Optics in Switzerland, Part 1: Federal Institutes of Technology

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"A train scheduled to arrive at 16h03, the person waiting at the station looks at the time, it's 16h04, and the train is still not there ! One must conclude ... that either the train in question is not Swiss or the watch at hand is not Swiss."
H. Weigel, in *Lern dieses Volk der Hirten kennen* (1966).

Far more than the yodeler, the banker, the hotelier, or the man who drills the holes in Swiss cheese, it is the Swiss drive for quality and precision that is at the backbone of Swiss economy and its prosperity. Swiss optics is no exception to this drive for perfection. Pragmatic in approach, the Swiss contribution to optics has placed a strong underlying emphasis on practical applications. Swiss industry, for instance, was one of the pioneers in developing surveying instruments, optoelectronic theodolites, large screen television projectors,[1] movie cameras, photographic optics, microscopes, and optical thin-film elements. It will be of interest to cite here the two works published in the mid-seventies in *Applied Optics* by Lotmar[2] and Thelen[3] in relation to optics in Switzerland and Liechtenstein, respectively. The survey by Lotmar was sponsored by the Swiss Society for Optics. These papers sketched an outline of optical activities in universities, research institutes, and industry. Twenty years later, optics in the country has blossomed into a very mature and effective field.

The range of optics-related activities currently in progress in the country is extremely wide. It is driven by the desire to achieve a balance between basic research and industrial development. The aim of this special section is to present a cross section of optics-related research and development activities in academic institutes and industries. The published papers are representative of the on going efforts in the field in both Switzerland and Liechtenstein. The principality of Liechtenstein, one of the smallest sovereign states of Europe with a total population of 30,000, is located between Switzerland and Austria on the right bank of the upper Rhine. Liechtenstein and Switzerland are historically linked together by close bonds of friendship and several common treaties.

This special section provides a window to the exterior of Swiss optics. This guest editorial begins with a brief perspective on the forebearers of the country's optics heritage, goes on to explore the breadth of the optics-related activities in the confines of the laboratories of the Swiss Federal Institutes of Technology, and winds up with short descriptions on the Swiss Society for Optics and Electron Microscopy and the Priority Programs in Optics. The brief survey of optics-related activities provided here is by no means exhaustive. The cited research and development areas are to be considered more as an indication of the direction of the efforts that are currently in progress. Finally, the survey emphasizes the strong multidisciplinary nature of the state of optics in the country.

Swiss Pioneers in Optics in the 18th and 19th Centuries

Johann I. Bernoulli (1667–1748) was born in Basel. A noted mathematician, his other fields of activity included physics, chemistry, and astronomy. He was keenly interested in optics. He gave a solution to the problem of determining the curve of quickest descent between two given points by reducing it to the optical problem already resolved by means of Fermat's principle of least time. Johann II Bernoulli (1710–1790), son of Johann I, was also an able mathematician. Associated with his father, he won the prize of the Paris Academy for their contribution on light propagation[4] entitled "Physical and geometrical research on the question: how does the light propagate."

Leonhard Euler (1707–1783) was also born in Basel. He

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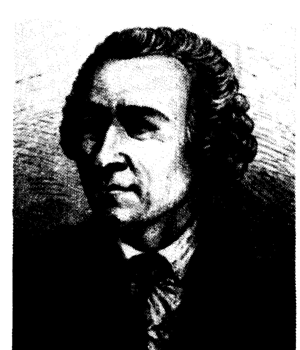

