

# HONORING SOL KIMEL

**HOLOCAUST SURVIVOR · CHEMICAL PHYSICIST · COLLEAGUE · MENTOR · FRIEND**

It is with deep sadness that we dedicate this magazine issue to Holocaust survivor and our esteemed colleague, revered mentor and dear friend, Professor Sol Kimel. Sol passed away on August 14, 2021 at the age of 92 in Haifa, Israel. In the 18 summers that Sol spent at the Institute, many Institute students, faculty and staff were fortunate to collaborate with Sol.

I met Sol as a postdoc conducting research at the Institute. Medical Director Stuart Nelson, Visiting Professor Lars Svaasand, Sol and I were developing a new laser technology to be used in the treatment of children with disfiguring vascular birthmarks. We knew that laser treatment would burn the surface of the skin, so Stuart had the idea to spray something cold on the skin's surface to prevent burning. Sol interjected with the idea to use a common fuel injector valve from an automobile air conditioning system based on an application that he had seen used in chemistry. It was the perfect way to cool the skin. We could spray a very small amount of liquid on the skin and get a dramatic temperature drop. Then, the liquid boiled off and disappeared.

In addition, Sol provided expertise on the thermal dynamic properties of the refrigerants used to cool the skin, as well as alternative refrigerants and their safety. He also helped with the interpretation of the thermal dynamics process when pressurized refrigerant was released from the valve of the device.

We not only relied on Sol's physical chemistry background, but Sol's creativity had a hand at naming the technology. When we contemplated calling it "Cryogen Cooling," Sol suggested, "Dynamic Cooling" instead. Today, "Dynamic Cooling" is incorporated in over 25,000 laser systems world-wide and has generated the second

highest UCI patent royalty income to date. Through Sol's contributions, we were able to streamline the development process and accelerate the commercialization of the technology to impact the lives of our young patients.

Among his many scientific contributions, Sol lived a remarkable life. Learning of the struggles that he faced as a Jewish boy in the Netherlands during Nazi occupation, I realized that I could learn a lot from him and not only as a mentor. Sol had deep life experience – deeper than most – yet he believed in the good and lived life to its fullest.

Sol formed meaningful relationships with all those at the Institute – faculty, staff and students alike. I recall when Sol ran into a former student. Their faces lit up when they saw one another. Even though they were worlds apart in terms of the stages of their careers – student versus senior professor – I witnessed a shared bond.

I will always remember when our first child was born. After the announcement, Sol stopped me and said, "Your life will never be the same." His follow-up was, "You know they're your children for life. Even though they grow up and move on, they'll always be your children." That statement – so true – has stuck with me as I have watched my children grow over the years into young adults.

In recognition of Sol – funny, complete and compassionate – who was important to so many and for his leadership as a photochemist and contributions in laser spectroscopy, we launched a campaign to endow a graduate student award in his name. When I informed Etan Kimmel and Daphna Klein, Sol's children, of our hope to establish the Sol Kimel Memorial Endowed Graduate Student Award in perpetuity, they were touched by our efforts to recognize their father in such a significant way.



Photo: Carlos Pulma, UCI

With seed funding from Beckman Laser Institute, Inc. non-profit, Institute Founding Director Michael Berns and Professor of Pulmonology Matthew Brenner and through the generosity of other donors, over \$100,000 has been raised thus far. As a way to leverage giving, for gifts of \$5,000 or more made prior to December 31, 2021, the UCI Graduate Division will match dollar for dollar the endowment payout for ten years.

Join us in honoring Sol's legacy as a Holocaust survivor, chemical physicist, colleague, mentor and friend by making a gift in support of the Sol Kimel Memorial Endowed Graduate Student Award. Your contribution would be particularly profound in remembrance of Sol, while providing life-changing opportunities to talented scientists for generations to come. To make a gift, please contact Gabby Comfort, Director of Development at [gcomfort@uci.edu](mailto:gcomfort@uci.edu) or 949.824.8859.

Warm Regards,

*Thomas Milner*

Thomas Milner, Ph.D.  
Director, UCI Beckman Laser Institute & Medical Clinic  
Professor, Surgery and Biomedical Engineering

# IN MEMORIAM SOL KIMEL

October 7, 1928 – August 14, 2021



*Bruce Tromberg, Ingrid Svaasand, Michael Berns, Miri and Yona Tadir, Sol and Bianca Kimel and Lars Svaasand*

On August 14, 2021, the Beckman Laser Institute & Medical Clinic lost chemical physicist Sol Kimel, an esteemed colleague, influential mentor and cherished friend in Haifa, Israel at the age of 92.

