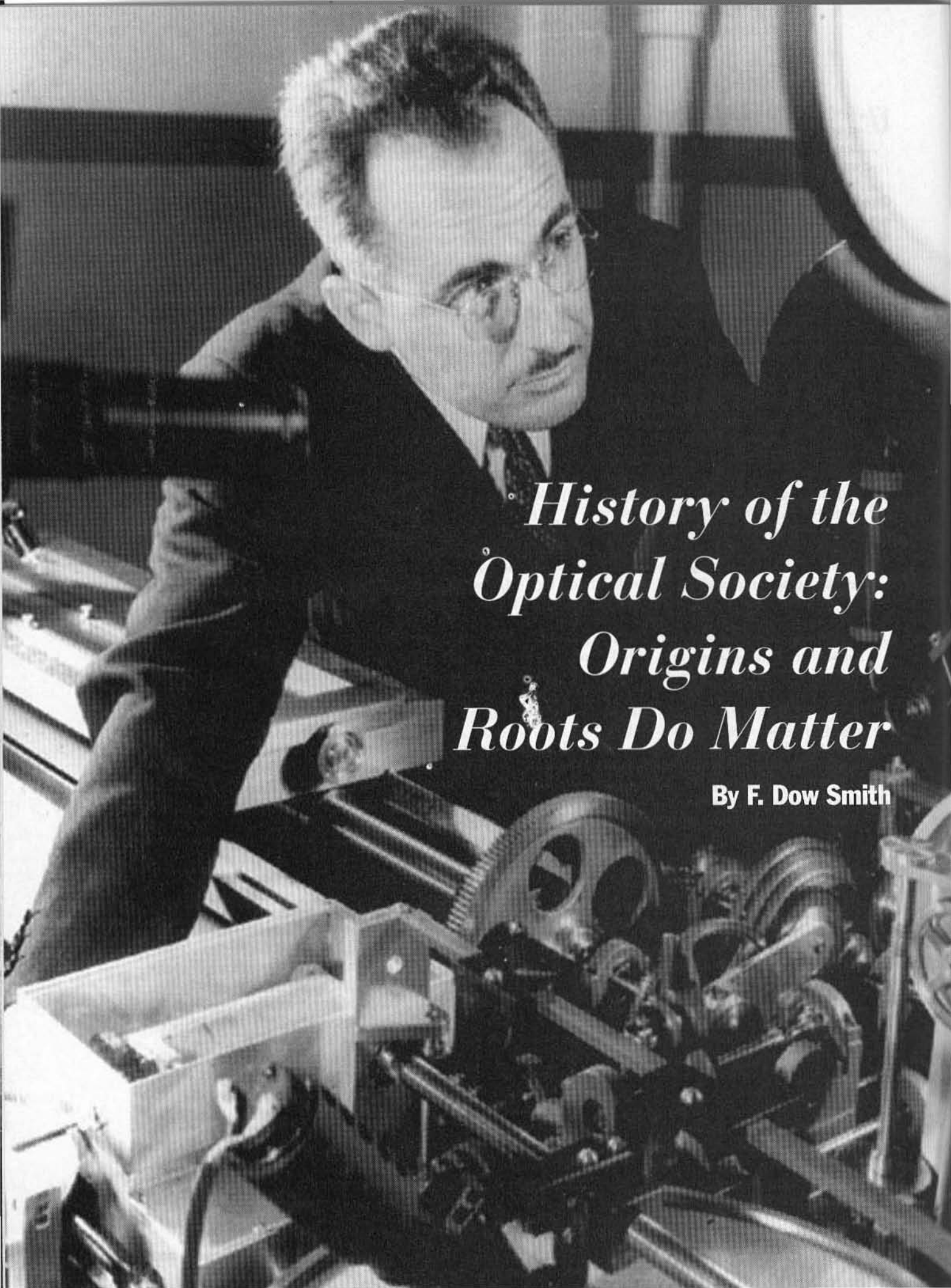

History of the Optical Society: Origins and Roots Do Matter

By F. Dow Smith

When I was asked to write a historical sketch of contributions the Optical Society had made to programs in the defense industry which depend on optical technology, it seemed far too monumental a task too undertake. It was not a question of whether or not important contributions had been made by the optical community, but rather how to extract from the voluminous record any sort of balanced account. Moreover, it is the accomplishment of members much more than those of the organization which really matter, though I did recall how often I had heard members talk of the special role the society had played in their own professional lives. As I reflected further, I also realized how much there was in the history of the society, in its roots, in its style, in the pattern of its development, and in its management actions, that provided key underpinnings for these accomplishments. Here, I thought, was an important story I might attempt to summarize.

Societies, like individuals, have personalities. Anyone who has had contact with our sister physics-based societies in the American Institute of Physics will attest to how different those personalities can be. It is not a question of better or worse, but of diversity: difference in the community served, in objective and focus, in subject matter, in the historical circumstances of formation, and in the pace and timing of the evolution of the field. The OSA has been shaped by all of these factors, and has successfully maintained a remarkable diversity of membership and vitality, while responding to enormous changes in optical science and technology, successfully responding to new opportunities as they arose. In all of this it has remained true to the ambitions of its founders,

The OSA...has successfully maintained a remarkable diversity of membership and vitality, while responding to enormous changes in optical sciences and technology....

Should you find yourself in a large research library with an hour to spare, I have a project for you. Go to the shelves which house *JOSA*, the *Journal of the Optical Society of America*, and scan some early issues. Begin with Volume 1, Number 1, published in 1917. The opening article[1] is entitled "Opportunities for Research" by Floyd Richtmyer, a 35-year-old charter member who would be the society's third president in 1920, and editor of *JOSA* from 1933 through 1938. Yes, this is the same Richtmyer whose 1928 and 1934 text, "Introduction to Modern Physics," (updated in 1942 by co-author E.H. Kennard and in 1955 with T. Lauritsen) became a landmark work for several generations of physics students struggling to learn about X-rays and atomic structure. The article opens with an upbeat, though somewhat feisty between the lines, comment:

