Obituary and Recollections for Bernard Krieger

We are sad to report the passing of our dear colleague, Bernard Krieger. We are devoting this Issue to his memory because of the calibre of the person and his standing in the microwave worldwide community.

Following an Obituary and colleagues tributes, we publish his article which appeared in Issue 42 because young colleagues will benefit from his long life experiences regarding microwave and RF heating and the mistakes he made from which lessons are learned. We also publish an interview conducted by Eli Jerby, past Editor-in-Chief, which illuminates his way of thinking and messages he still wished to convey to us all.

Roberto Rosa
Editor in Chief

Obituary: Bernard Krieger

Bernie and Susan

The microwave worldwide community has lost one of the most influential and charismatic proponents for the use of microwave energy in the industrial sector. One can only describe him as the quintessential industrialist. On Thursday February 16 2023 Bernie, as he was affectionally known, passed away peacefully in his home in Connecticut in the presence of his wife Susan, son Matthew and other members of his family. He was 93 years old.

It is very difficult to over emphasize the positive influence that Bernie had on many individuals over his long life, including myself. What I shall remember most was his sense of humour and his infectious laugh which made knowing him such a pleasure.

He joined the army when he was very young and in the article which this Newsletter published in 2004, which is reproduced in full in this Issue, describes his experience with the microwave radar system which controlled automatically his 120 mm aircraft gun. He states that at that time the concept of an automatically radar tracking system was magical and went on to describe how the system locked onto a young nurse's zipper as she walked in the vicinity. The zipper was made of brass with high reflection coefficient. He shut the system off and approached the young lady who, I quote from his article, "As I approached to tell her what I had just experienced, she said that she felt quite warm, which immediately made me feel quite flattered. I thought it was my charm because at that time I didn't realize the effect of dipole rotation." This was typical Bernie, always joking always smiling.

Bernie founded Cober Electronics with his partner Sandy Jacobson in 1966, the same year that IMPI was established. He regretted that he did not concentrate on military equipment but focussed instead on industrial applications thinking that this would have been the higher and more lucrative market. In hindsight he admits that was wrong but he persevered. He joined IMPI in 1967 and met some of the pioneers including John Gerling Sr with whom he wished to collaborate but alas they became competitors instead. His first venture with Cober was to join forces with the aerospace company, McDonnel Douglas, who had a vast expertise in designing vacuum systems (to simulate outer space environments) and they jointly developed a small scale microwave/vacuum system for drying grain.

Although the feasibility of the process was proven, the downside of this small scale system was that, when it was scaled up to satisfy farmers requirement of drying tons of grain, it proved too costly for a material that cost pennies. It was not commercially viable and later when attending lectures at the AMPERE conferences and he heard a presenter expounding the virtues of a new system for drying onions he would whisper to me, I quote, "tell him there is much sun in Spain". It is something that I learned from Bernie and I preach in every short course I present that microwaves are expensive and it would be best to use it for high value materials, such as drugs or pharmaceuticals where microwave vacuum drying has been a great success. Over the years Cober under Bernie and his staff produced some robust equipment particularly for rubber vulcanisation with hundreds of systems installed worldwide.

I first met Bernie at the IMPI conference in Buffalo where Margaret and I met his wife Susan and after the conference all four of us drove back to New York stopping at Corning where after a rest we had a swim followed by an early dinner and a visit to the theatre.

He and I met at the MRS meeting at Cincinnati where he put forward his ideas about forming what became known as the Microwave Working Group (MWG) and expounded his ideas about bridging science with applications. He argued that both AMPERE and IMPI were concentrating too much on theory rather than industrial applications although on many occasions I reminded him that in our AMPERE meetings we always had provision for hiring booths where industrialists could demonstrate their latest equipment. When I was President, the Management Committee of AMPERE not only consisted of academics, but had members representing Sairem, Puschner and Alter, all prominent firms based in Europe. Nevertheless he believed that a more concerted effort had to be made worldwide and towards achieving that goal he formed the MWG with its mission being, "Bridge Science, Technology and Applications." A series in World Congresses was organised early in the millennium in Florida by the MWG.

After the 2nd World Congress in Orlando in 2000 Margaret and I flew up north and stayed for a few days in Connecticut with the Kriegers where Bernie was keen to teach me how to hunt. We then drove to Maine for a break where amidst walks and eating lobster we discussed the future of our respective associations.