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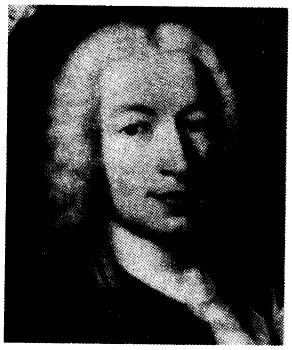
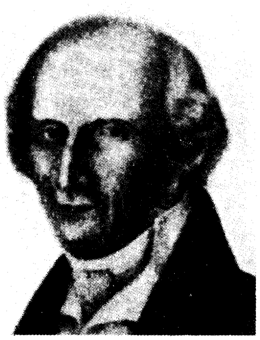
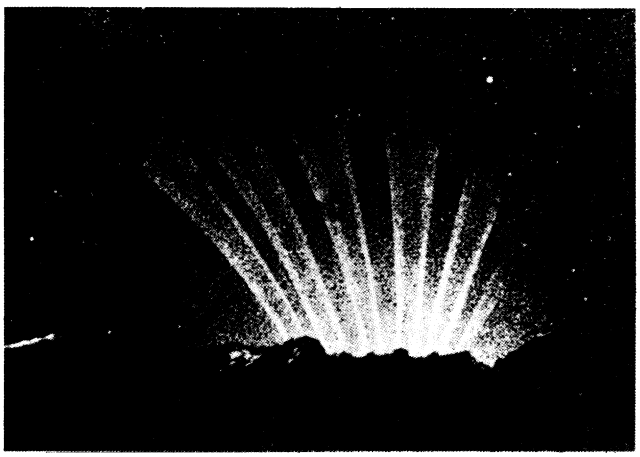


Jean Philippe Loys de Chéseaux (1718–1751)



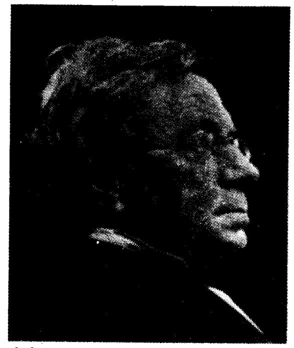
Pierre-Louis Guinand (1748–1824)



Chéseaux comet, 1744 [in P. Moore, *The Story of Astronomy*, MacDonald and Jane's, London (1977)].

made outstanding contributions in mathematics, mechanics, astronomy, and physics. An indication of the esteem in which he was held in his times is given in Johann I Bernoulli's letters to his former disciple, addressing him in 1728 as the "most learned and gifted man in science," in 1737 as the "most famous and wisest mathematician," and in 1745 as the "incomparable Leonhard Euler." Euler's contributions to optics held an important place in the physics of the eighteenth century. In 1746 he published his new theory of light.[5] He rejected the corpuscular theory and formulated his own theory, which attributed the cause of light to peculiar oscillations of ether. Euler's belief that the elimination of chromatic aberration of optic lenses was possible led him into a controversy with the British optician Dollond, which ultimately resulted in the creation of achromatic telescopes by the latter in 1757. Published between 1769 and 1771, his *Dioptrica*[6] in three volumes laid the foundation of the calculation of optical systems. The three volumes deal with the principles of optics, the construction of telescopes, and the construction of microscopes, respectively.

Jean Philippe Loys de Chéseaux (1718–1751) was born in Lausanne. An astronomer by profession, he discovered the Chéseaux comet in 1743. Nothing similar to the Chéseaux comet with a seven-fold tail has been seen since. Holding that the universe is finite and is uniformly populated by stars, Loys de Chéseaux concluded in 1744 that the night sky should be as bright as the sun. His work[7] of 1744 discussing the question of why the sky is dark at night has unfortunately passed unnoticed until recently.



Johann Jakob Balmer (1825–1898)

One of the first Swiss known to have endeavored in optics production, Pierre-Louis Guinand (1748–1824) was an amateur telescope maker. He was born in La Sagne in the state of Neuchâtel. As good quality flint glass was difficult to obtain at the time, Guinand[8,9] put himself to the task of producing it. After painstaking searches and trials, he succeeded in producing flawless flint glass of large dimensions. He spent the period between 1804 to 1814 with an optical instruments company in Bavaria, where he was actively involved in the manufacture of objectives. One of the important developments that he began was the introduction of a stirrer of a more refractory material to stir the glass melt during cooling. Guinand had the opportunity to work with the noted German optician J. Fraunhofer, who was highly satisfied with the quality of his glass disks.

