NEWSLETTER
OF THE
OPTOMETRIC HISTORICAL SOCIETY
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Of public interest:

That the history of spectacles is of popular interest is clearly indicated by a full page write-up in the March 9, 1982, issue of The Bridgeport Post under the caption "Focus/the arts." Described is a 1982 spectacle display at the Barnum Museum in Bridgeport, Connecticut, coordinated by O.H.S. member Eric P. Muth, an optician in Milford, Connecticut. The exhibit included frames from the last four centuries. About 225 frames were loaned from Muth's personal collection plus another 125 from the American Optical Corp.

This was not called to our attention until recently because the article lay buried those several years in Irving Bennett's office. He is presently cleaning out his files and thoughtfully forwarded the copy to us.

Ostwald or Ostwalt?

Two instances have been noted in recent publications where Ostwald and Ostwalt have been confused. They were two different people, contemporaries but perhaps unknown to each other. Both made significant contributions to visual science.

More famous was Friedrich Wilhelm Ostwald, 1853-1932, who earned 14 pages in the 1978 Dictionary of Scientific Biography, Vol. 15. Born and reared in Latvia, he spent most of his career in Leipzig, Germany, in the field of physical chemistry, was named a Nobel laureate, and did significant research in color science. Said one of his students, the American physical chemist Wilder Bancroft, "We can distinguish three groups of scientists. In the first and very small group we have those who discover fundamental relations. In the second group we have those who do not make the great discovery but who see the importance and bearing of it, and who preach the gospel to the heathens. Ostwald stands absolutely at the head of this group. The last group contains the rest of us, those who have to have things explained to us."

Franz Ostwalt, 1862-1937, on the other hand was a Paris oculist. He rated frequent reference in ophthalmic lens design. A portion of the Tscherning ellipse is identified as the Ostwalt branch of the curve.

The Brewster-Wheatstone rivalry:

Sir David Brewster (1781-1868) and Sir Charles Wheatstone (1802-1875) were the principal British visual scientists between about 1820 and 1860. Brewster's academic background was in religious studies and Wheatstone's in natural philosophy, but their scientific pursuits identify both primarily as physicists, Brewster's mainly optical and Wheatstone's mainly electrical. Both were knighted for their scientific contributions. They did indeed

maintain a civil respect for each other, but a bit of rivalry existed, with each seeming to manifest occasional resentment for the other's accomplishments and cognitions, especially in visual matters. Their papers on vision, especially binocular vision, showed a similarity of investigated topics and frequent differences of interpretation. Their involvement in visual science was of much broader scope and significance than commonly realized.

So concluded Nicholas J. Wade of the Department of Psychology at the University of Dundee in the course of his reading some early studies on subjective visual phenomena. Having drawn attention to this among several of his colleagues he was urged to republish the pertinent Brewster and Wheatstone papers which he had collected. This was accomplished in a 1983 book entitled "Brewster and Wheatstone on Vision" edited by him and published for the Experimental Psychology Society by Academic Press.

The papers, or excerpts from papers, by each of the two scientists, are presented in chronological order in three categories. "Binocular Vision and Space Perception," ten by Brewster, six by Wheatstone; "Inventions," two by each; and "Subjective Visual Phenomena," fourteen identified with Brewster and six with Wheatstone. Both authors occasionally wrote anonymously. Brewster was by far the more prolific writer but Wheatstone excelled in clarity and style.

The reproduced articles total approximately 250 pages. Another hundred pages include lengthy obituaries of both, editor Wade's summary, his commentary on the Brewster-Wheatstone controversies, some concluding remarks, a bibliography of almost 250 references, a four-page index of names, and a fourteen page subject index. Included are several portraits of each of the two subject authors, the numerous original illustrations relevant to the reproduced articles, and a few annoyingly unidentified, inadequately credited or unnumbered, illustrations that are apparently presumed to be sufficiently self-explanatory.

The book has one serious structural flaw, undoubtedly attributable to the publisher's staff editor. It is difficult on most pages to know which person, Brewster, Wheatstone, or Wade, is the author of the paragraphs in view. Brewster and Wheatstone almost invariably wrote in the third person so that a momentary lapse of the reader's attention often necessitated turning back several pages to reestablish which author one was reading.