> *The Optical Society of America is fortunate to have come into existence at a time when it is unnecessary to overcome the indifference—not to say prejudice—formerly experienced by some of the older scientific societies. The whole world today recognizes its debt to the scientist. The graduates of our universities need no longer look forward to teaching as the only career open to them, for biologists, chemists, physicists are demanded by industries in increasing numbers. The growth of the industrial research laboratory is a matter of common knowledge.*

He goes on to stress that "advances in applied science depend directly on the advances of pure science," but decries the "very small proportion of universities" which at the time contributed to the work of the scientific societies. He then discusses ways in which the new society, through committee work or publication, might stimulate research and help to open up new opportunities for university graduates. All in all, the paper offers a remarkably insightful view of the future.

The OSA vision community will be interested to note that the very first technical paper in this first issue is by Leonard Troland, OSA's fifth president, who presents an ambitious mathematical model in a search to understand "The Nature of the Visual Receptor Process." Another charter member, J.P.C. Southall, made an enormous contribution to visual science and its practical applications, by initiating the OSA's translation of Helmholz's three-volume "Treatise on Physiological Optics," published in 1924 and reprinted in 1962.

The drive to found the OSA came largely from a diverse group of industry-based optical scientists in Rochester, New York, who had formed their own local association[2] the year before, the culmination of a 14-year effort by P.G. Nutting of Eastman Kodak. In pushing for a national organization, the group insisted, however, on their right to continue the local association. This concept was enshrined in the OSA Constitution and By-Laws established in 1917, Section VI, Local Sections:[3]

> *Local sections of the society may be formed in any locality, with the advice and consent of the Council, for the purpose of holding meetings and promoting co-operation. The affairs of such local sections shall be entirely in their own hands.*

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First OSA president Perley Nutting.