In his 92 years, Sol lived an astounding life – not only as a scientist and teacher, but also as a Holocaust survivor.

## FORMATIVE YEARS

Sol Kimel was born in October 7, 1928 in Berlin, Germany. In 1930, Sol and his mother moved to live with his aunt's family in Amsterdam, while his father stayed in Berlin. For six years, he attended an elementary school of the then-novel Montessori system where children could study according to their development. During these formative years, one of his classmates was Anne Frank. After the war, the school was named the "Anne Frank School."

“Sol told me about his childhood and shared that he became a very close friend of Anne Frank in the Montessori school. On January 7, 1944, Anne mentioned him in her journal that she liked ‘Sally’ [Sol] the most among her friends and that if she were asked whom she would consider marrying – she would prefer him,” shared Karsten Koenig, Professor, Department of Biophotonics and Laser Technologies, Saarland University, Germany.

Sol's life was upended during the five-year Nazi occupation of the Netherlands. In 1942, Sol's mother was taken in a Nazi razzia to Sobibor to never return. Subsequently, Sol and his aunt's family of four went into hiding, living with a Protestant family on a rural farm. For their safety, Sol's family was confined indoors in one room with no sunlight. In early 1945, Nazi authorities raided the farm. Sol's uncle was killed in the raid, while Sol and his remaining family were sent to Westerbork transit camp where they were detained until the liberation of the camp by Canadian forces on April 12, 1945.

“Sol's uncle and the farmer who owned the farm were shot when the Germans discovered Sol and his family in hiding. Sol described it as such a senseless loss of life,” said Brian Wong, Professor of Surgery and Biomedical Engineering.

Sol pursued higher education after the war. In 1955, he joined the Weizmann Institute, returning to the Netherlands to marry Bianca Blaugrund-Alefrant. In 1956, they immigrated to Israel, where their daughter Daphna and son Etan were born.



*Ab Reiner, Sol Kimel's cousin, and Sol, classmates of Anne Frank, in the Montessori School in Amsterdam in 1937*



*Bianca and Sol Kimel and Bruce Tromberg*



*Michael Berns and Sol Kimel*

## **WORLD LEADER IN LASER SPECTROSCOPY**

In 1960, Sol obtained his Ph.D. in Physics from the University of Amsterdam. From 1961 to 1963, he was a postdoc at Princeton University. After serving as a Research Scientist at the Weizmann Institute, he became an Associate Professor at the Technion in Haifa, Israel. In 1977, he was promoted to Full Professor. Sol served on many Technion assignments, including Chair of the Physical Chemistry Division, a committee member for the promotion and tenure of senior staff, the committee for research, student tribunal and academic staff association.

Sol, a world leader in laser spectroscopy, was a highly demanded visiting professor at many universities worldwide. In addition to two sabbatical years, Sol spent 18 summers at UCI Beckman Laser Institute & Medical Clinic engaged in multiple key projects. After retirement in 1997, Sol spent ten years as a Senior Advisor in the Advanced Technology Center at the Sheba Medical Center in Tel HaShomer, near Tel Aviv, Israel.

## **JOURNEY IN SCIENCE**

Sol's 50-year journey in science started with high-resolution gas-phase spectroscopy and matrix spectroscopy, via laser chemistry and continued with the biomedical applications of lasers, developing photodynamic therapy (PDT) for cancer treatment.

“After he stepped down as Chair at Technion, he wanted to continue his research, which brought him to the Institute,” stated Stuart Nelson, Institute Medical Director and Professor of Surgery and Biomedical Engineering.

“Sol was one of the first scientists from outside the United States to make a real commitment to the Institute,” said Institute Cofounder and Founding Director Michael Berns, “He and his wife Bianca spent several summers here and they spent a whole year of sabbatical here as well.”

“Sol and Bianca lived on campus for two to three months during the summer. We used to call Southern California paradise – a ‘Disneyland for adults.’ These trips to ‘Disneyland for adults’ was a way for Sol to share his vast experience and collaborate with people who came from Europe and other countries. Sol as a Ph.D. and I as an

M.D., he brought a broad spectrum of knowledge that medical doctors usually aren't exposed to,” stated Yona Tadir, Former Institute Medical Director and Adjunct Professor, “Together with him, we had Lars Svaasand from Sweden and they synchronized their visits. We learned a lot from them. They had projects with everyone, including Tom Milner, Stuart Nelson, Bruce Tromberg and I. A large part of our careers belonged to Sol. He was the optimum teacher and the optimum scientist.”

