 17.00 Registration	08.00 – 12.00 Registration	08.00 – 12.00 Registration	08.00 – 09.00 Registration
08.30 – 10.00 Short course session I	08.30 – 09.00 Opening Ceremony 09.00 – 10.00 Plenary 1	08.30 – 10.00 Oral 3a: Temp Meas & Medical AppIns Oral 3b: Waste remediation	08.30 – 10.00 Oral 6a: Metals Oral 6b: Equip Design II	08.30 – 10.00 Oral 9a: Ceram & Glasses II Oral 9b: Applns of Plasmas
10.00 – 10.30 Coffee	10.00 – 10.30 Coffee	10.00 – 10.30 Coffee	10.00 – 10.30 Coffee	10.00 – 10.30 Coffee
10.30 – 12.00 Short course session II	10.30 – 12.00 Oral 1a: Equip Design I Oral 1b: Chemistry I	10.30 – 12.00 Oral 4a: Ceram & Glasses I Oral 4b: Polymers & Comp	10.15 – 11.00 AGM 11.00 – 12.00 Plenary 2	10.30 – 12.00 Oral 10a: Diel properties Oral 10b: Modelling III
12.00 – 13.00 Lunch	12.00 – 13.00 Lunch	12.00 – 13.00 Lunch	12.00 – 13.30 Lunch (exhibition closes)	12.00 – 12.15 Closing ceremony
13.00 – 15.00 Short course session III	13.30 – 15.00 Exhibitor presentations	13.30 – 15.00 Poster session	13.30 – 15.00 Oral 7a: Chemistry II Oral 7b: Modelling II	12.15 – 13.30 Lunch
15.00 – 15.30 Tea	15.00 – 15.30 Tea	15.00 – 15.30 Tea	15.00 – 15.30 Tea	
15.30 – 17.00 Short course session IV	15.30 – 17.00 Oral 2a: Modelling I Oral 2b: Food	15.30 – 17.00 Oral 5a: Microwave effects Oral 5b: Wood & Minerals	15.30 – 17.00 Oral 8a: Electronics Oral 8b: Kilns & drying	
17.00 Close of short course	17.00 Close	17.00 Close	17.00 Close	
18.00 – 19.30 Drinks reception (all delegates)	19.00 – 23.30 Buffet and entertainment (all delegates)	19.00 – 23.30 Free evening	19.00 – 23.30 Conference dinner (all delegates)	

# NEWS & EVENTS

## 9th International Conference on Microwave and High Frequency Heating

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is immediately adjacent to the lecture rooms forming a single, tight knit conference venue to allow maximum interaction with each different aspect of the event.

There is also a range of different accommodation available, ranging from low cost (but still decent!) university accommodation through to suites in a local 4 star hotel. The university accommodation is located only a 10 minute walk from the conference venue, whilst the hotel is about 1.5 km away; a bus will connect the hotel to the conference centre each morning and evening. The same bus will also take the delegates to the two evenings of entertainment that have been planned. On the Tuesday night a Social Night has been organised that will include a hot buffet, two glasses of wine (or equivalent) for each person and admission to fun gaming tables. Fake money will be provided to all participants and prizes will be awarded to the most successful at the end of the evening. On the last night of the conference, Thursday 4th (our President's birthday), a sumptuous dinner will be held at nearby Prestwold Hall. Home of the Packe family for 350 years, the first Packe to occupy the house was Sir Christopher, a supporter of Oliver Cromwell. The Hall, which was extensively remodelled in 1843, has many interesting features including a considerable amount of marbled Italian plaster work, some fine English and European furniture and a large collection of family portraits from Sir Christopher to the present day.

Further information on the conference may be found at:

<http://www.lboro.ac.uk/departments/iptme/Ampere9/Index.html>

including details of how to register, how to travel to and from Loughborough and also how to submit a paper for the proceedings. Individual enquiries may be addressed by email to Ampere9@lboro.ac.uk. I look forward to seeing you all in Loughborough in September,

Jon Binner  
Your host!

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## IMPI Symposium

The next IMPI Symposium will be held at the Marriott Bloor Yorkville Hotel in Toronto, Canada, on 23-25 July, 2003. Topics include: Microwave Assisted Chemistry (which forms the primary focus of the meeting), Practical Applications and Modelling and Environmental and Waste remediation.

For further details log on to  
<http://www.impi.org/Meetings/index.html>

## FISO Technologies

Fiso Technologies Inc. has introduced an enhanced model of the UMI Model Fiber Optic Sensors Signal Conditioner, built on the USB 1.1 technology, designed for multi-purpose fibre optic measurements available in 4 or 8 channel models.

For more details contact <http://www.fiso.com>

### Your news and views are always welcome

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### AMPERE Subscription Rates

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