It would be three decades before a second local section was established. Today the policy, still in effect and essentially unchanged, governs 25 sections which offer organizational access to optics to many professionals whose employment or job assignment, though technical in nature, does not lead them naturally to membership in the national society. Clearly this policy has been of great service to optical workers in the defense industry programs which this special issue of *OPN* addresses.

In 1922, as a gesture of outreach "in the interest of general science," the society signed an agreement with the Association of Scientific Instrument Makers to finance and publish (as an addendum to *JOSA*) the journal *Review of Scientific Instruments*. Beginning in 1930, the OSA published this as a separate journal, and in 1934 turned it over to the American Institute of Physics, the new federation of physics-based societies whose founding in 1931 had been pushed by several OSA leaders as "moving spirits."

The charter members of the OSA itself had come from academia, government and industry. The broad approach they took to their field of common interest was unusual for its time, perhaps even unique amongst technical communities. The seeds for a diverse society, open to a wide range of inputs and ideas, were well planted. Each of these segments contributed to optics and to the organization during the society's developmental years. During World War II, Division 16 (Optics), of the National Defense Research Committee, made numerous contributions of great importance to the war effort which are detailed in a report[4] published in 1946. The director was George Harrison of M.I.T., OSA president in 1945 and 1946. The list of its participants reads like a "Who's Who" of prominent OSA members of the time. The work of the group, scattered among several centers around the country, focused not only on immediate problems, but also on forward-looking research which would much later serve as the basis for other important work. One unanticipated consequence of the wartime work was the discovery by the government of the potential power of government sponsorship in advancing research. Such funding, which had been quite limited prior to the war, supported directly or indirectly much of the enormous growth in science and technology which blossomed in the United States in the immediate post-war world.

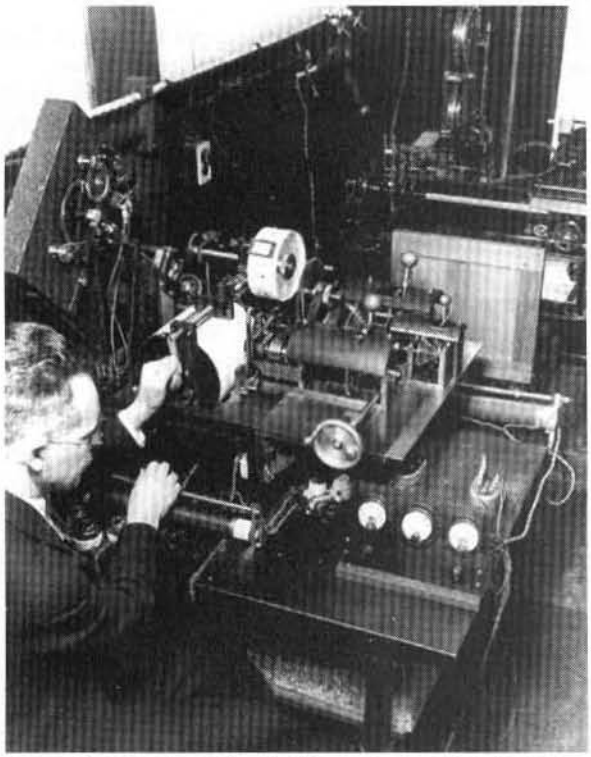
Fifth OSA President Leonard Troland.

The 1950s was thus a particularly fertile time for optics, a period which would witness various stages of development of the transistor, optical fibers, the laser, a plethora of infrared and thermal devices, side-looking radar, isotopic light sources, the application of computers to optical system design, as well as the introduction of information theory and statistical methods for image analysis. The U-2 had produced spectacular photographic results from high altitude, and hardware development for the first optical surveillance from space was virtually complete by the end of the decade.