The scope of Brewster's and Wheatstone's interests in visual science is so extensive as to make it inadequate to outline the coverage here. An isolated point of interest, however, is Brewster's definition of "optics" as "the branch of knowledge which treats of the properties of light and of vision, as performed by the human eye." This 19th century definition is important to keep in mind when we attempt to comprehend the history of optometry.

More on Brewster and Wheatstone

From the above review of Wade's book one might presume that both Brewster and Wheatstone are today well remembered for their original contributions to science. Two recent articles indicate to the contrary.

In the June, 1984 issue of Science 84 magazine (Vol. 5, No. 5, p. 70) writer Noel Vietmeyer has reviewed Wheatstone's career in an article titled 'Inventing Charles Wheatstone.' Perhaps Vietmeyer's most significant statements are "His [Wheatstone's] discoveries guided us to the age of communication, but we have forgotten his name," and "Wheatstone is essentially unknown today, except for the 'Wheatstone bridge,' something he did not invent."

Along the same line, R.V. Jones began his review of a recent book on David Brewster in the New Scientist (May 30, 1985) by stating, "The development of modern optical devices, and particularly of the laser, has given widespread currency to the Brewster angle - that angle at which incident light, plane polarized perpendicular to a plane refracting surface, will pass through it without suffering any loss by reflection. As for its discoverer, David Brewster, most of those who exploit his angle probably know little more than his surname.

The book Jones is reviewing is a collection of ten essays which were presented at a symposium at the Royal Scottish Museum on November 21, 1981. The authors, most of whom are historians of science and museum keepers, present an excellent account of Brewster's varied careers which include scientist, editor, journalist, historian of science, administrator, educator and evangelist. In addition to the ten essays, numerous appendices list Brewster's published writings and also articles and books on Brewster. Appendix 1(b) by George Duncan, Reader in Biophysics, University of East Anglia, details Brewster's investigations on the ocular lens. By devising a careful diffraction experiment using a piece of cod lens capsule Brewster was able to demonstrate that the lens fibers did indeed interdigitate, settling once and for all a continuing delate among anatomists. Duncan summarizes Brewster's work on the lens.

> In summary, the advances he may be said to have made are as follows: He developed noninvasive techniques (in this case optical diffraction) to resolve a dispute of fact and artifact. He made quantitative (in this case from Fraunhoefer's Wave Theory, even though he was a devoted advocate of Newton's corpuscular theory). He checked these calculations by simulating his observations with a defined model system. He understood that the patterns he obtained were more a property of the order of the biological system than of the substance of the system, thus substantially prefiguring the philosophical and practical foundations on which modern x-ray crystallography is based. He also understood the practical and medical consequences of his observations and put forward suggestions concerning the nature and cure of cataract.
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> That Brewster has received scant recognition for laying this firm foundation would have surprised him not at all and is probably due to the'aphakik' view of science engendered by successive educational systems rather than any lack of lustre in the illumination of science emanating from our elders.

This well illustrated book (including two photographs of Brewster) is entitled 'Martyr of Science': Sir David Brewster 1781-1868, edited by A.D. Morrison-Low and J.R.R. Christie and published by the Royal Scottish Museum, Edinburgh, 1984.

About early people in optics:

D. J. Lovell is an optical engineer whose initial interest in optics was fanned while working with Arthur Hardy's research group at the Massachusetts Institute of Technology during World War II. It has been a career-long hobby of his to collect interesting insights about people and events in the history of man's investigations of the nature of light. His collection was published in 1981 by the Society of Photo-Optical Instrumentation Engineers, Bellingham, Washington, in a 167 page paperback entitled OPTICAL ANECDOTES.

Sorted into 36 chapters called anecdotes, with graphic illustrations accompanying almost all of them, the contents provide fascinating accounts quite chronologically from "Optics in Antiguity" to "Holography—The New Photography." Included are glimpses into the lives and personalities of dozens of persons such as Plato, Ibn al-Haitham, Tycho Brahe, Galileo, Robert Hooke, Thomas Young, and David Brewster, to name a few.

