

Optical Engineering in Small Companies

Xiangyang Yang, MEMBER SPIE

University of New Orleans
Department of Electrical Engineering
New Orleans, Louisiana 70148

William J. Miceli, FELLOW SPIE

Office of Naval Research
800 North Quincy Street
Arlington, Virginia 22217

Small companies provide a surprisingly large part of the technology infrastructure. An article in the Summer 1994 issue of *Acquisitions Quarterly* estimates that small businesses in the United States benefit from 40% to 50% of the total dollar value of Department of Defense procurements. The same article also indicated that 20% of prime contract dollars go to small businesses and of the remaining 80% that do not, 34% is subcontracted to small business.

This special section on "Optical Engineering in Small Companies" is dedicated to those small businesses that bring innovation to the field of optics and feed the broad technology trends that build our infoculture and help sustain the economy. Papers from authors representing 14 different companies illustrate the scope of technological contributions from small companies, from astronomy to microscopy, from analog signal processing to digital computing, and from the venerated practice of optical interferometry to contemporary speculations of 3-D color photography.

No discussion of small companies can be complete without mention of the Small Business Innovation Research (SBIR) program—the engine that drives the development and growth of many small companies and the *sine qua non* of the small business environment. The remainder of this editorial will present an overview of the SBIR program and provide references for additional information.

The SBIR program was established in 1982 by the Small Business Innovation Development Act (Public Law 97-219) to encourage small businesses to conduct "high-tech" research and development. Envisioned as a four-year trial program, it has become the primary vehicle through which the federal government funds R&D projects at small technology companies. The program's purposes, as described in the act, are

- to stimulate technological innovation
- to use small business to meet federal R&D needs
- to foster and encourage participation by minority and disadvantaged persons in technological innovation
- to increase private sector commercialization of innovations derived from federally sponsored research and development.

The initial success of this trial program resulted in the Small Business Innovation Act of 1986, which reauthorized Public Law 97-219 to 1992. This was followed by the Small Business Research and Development Enhancement Act of 1992 (Public Law 102-564) that significantly expanded the SBIR program and increased the program's emphasis on private sector commercialization.

Federal agencies with R&D budgets of \$100 million or more participate in the SBIR program. Currently, eleven federal agencies participate: the Department of Defense, the National Aeronautics and Space Administration, the Department of Health and Human Services, the Department of Energy, the National Science Foundation, the Department of Agriculture, the Department of Transportation, the Nuclear Regulatory Commission, the Environmental Protection Agency, the Department of Education, and the Department of Commerce.

Each of these agencies is required to allocate a small percentage of their budget to fund an SBIR program; for fiscal year 1996, this tax is 2.0%; for fiscal year 1997, it will increase to 2.5%. The first five agencies in this list provide over 90% of all SBIR funds. Each agency sponsors mission-oriented R&D projects at small technology companies and independently run their SBIR program, with varying proposal due dates and funding levels.

The SBIR funding program is structured as a three-part process. The first part, Phase I, follows a selection process of proposals responding to a topic area defined by an SBIR program solicitation(s), published by the federal

government. A Phase I contract is typically a six-month effort funded between \$50,000 to \$100,000. Its purpose is to determine and document the scientific and/or technical merit of the proposed work. Phase II contracts, competitively selected from highly successful Phase I efforts, typically provide between \$500,000 and \$750,000 for a two-year effort to develop and demonstrate a prototype. Phase III is funded with money external to the SBIR program and involves the commercial production of newly developed technologies.

Each year participating federal agencies advertise hundreds of topics soliciting small businesses to propose solutions to the problems and requirements pertinent to their agency's mission. Prospective small companies can find out about these opportunities through a variety of ways. As previously mentioned, each participating federal agency runs its own program, so information regarding program solicitations can be obtained by contacting the SBIR office of the individual agencies. The program solicitation describes the topics of interest and all details concerning qualification requirements, proposal formats, and information about intellectual property rights. Other sources of information are:

- *Commerce Business Daily*: the federal government's publication of procurement opportunities. A subscription to this newsletter costs more than \$300 per year, but is now available through several online services, such as America Online. (Since the goal of SPIE's online services is to provide members with a wide variety of relevant resources, SPIE should consider providing the *Commerce Business Daily* on its FTP and World Wide Web server.)
- National SBIR conferences: The federal government holds three national conferences per year as an orientation for small businesses. The next one is scheduled for April 29 to May 1, 1996 in Dallas, Texas. These conferences include seminars on all aspects of running a small business and working with the government, SBIR success stories, and provide opportunities for networking.
- Small Business Administration: It provides general information about the federal SBIR program and keeps a presolicitation mailing list (phone: 202/205-7777).
- Federal Information Exchange, Inc.: It maintains an online service that provides information about various federal R&D opportunities. It also announces and provides the text of SBIR program solicitations as they become available. It can be reached via the World Wide Web (<http://web.fie.com/>).

The federal SBIR program has proven to be an effective method of financing "high-tech" research and development for small companies. Most of the small companies whose work is featured in this special section of *Optical Engineering* have benefited from this program. These small companies, and many others that have participated in the SBIR program, have advanced the field of optics and strengthened their economic competitiveness by adhering to the principles of the program.

It has been a great pleasure to introduce the contributions of these small companies to the field of optical science and engineering. We would like to thank Dr. Brian Thompson for giving us the opportunity to organize this special section of "Optical Engineering in Small Companies." We also wish to express our appreciation and gratitude to all the authors for their excellent work and collaboration. Finally, we would like to acknowledge the help of all the reviewers, without whom this special section could not have been published on time.



Xiangyang Yang received a PhD in electrical engineering from The Pennsylvania State University in 1991. He joined Quantex Corporation in June 1991 as a senior scientist, where he served as the principal investigator of seven SBIR research projects sponsored by the Department of Defense. In January 1995, he joined the University of New Orleans as an assistant professor in electrical engineering. His current research interests include optical signal processing and computing, optical interconnects, optical communications, automatic target recognition, radar detection, 3-D optical storage systems, and nondestructive testing. He has authored or coauthored more than 30 refereed journal publications and presented many conference papers in these areas. He is a member of IEEE-LEOS, OSA, SPIE, and Tau Beta Pi.



William J. Miceli is a technical program manager within the Surveillance, Communications and Electronic Combat Division of the Office of Naval Research in Arlington, Virginia. He is responsible for the conception, evaluation, and management of science and technology programs within the Department of Defense. His interests include the application of photonic technology and optical systems to optoelectronic signal processing solutions of wideband radar and communications systems, optoelectronic implementations of neuromorphic processing methods, and optoelectronic data/image storage technology. He has degrees in philosophy and physics from Georgetown University and the University of Dayton. He is a member of OSA and a fellow of SPIE.