Could the Optical Society keep pace? It did seem for awhile that it might not, given that there were influential members who felt that some of these topics were in conflict with the traditional interests of the society. Young Turks in new fields sometimes found their papers being turned down for publication; though the rules permitted (and still do permit) any member to give a paper at a meeting, some subject matter was being denied prominence on the agenda. It even looked for a while as if the society would not recognize the laser as a major new opportunity for optics, as something much more than just an interesting optical curiosity. It was a prescription for possible tragedy, all the more remarkable given the truly monumental contributions to optical science made by some of the most vehement naysayers.

In late 1956, President Ralph Sawyer (University of Michigan) asked President-Elect Irvine Gardner (National Bureau of Standards) to chair a small committee to report to the Board on the "State of the Society." At its next annual meeting, in October, 1957, the Board, responding to their recommendation that the society "broaden the subjects of interest in optics covered at meetings and in *JOSA*," appointed Walter Baird (Baird Associates, from the industrial sphere) to chair a committee to appraise "the society from the point of view of optics today and trends in the future." His committee, balanced with representatives of the society's three main constituencies, recommended a number of sweeping changes all of which were adopted. One of these led to the appointment in 1959 of Mary Warga from the University of Pittsburgh as Executive Secretary, OSA's first full-time employee; another recommendation led to the appointment of John Howard of Air Force Cambridge Research to edit a second journal (*Applied Optics*, first published in 1962) intended to overcome the conservatism of the *JOSA* editors, and offer a place for the publication of papers covering subject matter of wider scope.

The details of this troublesome time are not of great importance here; I mention these highlights only to



George Harrison (also pictured in the opening image) at the M.I.T. Spectroscopy Laboratory, 1935.

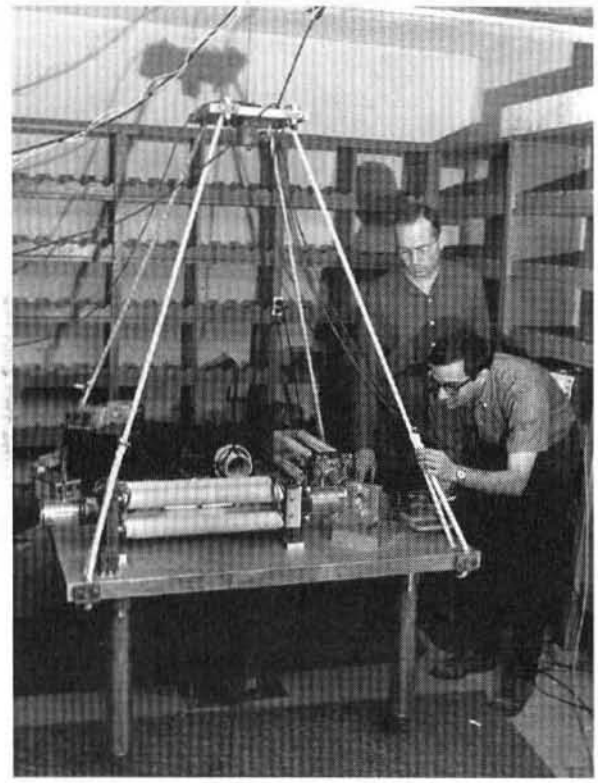
First OSA executive director Jarus Quinn, 1969-1993.

emphasize how leadership had picked up the theme set forth by the founders of the society. They knew what was needed, and didn't need to go back to Richtmyer, though it was all there had they sought it out. I do believe that without the diversity which has always been such a fundamental characteristic of the society, these changes might never have happened, or might have come too late. The basis for a more modern and more flexible society had been laid, though in truth few, if any, members predicted the enormous growth that was to come.

The establishment of the Technical Council in the mid-1960s assured that new technically driven needs could quickly find their way into meeting planning, as well as to the Board for policy decisions. At about the same time, the establishment of informal evening sessions, where the newly created technical groups could meet, offered a flexible communication mechanism for members in the new hot fields as well as in the more established areas. In 1971, a topical meeting on integrated and guided wave optics[5] was held, the first of many in this new format. One of the most remarkable of the early topical meetings took place in Williamsburg, Virginia, in 1977,[6] the first on optical fiber transmission. It was oversold by a huge amount, bringing to the OSA many non-member participants who responded to this outreach. Within months, planning was underway which led to the first OFC (Optical Fiber Communication Conference), guaranteeing the society a key role in what would become a whole new industry. The groups organizing topical meetings often showed great creativity in meeting the needs of a particular segment of members. One such meeting was "Optical Fabrication and Testing," first held in 1974. It brought specialists together in unique ways which clearly produced important contributions in support of defense-related programs.

