

Princeton University

HONORS FACULTY MEMBERS
RECEIVING EMERITUS STATUS



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The biographical sketches were written by staff and colleagues in the departments of those honored.

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SZYMON SUCKEWER



Szymon Suckewer, professor of mechanical and aerospace engineering, will transfer to emeritus status on July 1, 2016, after more than 40 years at Princeton and a career establishing him as a top scientist in the field of x-ray lasers and plasma spectroscopy.

Szymon was born in Warsaw, Poland, in 1938. He earned his M.S. in physics at Moscow University, studying under Lev Artsimovich, head of the Soviet fusion power program. For his Ph.D. in physics from Warsaw University, he wrote a dissertation titled “Spectroscopic Investigation of Plasma in Device with the Rod Gun.” His thesis for his Doctor of Science from Warsaw University was on “Theory of Excitation and Ionization of Atoms and Ions in Nonthermal Equilibrium.”

Throughout the 1960s and early 1970s, Szymon worked as a researcher and then professor at the Institute of Nuclear Research at Warsaw University. In 1975, he joined the Princeton Plasma Physics Laboratory, advancing from research staff to principal research physicist in charge of the X-Ray Laser Project in 1980. Szymon and his group conceived and developed the first recombination soft x-ray laser in a magnetically confined plasma column. Several years later, he and his group developed soft x-ray laser in transition to ground states of ions. They also invented a new type of x-ray laser microscope, the Composite Optical/X-Ray Microscope (COXRALM), which minimized radiation exposure of biological specimens and did not require destructive preparation of tissue. One of his early collaborators was PPPL’s Charles Skinner, with whom he now shares three patents and several publications on soft x-ray lasers and new spectroscopic methods for fusion devices. These new methods made it possible to develop new types of diagnostics of very high-temperature plasma using simple and inexpensive spectrometers.

In 1987, Szymon was appointed to the faculty of the Department of Mechanical and Aerospace Engineering (MAE) to help link the plasma lab to the University. In an article in *The Daily Princetonian* that fall, he joked, “I am supposed to be the bridge. People will be

walking over me.” Szymon retained his position at the lab and also headed a new x-ray lab at MAE.

In 1993, Szymon became the director of the Program in Plasma Science and Technology, a post he now shares with Samuel Cohen. The program is part of the University’s engineering school and sponsored by the lab. In recent years, Szymon has focused on bioengineering and medical applications of lasers. Working with Princeton professors Richard Register and Alexander Smits, alumnus and ophthalmologist Peter Hersh, and two other collaborators, in 2007 he developed an incision-free eye surgery technique that incorporated the femtosecond lasers he worked on in the 1990s. Szymon and Smits recently found another application of femtosecond lasers—they could be used for removing tattoos less expensively, without pain, and more safely and quickly than existing technologies using much higher-energy lasers that scar and burn.

Another area of Szymon’s research has been plasma spark plugs for internal combustion engines. He has been working on the development of a new type of ignition system for internal combustion engines in order to improve the engine performance and decrease its negative effects on the environment.

Quite recently Szymon and his group, which included Jun Ren, Anatoli Morozov, and graduate student Shuanglei Li, experimentally demonstrated a very high input seed intensity amplification of 20,000 and its compression from 0.5 picosecond down to 50 femtoseconds in a plasma waveguide just 2mm in length. These results were obtained due to very successful collaboration with Nathaniel Fisch (in PPPL and astrophysical sciences) and his group, who provided theory of Stimulated Raman Backscattering (SRBS) for the experiments with the development of a very compact and powerful plasma laser. In this new type of ultrashort pulse laser, very inexpensive plasma replaces the expensive crystal amplifiers and large vacuum compressor.

At the mid-April 2016 Princeton-Texas A&M University (TAMU) Symposium, Szymon presented, for the first time, very high gain at 4.0nm for the compact (“table top”) x-ray laser (XRL) in the so-called “water window” of 2.3-4.4nm. This research was primarily conducted by Anatoli Morozov, visitor Alexander Goltsov, and graduate student Yushan Luo, in collaboration with Marlan Scully. This XRL will allow for high-resolution images of live cells to be obtained using the table-top system.

Szymon has taught and advised numerous graduate students over the years. His courses included “Atomic Processes in Plasma and Lasers,” “Plasma Radiation and Diagnostics,” “Atomic and Molecular Spectroscopy,” “Plasma Engineering,” “Physics of Gases,” and others.

Among Szymon’s many honors, he won the American Physical Society’s Award for Excellence in Plasma Physics Research in 1990 and its Arthur L. Schawlow Prize in Laser Science in 2007.

Szymon is a fellow of the American Physical Society and American Optical Society. He has published more than 200 papers and has more than a dozen patents.