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Special Section Guest Editorial: Festschrift of the 70th Birthday of Zeev "Valy" Vardeny

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There is a challenge to writing about the career of an individual as accomplished as Zeev Valentine Vardeny—Valy to those who know him. How can one summarize a career in science in a few paragraphs? As an experimental scientist, I like to find useful metrics. One can start with co-authored publications, 560 and counting. Or perhaps measure the impact of his work in the number of times it has been cited (over 16,000) or citation indices such as the h-index (65). Invited talks? Over 120 invited talks at international conferences, including numerous keynote and plenary talks. Honors and awards? He started with the Technion Excellency Prize for his PhD thesis and has picked up many since then, notably being named a fellow of the American Physical Society in 1994 and receiving the Frank Isakson Prize for Optical Effects in Solids in 2008. He was awarded the Lady Davis Professorship at the Technion in 2000 and again in 2005.

Valy has a distinguished record of service to the research community. He has served on the editorial boards of *Synthetic Metals and Physical Review B* as well as editing special issues of *Molecular Crystals and Liquid Crystals* and the *Journal of Non-Crystalline Solids*. He founded the Optical Probes conference series that continues to this day and was secretary general of the 1996 International Conference on Synthetic Metals. His example served me well when I was called upon to organize conferences later in my career.

Most of all, I would argue that Valy's impact has been on people—his students, postdocs, and collaborators. Mine is one of many careers in science and technology that he helped to launch. I am one of 26 postdoctoral associates and 53 graduate students that he has mentored at the University of Utah. I am certain that he has inspired numerous undergraduate students through the years. We have gone on to diverse careers in science and technology. The faculties of universities in the United States, Europe, and Asia include alumni of his research group. Others are research scientists at national laboratories or are active in industry, including a number of entrepreneurs who have gone on to found companies of their own.

The scope of his impact was made clear at a remarkable meeting in October 2017 held to celebrate Valy's 70th birthday. Scientists and engineers came from across the United States and around the world to present their research. The breadth of the symposium made clear the scope of Valy's research and his impact on science. A brief overview of a few highlights of his research follows.

Valy earned his PhD in physics in 1979 from the Technion—Israel Institute of Technology studying thermodynamics of cuprous halides.[1–3] He then moved to Brown University for his postdoctoral research, beginning a remarkable collaboration with Jan Tauc on the photophysics of amorphous semiconductors. Among the notable discoveries was the first observation of hot carrier thermalization in amorphous silicon using ultrafast photoinduced absorption spectroscopy[4] and carrier transport by diffusion through hydrogenated amorphous silicon.[5] They were also part of a collaboration that developed a technique to measure the sound velocity in thin films of amorphous materials.[6] Valy returned to the Technion in 1982 to take up an appointment as a lecturer, later professor, before moving to the University of Utah in 1987.

Valy has been a pioneer studying the photophysics of organic semiconductors and their application in optoelectronic devices such as light-emitting diodes,[7] solar cells,[8] and optically pumped lasers.[9] His research interests include optical, electrical, and magnetic properties of organic semiconductors; fabrication of organic optoelectronic devices; and continuous-wave and transient spectroscopy. A hallmark of his approach is the application of multiple spectroscopic techniques that span the timescale from femtoseconds to milliseconds.[10,11] This combination provides powerful insights not possible with a single method. In one notable study, Wohlgenannt and Vardeny showed that the formation cross-section for emissive single excitons from charge carriers differs from that of nonemissive triplet excitons.[12] This has profound implications for the efficiency of organic light-emitting diodes (OLEDs) based on semiconducting polymers.

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Most recently, Valy has been a leading figure in the new field of organic spintronics.[13] Xiong et al. demonstrated in 2004 the first spin valve effect in organic semiconductor devices.[14] Giant magnetoresistance has since been observed in a number of different organic semiconductors. Organic semiconductors offer several significant advantages over other materials systems. They offer inexpensive processing and the spin-orbit interaction is usually weak, resulting in long spin relaxation times. The story of organic spintronics is just beginning to be told.

The scope of this special section reflects the breadth of Prof. Vardeny's research interests. Topics range from fundamental studies of materials by linear, nonlinear, and ultrafast spectroscopy to device applications such as solar cells and spintronics. A variety of materials systems have been studied, including organic semiconductors, carbon nanotubes, organic-inorganic hybrid perovskites, metamaterials, and photonic structures.

Acknowledgments

I would like to thank the many authors for their contributions to the Festschrift and reviewers for their careful scrutiny of submitted papers. Above all, I count Valy as a mentor and friend. No biography of Valy would be complete with a word regarding those closest to him. Valy has been married to his wife, Nira, for 47 years. They have three children, Orly ("my light"), Gily ("my happiness"), and Shai ("my gift"), and six grandchildren.

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