Of the other Swiss who earned fame during the last century, one can mention the names of Johann Jakob Balmer and Walter Ritz.[10] Balmer (1825–1898) was born in Lausen in the state of Basel. In 1885, he obtained a relationship for the wavelengths of lines in the hydrogen spectrum. He showed that each line of the series is given by the simple relation $\upsilon = R(1/2^2 - 1/n^2)$, where R is a constant, $n = 3,4,5,...,$ and υ is the wave number. Thus, the values of $n = 3,4,5,6$ for the first, second, third, and fourth members of the series yield the wave numbers of the four lines H_α, H_β, H_γ, and H_δ in the visible region. The formula later justified by Bohr's theory predicted that no lines of wavelength longer than H_α would be found and that the series would converge as n assumes very high values.

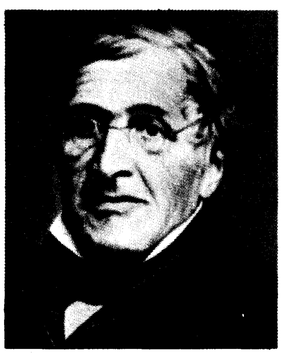
Walter Ritz (1878–1909) was born in Sion in the state of Valais. Ritz, in 1908, stated that by a combination of terms that occur in the Rydberg or Balmer formula, other relations can be obtained that hold well for new lines and new series. Predictions by the Ritz combination principle of new series in elements other than hydrogen have been verified in many spectra. The Ritz principle has maintained itself in the whole realm of spectroscopy, both in the optical and x-ray regions, as an exact physical law with the degree of accuracy that characterizes spectroscopic measurements. It gave Bohr the clue to interpret atomic spectra in terms of the quantum theory. The Ritz combination principle is without analogy in the classical theory of vibrations.

Swiss Entry into the Optics Industry

The cornerstones for Swiss entry into the optics industry were laid as early as 1819 by Jakob Kern with the foundation of a company bearing his name, Kern and Company. Initially, however, the company, with its production lines of drawing and surveying instruments, bought its optics from Germany. In the wake of the First World War, the optics import became difficult and led the company in 1919 to decide on building an optical factory. In the beginning, the company produced binoculars, telescopes, lenses, and photographic cameras.

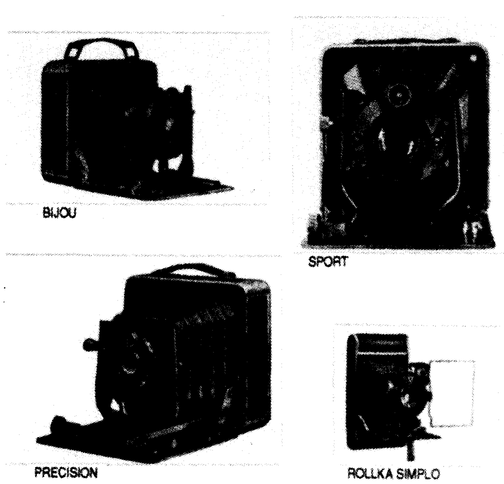
During and after the Second World War, Kern developed Switar movie lenses, including zoom lenses for 8-mm and 16-mm Paillard Bolex cameras. The movie lens production, which in 1958 made up about 50% of the production volume with 8000 lenses produced per month, dropped to zero in 1975. The company also produced surveying instruments, including electro-optical theodolites with 190-mm catadioptric lenses for tracking missiles, binoculars for the Swiss army, catadioptric lenses for night vision, thermo-optical lenses, and photogrammetric instruments. The year 1991 saw the end of the company with its merger with Leica Heerbrugg Ltd.