Although participants in the World Congresses included members from Europe and the Far East it was many years later that Bernie convinced the four prominent microwave and RF associations, AMPERE, IMPI, JEMEA and CAMPA, to organise a series of Global conferences, each at their locations, a scheme which eventually culminated in the quadrennial Global Conferences on Microwave Energy Applications (GCMEA). He worked tirelessly with the other members of the MWG team Jon Binner, Jon Booske, John Bows, Ralph ("Randy") Bruce, David Clark, Joe Cresko, Dianne Folz, John F Gerling, David Lewis, Ed Ripley, Bob Schiffmann, Rebecca Schulz, Juming Tang, Roger Williams and Ben Wilson to concentrate on the customer orientated focus which he believed industry much needed.

Bernie has been President of IMPI and the recipient of the 1st AMPERE MEDAL, the highest honour that our association can bestow on an individual, but he always played down his pivotal role on the worldwide microwave community and after I placed the medal round is neck at the Gala dinner in Kraków he smiled- his inimitable smile- and commented that it felt as though he was an Olympic athlete!

A few wonderful occasions spring to mind, principally after the biennial AMPERE conferences: the stay at our house in Cambridge after the conference in Fermo discussing all subjects under the sun. The dinner at the roof restaurant of our hotel in Cracow in 2015, in the presence of Bob and Marilyn Schiffmann was memorable in its ethereal atmosphere and laughter following Bernie's jokes. We last met in a rain-drenched Valencia in Sept 2019 visiting quaint alleys and eateries in that beautiful city.

For a while, we have been aware that he wasn't well but still wished for a brighter outcome which alas wasn't to be. The microwave worldwide community has lost a giant in our midst and I have lost a valued friend and colleague whose advice I will always cherish. RIP

Ricky Metaxas

Tributes from colleagues

It has been with great sadness that the microwave community received the news on Bernie Krieger's passing. Bernie was a pioneer in our area of activities and helped establish what is today a dynamic research field which is at the forefront of novel developments. Microwaves and RF have the potential via the electrification of industrial processes to contribute significantly in the tackling of global problems.

Bernie was a tireless worker which through his involvement with the development and proliferation of microwave technology for industrial microwave heating applications, helped AMPERE and its sister organisations to develop and transform to truly global communities, reaching industrialists and academics in many countries. He will be sadly missed but his legacy will remain and act as an example for all of us'

Georgios Dimitrakis
President, AMPERE

It is hard to think about Bernie Krieger in past terms, while his leading influence on the microwave communities worldwide is still vital, and will remain so.

Bernie was highly respected not only for his professional achievements - as an entrepreneur, industrialist and a business leader - but also for his devoted public services, initiatives and actions, in the leadership of professional microwave associations worldwide. To mention a few, Bernie was the President of IMPI, a founding member of AMPERE, and a founder President of the Microwave Working Group. Furthermore, Bernie was one of the driving forces acting to elevate and to unify the American and European organizations, along with their Asian sister organizations, and to form broad international bodies, namely the microwave federation of the worldwide microwave societies and the Global Congress on Microwave and RF Applications.

In a more personal view, I was always impressed by Bernie's intuitive wisdom. His unique intuition was not just a feature but a powerful tool in his ability to rapidly catch the main points in technological, scientific and organizational issues, as well as in his ability "to read" people, intentions and trends.

I trust that Bernie will be remembered by many of us as a friendly person with a good smile, "*a mensch*", who had the wonder ability to join people together and to create magnificent professional structures and activities for the joint benefit of all.

Eli Jerby
Tel Aviv University

Since I've met him and over these last three decades, Bernie Krieger showed a restless curiosity with subjects related to microwave and radio frequency processes as well as the development of equipment and theoretical models. A man with a vision who gathered our small community around the planetary event of GCMEA together with few other promoters. Ready to travel to Europe on the occasions of the AMPERE Meetings, he has been a reference and inspiration for many of us.

Good natured, he was always ready to help with suggestions and recommendations pulling out from his long experience in MW and RF applications. Yet, he was always ready to listen to younger colleagues with whom he could easily reach a compromise to bridge the generational gap.

My heartfelt condolence to those he left behind, especially to his wonderful wife, Susan and his son Matthew.