Sol introduced the chick chorioallantoic membrane (CAM), as well as PDT. The CAM is a very simple extraembryonic membrane which serves multiple functions with the main one being to exchange gases and nutrients. Scientists at the Institute grew tumors on the CAM to test PDT. PDT, a combination of photosensitizing drug and laser light that selectively destroys tumor tissue, works by destroying the blood vessels that feed the tumor. Nitric oxide (NO) signals the endothelium inside vessels to dilate, thereby increasing blood flow.

In PDT, the photosensitizer creates free radicals that counteract the NO, thereby constricting the vessels. The CAM provided key information on the amount of light and photosensitizer needed to “kill” the vessels – and the tumor. This model helped to determine the PDT parameters to develop the best treatment protocols for patients.

“I thought the world of Sol. He was incredibly gracious and a clear thinker – a good person to bounce ideas off of. His ability to dissect problems and look at research in a different way uncanny,” stated Wong.

Sol developed photosensitizing drug candidates, including porphyrins, porphycene and phthalocyanines. He also used advanced video microscopy in real-time and computerized image analysis to monitor and quantify the entire process of tumor growth and tumor regression.

“Sol was adventuresome. As a physical chemist, Sol had a sense of curiosity and wonder about biology, a bond we shared. I wish I had the opportunity to tell him about recent discoveries, just over the past five years, of intrinsic epigenetic and circadian clocks that drive



Lars Svaasand and Bianca and Sol Kimel



Sol and Bianca Kimel and Kristen Kelly



Sol Kimel's "Holocaust Oral History Project of the Orange County Anti-Defamation League" interview filmed on September 11, 1994

metabolism," said Bruce Tromberg, former Institute Director and current Director, National Institute of Biomedical Imaging and Bioengineering, "Biologists are just now beginning to validate these musings, speculations we shared decades ago about how living systems must work. Many of these ideas now play a crucial role in my work at the NIH [National Institutes of Health] to bridge biology and medicine with engineering and physical science," stated Tromberg.

The CAM also aided imaging research, serving as an in vivo model to test pulsed-photothermal radiometry (PPTR). As an imaging method, PPTR uses laser light to induce a temperature increase in vessels. When the laser is removed, heat diffuses out of the vessels and up to the CAM's surface. By measuring the surface temperature as a function of time, the position of subsurface vessels can be determined.

"Another postdoc and I were working on an experiment zapping glass capillary tubes filled with blood using clinical lasers trying to look at bubbles that would form inside the glass capillaries. From the experiment, the idea was to get a sense of how wavelength affects these bubbles that form in blood vessels when you radiate them. It was a basic science experiment and Sol was the architect of the experimental work, while Lars was the theoretical arm who did the computational modeling to explain the outcomes. It was a nice example of collaborative work," explained Bernard Choi, Institute Associate Director and Professor of Surgery and Biomedical Engineering.

"There was a lot of discussion with Sol on experiments. He had a certain approach and was a very careful scientist. He wasn't afraid to express when he didn't think an experiment was done well or properly. He would speak up, but in a kind way. It involved spending more time than I originally would have and it spoke volumes of how Sol approached doing experimental work," continued Choi, "He was a thoughtful scientist and very thoughtful in general."

The CAM's clear membrane also allowed researchers to see the vessels, which the human epidermis obscures. With PPTR, the goal was to improve the treatment of vascular

birthmarks. Knowing the temperature within the target vessel and its depth helped to make improvements.

"We were fortunate to have Sol at the Institute. He and Lars were here when Tom Milner and I invented and conceived the idea of dynamic cooling and we were in the process of translating it," stated Nelson, "Sol made really important contributions. After that we were able to develop the device quickly."

"There are many brief moments we experience with others that, for one reason or another, become etched into our memories. Sol was able to inspire positive memories at a very high frequency – ever the spectroscopist," stated Tromberg. "Some were technical, but Sol also took the time to personally sit with his collaborators and discuss the relative merits of specific words and ideas, sentence by sentence, relentlessly pursuing clarity and purpose in writing scientific manuscripts. Sol taught us rigor, but was never rigid, and was always willing to integrate new ideas and build consensus on any project."

