



**Wladek Walukiewicz**  
(1946-2022)

We have recently received very sad news of the death of our colleague, an excellent condensed matter physicist, a graduate of our Department, Wladek Walukiewicz.

Wladek passed away November 9, 2022 in California.

Wladek Walukiewicz graduated from the Faculty of Physics at the University of Warsaw in 1971. He then joined the Institute of Physics of the Polish Academy of Sciences (IF PAN), where he received his doctorate in 1974. He worked at the IF PAN until 1982. In the late 1970s and early 1980s, he was a frequent guest at the Massachusetts Institute of Technology, where he conducted research work on the electrical and optical properties of semiconductors. He worked in a group headed by Prof. Harry Gatos, and whose scientific leader was another graduate of the Faculty of Physics at the University of Warsaw and later an employee of the IF PAN, Prof. Jacek Lagowski.

Jacek and Wladek exerted a great influence on each other, and their joint discussions gave rise to many valuable papers on the electrical and optical properties of semiconductors, such as the model of electron transport in three- and two-dimensional systems.

In 1984, Wladek was hired as a full-time researcher at Lawrence Berkeley National Laboratory (LBNL) and worked there until his retirement in 2019, leading his research group and large ongoing projects. His research interests focused on the study of defects in semiconductors and the properties of semiconductor materials resulting from their doping and formation of mixed compounds. In recent years, he has been studying the properties of semiconductor materials in

terms of their potential use for photovoltaics. Since his retirement, he was still an active researcher, collaborating on behalf of the University of California, Berkeley, with the National University of Singapore, and also had a very lively collaboration with the Department of Fundamental Technological Problems of the Wroclaw University of Technology (group of Prof. Robert Kudrawiec), heading a joint NCN grant on perovskite materials. He left behind many valuable published papers (510), cited more than 20,000 times, his index H=70. These parameters are impressive in the field of condensed matter.

Wladek was a theoretical physicist, but he always worked closely with experimentalists, and the results of his work served experimental physicists strongly. His work contained models and quantitative descriptions of phenomena that could be used in understanding and analyzing experimental data. He considered very basic and fundamental phenomena, such as doping or mixed crystals, discovered and built new areas of semiconductor physics related to these phenomena, and was able to create pictures of the very general behavior of materials and determined the regularities of this behavior.

*Wladek Walukiewicz can be remembered in many ways, with impact for the future. For young physicists, an important example might be Wladek's affiliation with the Polish School of Physics of Semiconductors. When creating this School, Professor Leonard Sosnowski favored the chosen ones, admitting, that we should favor and value those from whom we learn the most. At MIT and Berkeley, many learned a great deal from Wladek. He was not only an ambassador of the Polish School of Semiconductors, but an authentic creator, creating knowledge about electrons in the unique space of semiconductor structures. As Jolanta Walukiewicz, Wladek's wife and also a physicist, comments: "...Wladek understood electrons in semiconductors as if they were his closest friends."*

*From a completely different angle, one can also remember Wladek working out in the gym, playing tennis on the court, running long distances or skiing down snowy slopes. Perhaps these physical exercises allowed Wladek to continue his scientific work until his passing "from here to eternity."*

**Jacek Lagowski**

Massachusetts Institute of Technology  
University of South Florida  
Semilab

*The sad news of Wladek's illness and such a quick death has shocked us all. None of us would never have guessed that such a well-athletic man, always smiling, kind and full of energy could be sick! I always looked at him as a specimen of health. Fate made it so that I knew Wladek from the time of Hoża, through the IF PAN and all the years of work at the Lawrence Berkeley Laboratory. Wladek was a great theoretical physicist, very well known in the world forum, focusing his work on semiconductors, with a good understanding of experiment. He used data from the experiment he used for his calculations and models. I, as Wladek's collaborator in the LBL Electronic Materials (EMAT) Program on a daily basis, saw students, visiting researchers*

*from all over the world and us team members surrounding Wladek, who was always kindly willing to share with us knowledge based on the fundamental laws of physics.*

*It was Wladek who, in collaboration with experimentalists, showed the narrow energy gap (0.67 +/- 0.05eV) in InN (at the time a very controversial issue!). Understanding the issue of "band anticrossing" with application to a wide class of highly mismatched semiconductor alloys was an ambition of every student and us EMAT team members. The door of Wladek's room was always open, encouraging scientific discussions.*