Leica Heerbrugg Ltd., formerly Wild Heerbrugg, another pioneer of the Swiss optics industry, is today the largest manufacturer of optical instruments in Switzerland. The company was founded in 1921 by Heinrich Wild, Jacob Schmidheiny, and Robert Helbling in Heerbrugg. Its product line covered theodolites, levels, and photogrammetric equipment including aerial cameras. Heinrich Wild was a brilliant designer who made many outstanding contributions to the field of optomechanical surveying instruments and is regarded as the father of modern theodolites. He died in 1951. The company's rank of chief optical designer was occupied in their times by the likes of Ludwig Bertele, the renowned inventor of "Sonar" and "Avignon" lenses, and Klaus Hildebrand. Over the years, the product program was extended to cover a complete system of instruments for surveying, including IR-distance measuring equipment, optoelectronic theodolites, automatic and digital levels, laser instruments for building and construction, GPS equipment, data registration sets, and application software for processing the measured data. In the field of photogrammetry, the range includes cameras and lenses for aerial and terrestrial photography, analytical plotters, and data processing systems. Leica's manufacturing expertise includes night vision instruments, thermal-imaging equipment, and precision stereo and surgical microscopes. Currently the Leica staff in Heerbrugg is comprised of 1800 persons.



Jakob Kern (1790–1867)

Heinrich Wild (1877–1951)



Cameras built at Kern during its days of yore.

On the other hand, Balzers Ltd., the pioneer of the optics industry in Liechtenstein, is the fruit of the active engagement of Prince Franz Joseph II of Liechtenstein. At the end of the Second World War, with the Liechtenstein economy still dominated by agriculture and the country's rate of industrialization low, its people had to leave the country to go abroad in search of work. Balzers Ltd. was founded by Max Auwarter in 1946 with the encouragement and participation of Prince Franz Joseph II of Liechtenstein and Emil Georg Buhrle, a Swiss industrialist. The company was founded with the objective of producing thin films for optical and electrical applications and to build equipment containing thin films as functional components. Because the systems to produce these thin films were not available on the market, Balzers Ltd. developed, manufactured, and marketed vacuum components and coating systems, which consumed the larger part of its activities. Thin films for optical applications were developed and produced on company-built coating equipment. The thin-film activity was later on extended to include the field of electronics and wear protection. The company's research and development work in the field of optical thin films embraces the development of new coating technologies and corresponding coating systems, the development of new thin-film products, and the development of coating materials for optical thin-film applications.

Optics Activities at the Swiss Federal Institute of Technology, Lausanne

The research activities in optics at the Swiss Federal Institute of Technology, Lausanne, are many and highly diversified. The research activities of the Applied Optics Laboratory are devoted to optics and laser applications. The majority of projects are in the field of biomedical applications with interest focused on tissue characterization and imaging with coherent and incoherent light; microendoscopy; and laser surgery and welding. Future developments are aimed at developing imaging and surgery at the cellular level using microholography and near-field microscopy. Investigations are also in progress in the fields of fiber-optic processing for signal treatment and telecommunications, and power laser applications for micromachining and assembly.

The Center of Electron Microscopy offers service and collaboration in the areas of microstructural imaging, diffraction, and chemical analysis by electron beams. The center's research mainly concerns high-resolution transmission electron microscopy, analytical transmission electron microscopy, electron holography, and computer simulation of images and diffraction patterns in the field of crystalline materials.

The research activities at the Centre of Lasers Material Processing are mainly oriented toward surface treatment. Hardening and alloying have been extensively studied in the past. Cladding is currently the main field of research with particular interest in the production of hard coatings for Al alloys and steels. Numerical and analytical models of the laser cladding process have been developed for a better understanding and optimization of the process. Modeling of microstructure selection maps during rapid solidification, the determination of metastable phase equilibria in Al alloys, and the study of microcrystalline and amorphous surface layers obtained by laser treatment are the subjects of more fundamental research.

At the Institute for Micro and Optoelectronics, the physical properties of quantum-well, quantum-wire, and quantum-dot structures are studied in view of the development of novel device concepts for optoelectronics. The institute has developed modern semiconductor growth and processing facilities together with sophisticated structural and optical evaluation equipment. Device applications cover quantum-well and surface-emitting lasers and laser arrays, quantum-well modulators, and high-speed photodetectors.