"When I think about all those whom I have had the opportunity to interact with in my professional career, Sol was certainly one of the top. He was a gifted writer with a stellar grasp of grammar – fluent in at least six languages," stated Nelson, "I published 41 papers with Sol. We used to sit with a red pen over manuscripts for hours, arguing over English grammar. When we finished collaborating over a paper, not only was the science top notch, the paper was always well written. It was fun and I enjoyed every minute of our time together."

## BEYOND SCIENCE

Beyond the knowledge and expertise that Sol brought to the Institute, the impact of his life and who he was as a person will be felt by many for years to come.

### Sol was a jokester.

"He loved to tell jokes and had a phenomenal sense of humor. He could deliver the punch line superbly and everyone would laugh and laugh," stated Nelson.

"For decades, I received emails with jokes from Sol," said Tromberg.



Sol Kimel in his birthplace in Berlin, Germany



Karsten Koenig, his son Askar and Sol Kimel in Haifa, Israel in November 2018



Sol Kimel and Askar Koenig

### **Sol was well-rounded.**

“When Sol would return home after working at the Institute all day, he would devour the newspaper. He described it as his food for going to sleep at night, reading for at least an hour every night. Although he put in a full day of research, he still needed to know what was going on in the world,” stated Thomas Milner, Institute Director and Professor of Surgery and Biomedical Engineering, “That was the personal aspect of Sol. He was such a well-read and well-rounded person. There was nothing that he couldn’t talk about and add a new and different perspective.”

### **Sol was a family man.**

“He and Bianca were a nice couple. Every other weekend they used to go on excursions and enjoy the area. It was a very nice combination of doing cutting edge science and quality of life,” stated Tadir.

“I was extremely thankful to meet Sol, who was such a great person – an excellent scientist from Israel, a Holocaust survivor and a very warm, kind person with knowledge of history and culture. He was a real friend,” said Koenig, “He was honest, always a positive and a very diplomatic and excellent communicator. He knew all about my scientific activities, my holiday travels and family affairs. He wrote about his family, his daughter and son, as well as his five grandchildren.”

### **Sol will be remembered.**

“Coming to the Institute changed my life and it had a lot to do with Sol. He introduced me to the Institute. I owe a lot of my career to Sol and I cannot see a bigger impact,” stated Tadir, “He was always teaching and his contributions to so many peoples’ careers was so significant. He left his footprint not only on the Institute, but also on science.”

“Sol was energetic, optimistic and always offered a positive perspective, especially having experienced a truly dark time in human history. He was a part of every step of my training – one of the most important and critical formative influences of my career. Not only was he was part of the foundational direction of the Institute, but also a part of so many of us who were privileged to know and work with

him. He enjoyed interacting with everyone, not just scientists, but everyone from students to staff,” continued Tromberg, “Sol was easy to talk to and always had uplifting words. He cared very deeply about sharing his knowledge, teaching and training and spent an enormous amount of time, investing years learning and passing on his experience to the next generation. We have been passing on the lessons he taught us for decades, and this will continue.”

“I will miss Sol not only because of his sharp mind and wit, but also for his humanity. Sol was a pleasure to be around. His spirit was always in an ‘up-mode’ and this had a positive affect on our students, faculty and staff,” stated Berns.

“I am thankful to Sol for the wonderful time we spent together. I will miss him every day for the rest of my life,” stated Koenig.

“The man had an absolutely amazing life and it’s not hyperbole. What I remember most is that talking with Sol was like talking to your grandfather. I always sought his advice whether business or personal,” stated Nelson, “Even when you messed up or did something wrong, Sol always said that you did the best you could. He always had a kind word. I will miss him a great deal.”

And how would Sol want to be remembered? For the “Holocaust Oral History Project of the Orange County Anti-Defamation League” filmed on September 11, 1994, Sol concluded the interview:

“I hope that my grandchildren... I hope that they will see this video and learn something about their grandfather and know that all together I’m a happy man, partly because I have these 4 [now 5] wonderful grandchildren – they’re really wonderful children.”

To learn more about Sol Kimel, please visit: [bli.uci.edu/Sol](http://bli.uci.edu/Sol). Join us in honoring the life of Sol Kimel, by making a gift in support of the Sol Kimel Memorial Endowed Graduate Award. To make a gift, please contact Gabby Comfort, Director of Development at [gcomfort@uci.edu](mailto:gcomfort@uci.edu) or 949.824.8859.