Cristina Leonelli
Università degli Studi di Modena e Reggio Emilia

I met Bernie for the first time in February 2004. We were quietly waiting in the living room of Bob Schiffmann's home in New York to prepare some input of UIE and the Microwave Working Group for the 4th World Congress on Microwave and Radio Frequency Applications that would be organized the same year in Austin, Texas. Once Bernie came in, the atmosphere became even more relaxed. His first question was whether Bob had the tickets for the opera at the Metropolitan for the performance he and Bob would attend that evening. And, indeed, it was all right with the tickets. Bernie gently smiled. Now, our business could be discussed; and a gentle smile on Bernie's face was there for the whole meeting.

I had another gentle discussion with Bernie in 2015 at the gala dinner of the 15th AMPERE

conference in Krakow. Bernie just received the AMPERE medal, and he jokingly assured me that, now that he had got it, he will never give it away again! According to AMPERE's house rules, "the AMPERE medal is bestowed upon an individual that has worked tirelessly promoting the use of RF/microwave energy". A most fitting word between the medal and its first receiver is "tirelessly". Until the end of his life, Bernie never got tired from smiling and promoting the use of RF/microwave energy and being gentle.

Thank you so much, Bernie, for your help in bridging the gap between industrial applications and academic research. And we are sure that your smile and gentleness is smoothly joining for eternity the tireless smile and gentleness of the angels.

Koen Van Reusel
UIE General Secretary

Bernie Krieger was a true giant in the field of microwaves, a pioneer who helped shape the industry in countless ways. As a microwave expert with decades of experience, Bernie was renowned for his knowledge, insight, and leadership, and he inspired countless colleagues and mentees over the years.

He was a pioneer in his field, a true visionary who saw the potential of microwave technology before most people even knew what it was.

I first met Bernie many years ago when our companies, COBER and MUEGGE, were working together on the joint venture CoberMuegge. From the very beginning, it was clear that Bernie was a true microwave guru, with an encyclopedic knowledge of the field and a passion for innovation and progress. But beyond his technical expertise, Bernie was also a warm, kind, and generous person who touched the lives of countless colleagues and mentees over the years.

Over the years, I had the pleasure of working alongside Bernie on numerous projects and initiatives. His insights and guidance were invaluable, and I learned so much from him. Bernie had a remarkable ability to break down complex technical concepts into understandable terms, and he had a way of making even the most challenging problems seem solvable.

In the article "After I Forgot… Lessons that I have learned" which appeared in the AMPERE Newsletter Issue 42, Bernie shared some valuable lessons he had learned over the course of his long and illustrious career. One of the key takeaways from the article was the importance of staying curious and open-minded, even in the face of uncertainty or adversity.

This spirit of curiosity and exploration was evident in everything Bernie did, from his ground-breaking work on microwave heating to his tireless efforts to mentor and inspire others in the field. As a colleague, I had the pleasure of witnessing this first hand. Bernie was always eager to share his knowledge and insights, and he had a remarkable ability to break down complex technical concepts into understandable terms.

Another lesson that Bernie emphasized in the article was the importance of collaboration and teamwork. This belief was reflected in his many years of collaboration with COBER and MUEGGE, as well as in his efforts to mentor and inspire young engineers and scientists in the field.

Bernie's passing is a great loss to the industry, but his legacy and impact will continue to inspire us all. He was a true pioneer, a microwave guru, and a remarkable human being, and his contributions to the field of microwaves will never be forgotten. As we continue to grapple with the challenges of the future, we can all draw inspiration from Bernie's example of curiosity, collaboration, and dedication to progress.

Klaus Baumgaertner
CEO, Muegge Group

I am very sad to hear that Bernie has passed away.

Forty years ago I met Bernie for the first time. I was only 27 years old and Managing Director of Sairem already for 2 years. I was very impressed about him and his company COBER that was well known in the World. We had often interesting talks during the past 20 years. These involved some potential projects between my ex-company Sairem and Cober concerning the US market.

For me like Bob Schiffmann, he represented one of the leaders in MW business and the MW fraternity worldwide.

I have very much enjoyed my discussions with Bernie's wife, Susan, during the IMPI and AMPERE congresses and also similarly with his son Matthew whom I had the opportunity to meet in the USA on many occasions.

My condolences to his family.

JP Bernard
President, MIS

I have known Bernie since the early 1990s and it is going to take quite a while to get used to the fact that I won't see him again – even though it must have been at least 5 or 6 years if not more since I last saw him.