The main focus of the Laboratory of Atmospheric and Soil Pollution is the understanding of chemical and transport processes on a mesoscale in the troposphere. In the optical context, these studies include the development of novel differential absorption lidar technology for real-time *in situ* 3-D measurement of NO, NO_2, O_3, SO_2, turbulence, and windfields. The second direction of research embodies the development of new technology and procedures for the phototherapy and photodetection of cancer, in collaboration with the Lausanne University Hospital and pharmaceutical industries.

The Laboratory of Metrology has been active for more than 12 years in the fields of fiber optics, integrated optical circuits, and other guided optics components, focusing on sensor and telecommunication applications as well as optical signal processing in general. Among others, two types of operating optical current sensors have been developed. Basic research on nonlinear effects in fibers has led to new applications in the field of distributed sensing, lasers, and the optical generation of rf signals for telecommunication purposes.

The optical spectroscopy of semiconductors has a long tradition at the Laboratory of the Physics of Electronic Materials, where their electronic states close to the band edges and the effects of strong excitation have been studied, first in bulk samples and later in ultrathin epitaxial layers (quantum wells) made of III-V compounds. The activities include time-resolved coherent nonlinear spectroscopy as well as nonlinear optics using a free electron laser.

The Laboratory of Physics of Semi-crystalline Solids is actively involved in research related to light emission from organic polymer semiconductors with emphasis on the optimization of the emission properties of these novel materials for potential optoelectronic applications. From a general point of view, the work involves the fabrication of light-emitting devices of various visible colors, the study of the optical and electrical properties of these materials, and the investigation of charge injection from metal/organic polymer interfaces.

The Laboratory of Stress Analysis is involved in the research and development of optical techniques for deformation and shape measurements. These techniques include holographic interferometry, speckle photography, speckle interferometry, phase stepping, moiré, and low-coherence interferometry. The laboratory has developed two prototypes, one for the measurement of road inventory parameters in real time using moiré and the other as an optoelectronic system for real-time crack detection in roads. The laboratory is also active in the field of fiber optic sensors for application in civil engineering "smart structures."

The Signal Processing Laboratory is concerned with a wide variety of research subjects, ranging from speech recognition and modeling to image sequence coding. Main interests in image processing are pattern recognition for specific applications, texture analysis, image segmentation, and motion (optical flow) detection. Image coding is addressed for video telephone communication (very low bit rate) and for future HDTV standards using, for example, subband decomposition schemes with motion compensation.

Optics Activities at the Swiss Federal Institute of Technology, Zurich

The interest in optics is widespread at the Swiss Federal Institute of Technology, Zurich. At AFIF, an industry research unit, the main optics-related activities are on thin films and heteroepitaxy, particularly the physics and technology of infrared sensor arrays. The emphasis is also on the development of thin-film compound semiconductor solar cells.

At the Institute of Astronomy, the development of polarimetric instrumentation used for the investigation of solar magnetic fields mainly concerns photodetectors, piezoelastic polarization modulators, and the synchronous detection of the intensity modulation produced by the piezoelastic modulators. The main engineering work done at the institute concerns the construction of small optical devices like spectrographs, monochromators, scanners, etc., and the development of online software for control of the instruments, data acquisition, real-time image processing, and data display.

At the Institute of Atmospheric Sciences, the current interest is in theoretical and experimental meteorology and projects related to atmospheric air pollution. Many of the observational techniques used in the framework of these research projects are based on optical methods, such as satellite observations based on optical sensors operating in the IR, which are used for the observation of precipitation systems and the water vapor field. The global total ozone fields are monitored by sensors operating in the UV range. The mean wind speeds are determined by analyzing in real time the turbulence-induced scintillation of a distant visible or IR light source.

At the Institute of Biomedical Engineering and Medical Informatics, high-resolution endoscopy systems are being developed to enlarge the applicability and reliability of microinvasive procedures. Time-resolved, laser-induced spectroscopy in the picosecond range is used for the analysis of molecular autofluorescence within a cellular environment and the identification of biomolecules. A time-resolved measurement is used to increase the sensitivity of flow cytometry.