*We thank you, Wladek, for your contributions to science and the way in which you interacted with people. You left us much too early. You are missed among us. Rest in peace!*

*Your colleague, associate and friend for many years,*

**Zuzanna Liliental-Weber**  
Lawrence Berkeley Laboratory

*I met Wladek in Berkeley during my postdoctoral training in the group of Dr. Zuzanna Liliental-Weber and Prof. Jack Washburn at LBNL in 1994-1995. It was then that I had the opportunity to collaborate with him in a project on the use of argon ion implantation to obtain highly resistive GaAs with very short carrier lifetimes for optoelectronics applications. Our second, much longer collaboration took place between 2000 and 2004, when I worked in Zuzanna's group, this time on a postdoctoral fellowship. This project was devoted to studying the properties of dilute Group III-V nitrides ( $\text{GaN}_x\text{As}_{1-x}$ ,  $\text{In}_x\text{Ga}_{1-x}\text{N}$ , etc.) obtained by the method of ion implantation and rapid thermal annealing or pulsed-laser beam melting. These studies have resulted in a number of interesting results and several papers, including in Applied Physics Letters. In addition to being an outstanding physicist, Wladek was also a very kind and nice person, just like his wife Jola. That is why we became friends (me and my wife Asia) with them, especially during the period of our stay in California until 2008. A few years later, in 2013, we had the opportunity to meet Wladek and Jola again, this time in Louisville, where Wladek presented an invited paper at the 2013 Kentucky Workshop on Renewable Energy and Energy Efficiency (RE3).*

**Jacek Jasinski**  
Conn Center for Renewable Energy Research,  
University of Louisville

*The news of Wladek's death was completely unexpected. I remember him as athletic and gushing with life. We studied together and later met several times during my stay at MIT in 1986-1988, but we never worked closely together. On the other hand, his canonical paper: Electron mobility and free-carrier absorption in InP; determination of the compensation ratio, J. Appl. Phys. **51**, 2659 (1980) I always have at hand when designing waveguides for cascade lasers.*

**Maciej Bugajski**  
Lukasiewicz Network Institute of Microelectronics and Photonics

*It was with great regret that I received the news of Wladek's death. He remains in my memory as a person seeking new ideas, an insightful scientist and a good friend. I remember the meetings I had with him in Berkley, which were always an opportunity to exchange thoughts and new ideas. I was impressed by his broad knowledge that transcended narrow issues and his ability to communicate simply. He was an extremely active scientist, as evidenced by his impressive scientific output. I learnt about his passing with great sadness. He will remain in our memories of him and his great scientific achievements.*

**Jacek Baranowski**

Faculty of Physics, University of Warsaw  
Lukasiewicz Network Institute of Microelectronics and Photonics

*I still show some of Wladek's demonstrated trends in semiconductor behavior in his original drawings during lectures to students. These are primarily semiconductors mixed for the case of matched and strongly mismatched systems (with extremely high electro-negativity of one of the mixed components), or properties resulting from the proper alignment of the conduction and valence bands with respect to the vacuum level. I remember how Wladek during his time at MIT determined the effect of various carrier scattering processes on their mobility in GaAs. Based on his diagrams and measurement results, it was possible to directly infer about the number of dopants of different types, and to know the amount of compensation. For experimentalists, invaluable data. Recently, we used the regularities he noticed regarding defects in perovskite materials. Wladek maintained scientific contact with us, and I will always be grateful for hosting doctoral students, supporting our efforts to purchase apparatus, or helping us get in touch with interesting research groups in the US.*

**Maria Kaminska**

Faculty of Physics, University of Warsaw

*It was with great regret that we received the news of the death of Dr. Wladek Walukiewicz, an outstanding scientist and friend. Wladek Walukiewicz, a graduate of the Faculty of Physics at the University of Warsaw, received his doctoral degree and habilitation at the Institute of Physics of the Polish Academy of Sciences in Warsaw. For nearly thirty years, he was associated with research institutions in the United States, primarily with Lawrence Berkeley National Laboratory, LBNL. Wladek was a brilliant scientist, with great intuition and the ability to find effective solutions to fundamental problems of semiconductor physics. Our collaboration with Wladek yielded some 11 papers with high citation indexes (e.g., "Large, nitrogen-induced increase of the electron effective mass" in Appl. Phys. Lett. **76**, 2409, over 300 citations). These collaborations were particularly intense in the area of dilute nitride physics, one of the topics in the development of which Wladek's contribution is particularly large.*