He was such a total live wire, always keen to find that 'killer application' that was going to get the technology adopted even more than it is now and make everyone rich in the process. He would spend hours happily arguing about the pros and cons of anything that he thought might have a chance of turning into his 'killer application' and had a growl that was unbeatable if he sensed that he wasn't winning the argument.

Whilst he certainly gave the impression that he took life very seriously, and could be totally uncompromising when chairing a meeting, he was rarely without a smile ready to come to his lips and usually had a very kind word for people once he felt that he had won. I shall miss his raw energy, his drive – and his laughs.

Jon Binner
University of Birmingham

I got to know Bernie in the 1990's when we first met at one of the IMPI conferences and at IMPI conferences in the years after. Working in industrial foods R&D, I was always taken by his simple but powerful perspective with industrial microwave applications – you've got to know the customer's business thoroughly and be closely involved over years to enable disruptive microwave technology to become truly established, it's always more than just cost!

When Bernie founded the Microwave Working Group (MWG) around 2004 to "bridge science, technology and applications", I was immediately drawn to the concept. When Bernie invited me to join the MWG in 2005, I was happy to do so, and contributed & attended the first and second Global Congresses in Japan (2008) and Long Beach (2012). I learned a lot about managing organisational politics from Bernie as he skillfully navigated the major microwave associations to reach consensus on quite a few not-so-simple issues along the way! At the Long Beach conference, I took my family to make a holiday of the occasion, my son Dominic (then 9 years old) was very taken by Bernie at a post-conference meal. That's an abiding memory I have of Bernie, very hospitable and genuinely interested in others. Bernie even took me pheasant shooting with his beloved Setter called Esau, quite an experience for me, and Susan cooked some of the birds for dinner!

I have fond memories of working with Bernie and his team at Cober between 2006 – 2009 on a particularly innovative & challenging rotary microwave cavity for a Pepsico snacks process. No other microwave company would take on the risk, Bernie was happy to develop a partnership-based approach with me, and we had a lot of fun amidst some major technical hurdles along the way.

My sympathies to Susan and the family and Bernie's friends. Bernie was one-of-a-kind and I will really miss him.

John Bows
R&D Pepsico

To say that Bernie was passionate about microwaves would be an understatement.

From my first conversation with him at the 1988 IMPI symposium in Ottawa, his dedication and leadership were truly inspiring and motivating. Anyone involved in the Microwave Working Group, for which I believe Bernie deserves the most credit, could see that. Bernie's leadership was also instrumental in the formation of MAJIC which is arguably one of his greatest ongoing legacies. Perhaps the most enjoyable moment I had with Bernie was in 1994 as my wife, Sally, and I drove him and Bob Schiffmann to an evening concert at the Ravinia, outside of Chicago, during the IMPI symposium. Sitting together in the back seat, Bernie and Bob's non-stop banter full of stories and jokes had us in stitches! Friendships like theirs are few and far between, and I'm grateful for the impression it made on me.

John F Gerling
President, IMPI

I am devastated to hear the sad news of Mr. Bernie Krieger's passing.

Bernie had been the trusted President of Cober Electronics, Inc. and showed excellent leadership skills through Microwave Working Group and guided great success of the first Global Congress on Microwave Energy Applications (GCMEA), and he hosted wonderful 2nd GCMEA.

Every time I saw him, I could feel his strong power to connect human over the microwave research and industrialization. I shall miss him always as one of the great pioneers. RIP.

Yoshio Nikawa
Kokushikan University

Bernie meant a lot to us, and to AMPERE and IMPI.

He had a long history in the microwave field. It is with great sadness that we receive the news that Bernie has passed away.

We will remember him in the future as being a past President of IMPI and an IMPI Fellow, as well as a founding member of AMPERE and the first recipient of the Ampere Gold-Medal.

Birgitta Raaholt
Rise, Göteborg

Mr. Bernie Krieger, another Microwave Guru, went up to heaven to join his friends Georges Roussy and Bob Schiffmann.

Let us all hope that we will make them proud whenever they look down upon the Earth. I offer my sincere condolences to the family. Bernie was an inspiration to all of us and his memory will be cherished. Farewell, Bernie and Godspeed.

Marilena Radoiu
President, Microwave Technologies Consulting

The first time I met Bernie it was in Orlando in 1996.