The research activities at the Institute of Photogrammetry and Remote Sensing concern the qualitative and quantitative analysis of close-range images, aerial images, and images from satellite platforms using techniques from machine and robot vision, aerial photogrammetry, and remote sensing. A wide range of applications are addressed, such as topographical and thematic mapping, geographical information systems, cadastral surveying, town and regional planning, environmental monitoring, architecture and monument preservation, industrial quality control, robotics and navigation, and others in the fields of physics, engineering, medicine, and biomedicine.

The Institute for Quantum Electronics (IQE) hosts several research groups. In the Infrared Physics Laboratory, the research concerns physics and quantum electronics of the infrared at frequencies from 1 to 100 THz or wavelengths from 3 to 300 μm. The laboratory's activities concentrate on novel infrared and submillimeter-wave gas lasers, superradiance, distributed feedback lasers and related solitons, interaction of laser radiation with gases and condensed matter, laser photoacoustics including monitoring of air pollution, the development of thin-film monometer diodes with integrated dipole and butterfly antennas for detection and mixing of 10 THz radiation, far-IR astrophysical radiometry, spectroscopy, and imaging with large 380,000-m^3 stratospheric balloons. In the Micro- and Optoelectronics Group, the activities are in the field of design, fabrication, and characterization of integrated-optics semiconductor components based on InP and GaAs compounds, which are used for fiber-optic telecommunications. Structures such as waveguide optical switches, modulators, multifunctional semiconductor optical amplifiers, diode lasers in the 1.3 and 1.55 μm range, and integrated high-speed optical receivers are fabricated, packaged, and measured. In the Nonlinear Optics Laboratory, new molecules for electro-optic and photorefractive applications are developed. The molecular hyperpolarizabilities are determined with hyper-Rayleigh scattering measurements. Crystal packing calculations are performed and crystals of the most promising materials are grown. Interesting molecules are also incorporated in polymers. The nonlinear optical and electro-optic properties of the macroscopic samples are investigated for fundamental studies and for potential applications. Basic photorefractive effects such as photorefractivity in the ultraviolet and the near-infrared spectral range are studied and their time-dependent behavior investigated. The photorefractive effects in associative all-optical memories and in holographic optical storage are also implemented. In the Optics Laboratory, the research is concentrated on chemical and biochemical integrated optical sensors using input and output grating couplers and integrated optical interferometers, and nanomechanical integrated optical components, in particular an integrated-optics microphone. The Ultrafast Laser Physics Laboratory is a new research group, established in April 1993, within the IQE. The main research goal of the group is the investigation and development of versatile ultrafast all-solid-state laser technology and its applications. Some directions of research are mode locking of monolithic integrated solid state lasers and exploring the limits on ultrashort pulse generation with Ti: sapphire lasers.

The Group of Material Properties and Optical Methods is with the Institute for Design and Construction Methods. Its research in optics is focused on the development of speckle interferometry techniques for the measurement of deformation and surface characterization. Special efforts have been taken to detect and quantify damage in fiber-reinforced plastic structures. Noncontact roughness measurements for industrial applications and shearography also form a part of the research activities of the group.

The Laboratory for Electromagnetic Fields and Microwave Electronics hosts two groups with interests in optics. The Electromagnetics Group works on the theory and computation of electromagnetic fields. Its activities are focused on electromagnetic scattering and optics. The main interest in optics concerns the study of eigenvalue problems, gratings, and near-field optics. The Microwave Electronics Group performs gain measurements on multisection quantum-well GaAlAs lasers to study and optimize the performance of self-pulsating laser diodes. For the optimization of multisection DBR lasers for metrology applications, the radiation of doubly corrugated waveguides is analyzed. The method of finite difference beam propagation is used to calculate fundamental and higher order modes of waveguides by imaginary distance propagation. Laser diode nonlinearities and noise are modeled and optimized theoretically and experimentally.