*We remember Wladek as a person full of life, always witty, but concrete and serious when it came to work. He was a keen sportsman and played tennis very well. He liked people and helped them. Wladek will always be associated with our stays in Berkeley and this is a very precious memory for us.*

**Piotr Perlin, Tadek Suski and Iza Grzegory**  
Institute of High Pressure "Unipress", Polish Academy of Sciences

*We studied together in the same year at the Faculty of Physics of the University of Warsaw and later for doctoral studies at the Institute of Physics of the Polish Academy of Sciences. Almost 45 years ago we worked together at MIT. Then we published a paper in which we showed how from a mobility measurement (for a given concentration of current carriers) one can determine carrier compensation in materials of groups III-V (e.g., for GaAs). When we published this work, we didn't realize how important it would be. Years later I learned that this work was crucial for improving the quality of III-V materials and their applications in optoelectronics.*

*And my last memory of Wladek:*

*We watched the sunset over the Gulf of Mexico together from my balcony, sipping a good Bourbon and reminiscing about the good old days. That's how I will always remember him.*

**Lubek Jastrzebski**  
Massachusetts Institute of Technology  
University of South Florida  
Semilab

*I met Wladek while I visited MIT and later our families became friends when Wladek moved to Berkeley. Wladek always had a wonderful sense of humor and, of course, was a great Physicist. I remember many interesting discussions during our meetings. We also met at various conferences, including one in 1994 in Warsaw. My wife Ela and I very painfully felt the death of Wladek. We will miss very much this close friend, wonderful man and Physicist.*

**Chris Kocot**  
Optical Sensors Group, Coherent

*I met Wladek during my studies at MIT. Even then I had the opportunity to appreciate his knowledge and talent, when he assisted my PhD work with carrier transport calculations. Later, Wladek's move to Berkeley and mine to Palo Alto created opportunities for closer contact and collaboration. I remember Wladek and Jola's presence at Eve's and my wedding and the multiple meetings that followed. Wladek was a Renaissance man, with great knowledge, open to new ideas and contacts, always ready to offer help. The memory remains, but we will miss him greatly.*

**Krzysztof Nauka**  
Massachusetts Institute of Technology, Cambridge, MA  
HP Labs, Palo Alto, CA

*The unexpected death of my friend and colleague Wladek Walukiewicz is a great loss for me. I actually met Wladek for the first time when he was considering to change from MIT to Berkeley*

in 1984. I still remember him coming to my Berkeley apartment, and we had intense discussions about semiconductor science, and the life in Poland, in Boston and in Berkeley. May be, this helped a bit to convince him to come out to the West coast and join the group of my colleague, Prof. Eugene Haller, who regrettably died already a couple of years ago. Eugene had founded in LBL the 'Electronics Materials Program' (EMAT), and Wladek was our chief theoretician in this team, that included besides myself and Wladek as well Zuzanna Liliental-Webe, among others. The remarkable scientific achievements of Wladek have already been mentioned by other friends, most notably are in my view his models for the band-line-up of different semiconductors in contact. In 2006, I decided to retire from Berkeley to go to Germany, as director of the Fraunhofer Institute for Solar Energy Systems (ISE) in Freiburg, and my contact with Wladek got weaker. However, when I retired in 2016 from Freiburg and accepted the position as Director/CEO of the BEARS research program of UC Berkeley in Singapore, I was delighted to find out that Wladek was part of the Berkeley team there, and we spent the years 2017/18 not only working together scientifically in Singapore, mainly on the optimization of Perovskite-based Solar cell materials, but as well meeting often privately with Jolanta and Monika. The four of us shared many happy and pleasant experiences in this period, with good food and wine!

I am quite pleased to mention that Wladek's scientific achievements have resulted in an excellent place in the Elsevier/Stanford global ranking of scientists, with a place 17,050 among the top-200,000 scientists, based on 26,000 citations of his work and H-Value of 60 (excluding all self-citations). For comparison, I am ranked 20,500, Wladek clearly exceeds my placement!

Wladek had in addition to his appointment at LBL been asked to join my Department of Materials Science and Engineering of UC Berkeley as faculty, and it was my great pleasure that during a visit to Berkeley in 2019 I could attend the seminar organized in his honor upon his retirement from the Berkeley faculty. I would like to invite everybody to watch the video that I recorded from Wladek's Good-Bye talk, a very moving document that will help all of us to keep the memory for our great colleague and friend.

[Video link](#)

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