During all the years we met on numerous occasions mainly at the Ampere conferences he was the "big microwave guy" having 120 employees in his company. I listen to his stories and advice and I have learned a lot from him. But at the end we were competitors and our respect for each other steadily grew. Now after his passing I hope that his son Matthew will be able to develop Cober successfully into the next generation. In the final analysis, it is good to have serious microwave companies worldwide with good reputation for our technology. For me I learned more from Bernie than from anybody else in the microwave community because he was a 100% industrialist and always very open and frank with his opinion for various matters.

The last time we talked was during Ampere 2019. I feel grateful for all the conversations I had with him. When I first came on the scene I was the son of Herbert Pueschner but at the end I had his respect to be a serious competitor. This was the respect I felt for him from the beginning.

Peter Pueschner
PÜSCHNER GMBH and Co KG

I believe that my first encounter with Bernie was at the 3rd World Congress in Sydney. He seemed to be enthusiastic about many things, especially when talking about new and novel applications of microwave energy. I think this defined my ongoing encounters with him.

In spite of time passing, his enthusiasm over interesting ideas never seemed to wane. My encounters with Bernie continued at the various international conferences in the US or Europe.

The 3rd World Congress was my first foray into microwave heating applications after having to reinvent my engineering career for about the third time. My conversations with Bernie, and many other very experienced colleagues, in the years since were invaluable. He will be missed.

Graham Brodie
Adjunct Associate Professor, James Cook University, Townsville

I have been Bernie's friend for over two decades. During that time, I have had the opportunity travel with him all over the world. As both a member of the Microwave Working Group and AMPERE, I have wonderful memories from my travels with Bernie (and Susan). Whether busting open sake barrels at a gala banquet in Lake Biwa, Japan, or watching kangaroos in Australia, or walking through the medieval walled city of Carcassonne, or riding elephants in India, he always embraced new

experiences with joy and wonder. I will always treasure those memories and experiences.

One of the things I most admired about Bernie was his endless curiosity. I think he genuinely loved learning about and understanding everything. He was an active listener, and you always knew he was truly interested in what you had to say. He loved to talk about everything from fly fishing to watchmaking, and he was always willing to share the wisdom of his experiences.

When Bernie and Bob Schiffman started the Microwave Working Group, it was to help others "bridge the gap, between technology and application". He was truly committed to helping others understand the benefits and limitations of Microwave and RF technology, accurately describing the advantages, without ever overselling the technology.

I always enjoyed talking to Bernie, and I will remember him as a gentle, friendly person, with an inquisitive soul.

Ed Ripley
President, Microwave Working Group

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*After I forgot….lessons that I have learned**

Bernard Krieger
CEO Cober Electronics, Managing Director of CoberMuegge LLC, President of the Microwave Working Group

This article is the third in the series suggested by Ricky Metaxas for the benefit of the "new and younger fraternity of AMPERE". Ricky wrote the first entitled "Before I forget…" and Bob Schiffmann the second "After forty-two years, I'm still microwaving".

It is amazing to me how Ricky and Bob remember details about so many people and events. While Ricky entitled his article "Before I forget" I suppose mine should really be called "After I forgot" because my recollections about MW technology, I am embarrassed to say, go back more than the forty-two years documented by Bob. Scientists like Ricky and Bob probably have records of every paper they gave and every article they wrote. I have done a lot myself also, but I really can't remember those details because my focus has been to look at our industry as a businessman rather then as an academic. I measure my progress in dollars and in the number of friendships that I have made. The latter are very ample; the former, I can't comment on too much: but I can tell you that when I look at my company's financial statements sometimes the numbers look like Hippel's tables of dielectric loss factors.

Ricky and Bob recalled and mentioned almost all of the key names in the history of our technology. I too know most of them, but my approach is not to duplicate but rather to focus on the lessons that I have learned. I will pass a number of these on to you in this article as thoughts for the future, which will hopefully save you the expenditure of time that it took me to draw these conclusions. Since Ricky and Bob dated their first experience with MWs, I am glad to say I have been there longer! You of course can all also recognize me in the photo on page 2 with my first "MW processing system" in 1951. Most will recognize me: I look exactly the same today! In any case, I was operating a new MW radar system, which in those days had the remarkable feature to automatically control a 120mm aircraft gun. The "applicator" is depicted behind me in the photograph. To equate this to an industrial microwave processing system as used in a factory, there is in this process the production foreman whom I called " sergeant". He was a man of few words, in fact only one word, and "fire!" The machine operator who I call "corporal" was also of singular purpose because when he heard the foreman's utterance, his job was just to pull a