The Laboratory of Physical Chemistry has two main optics-related research groups. In the Infrared Spectroscopy and Kinetics group, the optics-related research concentrates on three areas: high-resolution Fourier transform IR spectroscopy of gases and supersonic jets; high-resolution diode laser spectroscopy of polyatomic molecules; and IR laser chemistry and kinetics after IR multiphoton excitation with pulsed CO_2 lasers. Recent developments concern uncertainty-limited high-resolution kinetic spectroscopy of reaction products in laser chemistry and new schemes of supersonic jet spectroscopy. The focus is on the understanding of femtosecond to nanosecond quantum dynamics of polyatomic molecules. The interest of the Spectroscopy and Integrated Optics group is focused on the photochemistry and photophysics of molecules in amorphous materials and crystals at low temperatures. The investigations in spectral-hole burning and single molecule spectroscopy have opened a wide field of technical applications with respect to frequency-selective information storage and holographic optical elements. Recently, more than 2000 images were stored in a single polymer film at different optical frequencies. Logical operations between images and molecular computing have been performed.

The Swiss Society for Optics and Electron Microscopy

The first organizational structure provided to the optics research and development community in the country dates back to 1947 with the foundation of the Swiss Committee for Optics[11] with H. Konig (1947–1952) as its president and W. Lotmar (1947–1956) as its secretary. The scope of interest of the committee was expanded in 1955 to include electron microscopy by its second president N. Schatti (1953–1966). The name of the society was changed in the process to the Swiss Committee for Light and Electron Optics. The secretariat was divided into sections for optics and for electron microscopy. In 1969 the name of the committee changed again to the Swiss Society for Optics and Electron Microscopy to be more representative of the committee's goals, a name to which the society adheres today. The society edits a copy to be more representative of the committee's goals, a name to which the society adheres today. The society edits a quarterly bulletin, holds regular meetings, and provides specialized courses in optics. As for the evolution of the membership of the society, its number of individual members has gone up from 41 in 1956 to 639 in 1994, and its corporate membership has jumped up from 7 in 1956 to 69 in 1994.

Swiss Priority Program

In its message of January 9, 1991, the Swiss Federal Council defined six specific program areas to receive direct government assistance to encourage scientific and technology-development related research in these focused areas. The aim of the federal government initiative is to strengthen the competitiveness of the Swiss industries on an international level by encouraging scientific and technological research in strategically important areas.

Of these six priority programs, the three managed by the Swiss National Science Foundation concern environment, biotechnology, and informatics. The three-priority program areas that lie in the domain of the Board of the Swiss Federal Institutes of Technologies are Lesit, optics, and materials science. Starting this year, the initiative has been extended to include two more specific program areas: "Tomorrow Switzerland" and the technology of micro- and nanosystems. Whereas the management of the first program has been entrusted to the Swiss National Science Foundation, the second program will be run by the Board of the Swiss Federal Institutes of Technologies. The program Lesit will draw to a close at the end of 1995. The priority programs are concerned with a long-term perspective. Their primary mission is to stimulate development in specific areas of technology.

Jean Claude Badoux, President of the Swiss Federal Institute of Technology, Lausanne, and a strong partisan of the Swiss Priority Program firmly believes in the future of the program. According to him it nurtures an increased academic-industry collaboration and encourages an investment in new and upcoming technologies. He considers the program to be an important asset for Swiss industry in the development of technology with broad-based economic fallouts. Professor Badoux strongly feels that the program would serve to significantly reduce the feedback time between research and product development.

Priority Program in Optics

Optical Sciences, Applications and Technologies, one of the six priority programs, is run by the Board of the Swiss Federal Institutes of Technology. On the basis of the message given by the Federal Council, the Priority Program in Optics (PPO) concentrates on assisting five specific areas: quantum optics and nonlinear optics; nanostructures and nanotechnologies for optics and optoelectronics; optical communications; optics in medicine; and optics in microtechnics. Of the five focused areas, the first area is directed toward basic science, the second area is technology-development based, and the remaining three areas are linked to specific fields of applications and include both fundamental and technology-related aspects. For its first phase (1992–1995), the total allocation for the PPO is expected to be of the order of 34 million Swiss francs. Currently, there are about 30 projects active under the scheme. A second phase of the PPO, planned for the period 1996–1999, is presently in preparation. It intends to support several potential payoff projects of the first phase and sponsor additional promising projects, with an emphasis on industrial relevance.