The laser generated difficult challenges for society leadership, in that it presented the clear need for inter-society cooperation. Cooperation with the American Physical Society was facilitated through ties within our common

First OSA-owned headquarters at 1816 Jefferson Place, 1980-90.



Charles H. Townes and Ali Javan at the M.I.T. laboratories.

OSA seal of incorporation, New York 1932.

umbrella organization, the American Institute of Physics. But it was the electrical engineers who were at the center of the applications research, and who presented the greatest challenge. Some members felt that close cooperation with the much larger IEEE would be risky as it might lead to a loss of identity for optics. The Conference on Laser Engineering and Applications in 1967 had attracted 1,400 attendees, a spectacular number for the time, but the OSA was not a sponsor. Was this kind of limited participation to be the wave of the future? The answer is no, as I suspect my readers all know. Creative leadership in the society put the interests of the technical community to the fore, ran some risks, made some deals, and the OSA clearly emerged with a strong and central role, as well as a strong relationship with IEEE-LEOS. The history of it all, and of the many participants in lasers, quantum electronics, integrated optics and fiber optics can perhaps be summarized most quickly by the following alphabetical soup of meeting acronyms: CLEA, CLEOS, CLEO, IQEC, QELS, ILS, IGWO, OFT, OFS, and IOOC. Can you name them all with accuracy? I know I couldn't without a crib sheet . Jarus Quinn, who became the society's first executive director in 1969, played an essential role in supporting and guiding volunteer leadership through this period of expansion.

There were occasions when the society made direct contributions to the defense effort. Apparently it is the case, though it was not publicized, that the OSA initiative in undertaking the translation of the Russian journals *Optics and Spectroscopy* in 1959 and the *Soviet Journal of Optical Technology* in the mid-sixties, stemmed from information needs expressed by the intelligence community. The 1959 and 1960 meetings of the Infrared Symposia (IRIS) were collocated with the OSA in a cooperative effort to support an important new field. These joint meetings came to an end when the defense department objected to classified meetings being held in a hotel. IRIS prospered over the subsequent years, apparently neither helped nor hurt by the experiment.

I have tried to identify some of the highlights of OSA history, and especially of the essential personality of the society, which strikes me as particularly relevant to contributions to defense programs. I am grateful to the authors listed below for the confirmation of many dates and details, and also to John Howard for making available to me an unpublished, detailed history entitled "OSA at 75: A Recent History," which he prepared in 1991.

Quinn recently told me a story which encapsulates the unique character of the society. Nobelist Arthur Schawlow, despite his deep roots in physics, was active in the Optical Society through much of his life and was President in 1975. He once told Jarus that he liked coming to the meetings because he could go to one place to meet people giving papers on fundamental topics of interest to him, and then, after walking a short distance, meet the people who were developing the devices and equipment he needed to carry out the experiments he wanted to do. Of course it is more complex than this, but I can't think of a better way to characterize this treasure of diversity which the Optical Society gained as a birthright, and which still lies at its heart. A challenge for the future will be to maintain this character while still facing the fact that optics has moved to a place on the center stage of a wide bandwidth world, and gained a new and growing industrial clout.

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Dow Smith has worked in thin films, colorimetry, interferometry, the optics of aerospace systems, and in ophthalmic optics. He is a former chairman of physics at Boston University, vice-president and corporate scientist at Itek Corporation, and president of the New England College of Optometry. He was OSA president in 1974, and is a recipient of the OSA's Distinguished Service Award.