Swiss Presence in the Hubble "Rescue"

Switzerland is proud of its astronaut Claude Nicollier's participation in the most daring "optics" rescue feat in space undertaken so far. The ambitions of the Hubble telescope to probe the unknown reaches of the solar system and the universe to its subsequent loss of vision will forever remain sharply engraved in the annals of the triumphs and tribulations of modern optics instrumentation. Endeavor's seven-member crew in a breathtaking mission in December 1993 repaired in orbit the blurred vision of the telescope.

Organization of the Special Section on Swiss Optics

It has been a pleasure to see the response and the enthusiasm generated by this Swiss special section in *Optical Engineering*. However, given the large number of papers received for the special section, the problem inevitably arose as to how to fit them in a single issue. The space and processing time constraints limited the number of papers that could be assigned to a single issue. These considerations led us to decide in favor of splitting the Swiss special section on the basis of three distinct themes:

July 1995 issue, Optics in Switzerland: Federal Institutes of Technology (29 papers)

August 1995 issue, Optics in Switzerland: Universities and Research Institutes (22 papers)

September 1995 issue, Optics in Switzerland: Industries and Observatories (20 papers).

Preparation of the Trilogy "Optics in Switzerland"

The preparation of a special section is an uphill task, demanding from the guest editor enormous reserves of organization and communication skills. It is hectic right from the word go to the final sprint involving the monitoring of the movement of each manuscript within a complex network composed of authors, guest editor, and referees until its final journey to Editor Brian Thompson.

My first task as a guest editor was to identify research activities in optics being pursued in the country and to invite workers in the field from academic institutions and companies to contribute to the special issue. The process of identifying activities was intellectually very satisfying. The number of groups active in optics in Switzerland turned out to be far greater than what I could have imagined earlier. Notwithstanding the country's small size, there is a relatively high concentration of important and intensive research programs presently in progress in Switzerland. This certainly augurs well for the scientific and technological future of the country.

Most of my invitations to contribute to the special section were met with enthusiastic and encouraging responses. The presence of different research groups under distinct covers provides a national perspective to the optics research activities in the country. This fact has certainly played a role in fueling

The manuscripts began to flow in July 1994. The flow steadily increased in strength, reaching its peak during the fortnight preceding the deadline. Most of the promises for manuscripts were kept. Each manuscript was sent to a minimum of two referees. The average number of review reports per paper was 3.3. Of the 233 referees who helped in screening the manuscripts, 67 were from the United States, 54 from Switzerland, 46 from Germany, 12 from France, 11 from England, 7 from Japan, 7 from Canada, 5 from Australia, 3 each from Austria, Finland, Holland, Italy, and Sweden, and one each from Belgium, Bulgaria, Ireland, Mexico, New Zealand, Norway, Poland, Portugal, and Spain. Special credit goes to the referees for their perseverance and promptness in reviewing the manuscripts. I would like to express my gratitude to the referees for their invaluable comments and suggestions.

I would like to sincerely thank the authors for their sense of timeliness both in the preparation and revision of their manuscripts. Their courtesy and active cooperation made the preparation of the special section an enjoyable and a worthwhile effort to undertake.

The completion of this work has provided me with a special sense of fulfillment and gratitude. I feel indebted to Professor Leopold Pflug for his counsel and warm interest during this project. My special thanks go to Professor Brian Thompson for giving me the opportunity to prepare this section on Swiss optics. Finally, I wish to thank Karolyn Labes of the SPIE for her cheerful assistance. I'll conclude with the hope that the present and the two following issues would serve as useful sources of reference worldwide for identifying and measuring the importance of optics-related activities currently in progress in Switzerland both at the academic and industrial levels.

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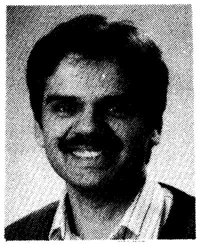

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