Examples of interesting details are Descartes' sword battle with a boat crew intending to slay him, Lippershey's observing two children playing with some lenses lined up in telescope fashion giving him the idea for his invention, Napoleon's involvement in the support of science, and Euler's letters to a German princess.

A good index and a valid bibliography give credence to the reliability of Lovell's anecdotes.

A bit of Helmholtz wit:

Theo Aronson, in his 1971 book entitled "The Kaisers," published by Carsell, London, comments amusingly on Princess Victoria, daughter of England's Queen Victoria and Prince Albert. In 1858 at age 17 after a two-year courtship, Princess Victoria married Prince Frederick of Prussia, son of Prince William who later became German Kaiser William I, initiator of the Second Reich. She was somewhat rudely outspoken but admittedly intelligent. Aggressively honest, her frankness could be embarrassing. "Think, think, Madam," Professor Helmholtz once advised her, "but don't tell the entire world what you are thinking!"

Norwegian optometry history:

If you happen to be able to read Norwegian you will enjoy perusing the 1945 Jubilee version of Optikeren commemorating the 40th anniversary of the founding of Norges Optikerforbund, the Norwegian optometric association. Featured are articles on the history of the association itself, the educational developments including the Tinius Olsen school in Kongsberg, the development of a public relations organization, the role of the optical industry, and many pre-organizational details dating back to 1911. The numerous photographs add timely interest.

Purkinje-Sanson images in 1531

If you happen to be one of the ten million people per year who visit the Shrine of Our Lady of Guadalupe in Mexico City to look at the life-sized,

full-length image of the Virgin Mary legendarily formed by the Madonna herself on the cactus cloth cloak (tilma) of an Aztec peasant in 1531 A.D. you will enjoy the book "The Image of Guadalupe: Myth or Miracle?" by Jody Brant Smith, a revised edition of which was published by Image Books, Garden City, New York, in 1984. You will enjoy even more Isabel Fletcher de Téllez's review of the same book of slightly different title, "The Guadalupe Madonna: Myth or Miracle?" published by Souvenir Press, London, in 1983, in the May 11, 1985, issue of Optometry Today, Vol. 25, No. 10, pp. 328 and 330. If you are optometricaly sophisticated you will particularly enjoy, or at least be amused by, Chapter VI of the book, "The Right Eye of the Virgin", in which are detailed the interpretations of ocular reflections by several consulted ophthalmologists as Purkinje-Sanson images of persons in the Madonna's view.

Both issues of the book include several photos of the right eye and one of the left, including a section computer-magnified 2,500 times. Says reviewer de Téllez, "Plates of these computerized magnifications...may reveal more about the onlooker than anything else, like Rorschach ink blots!" She adds, "Certainly they require informed skills of interpretation and a willingness to be convinced," both of which she claims to lack.

The author of the books is an associate professor of philosophy and religion at Pensacola Junior College in Florida. The extensive research of the history of the Image of Guadalupe and of the original icon itself by author Smith and his principal co-investigator, an entomologist and biophysicist, put both of them, say Smith, "firmly in the ranks of those who believe the Image was created supernaturally."

On witnessing history:

In about 1948 Felix A. Koetting (1893-1983) wrote a paper entitled "The history of Optometry in St. Louis, Missouri". It appears not to have been published while he was living. It was found in his file and published posthumously in the 2nd quarter, 1984, issue of the Journal of the Missouri Optometric Association, pp. 21-23.

The article is truly documentary not only because Dr. Koetting was a meticulous writer but also because he was personally involved in Missouri optometric history throughout his 90 years. In early childhood he and his brothers and sisters worked in his father's store, which included watches, jewelry, spectacles, and various customer services. This was in the small town of St. Genevieve, Missouri, about 80 kilometers from St. Louis. It seems reasonably certain that his father, John Koetting, must have included some incidental sight-testing, the primitive optometric service of the time in the rural areas of that region of the country.

Felix's father was born in Germany in 1856 and came to Missouri with his own father at age nine. Young John soon became an artisan of several skills. His first savings were invested in a stock of jewelry to sell in his shoemaking shop. At the same time he subscribed to The Keystone a watchmaker's trade journal and earliest of American publications to include articles of optometric interest. He opened his jewelry store in 1887 in St. Genevieve, Missouri, and advertised watches, clocks, and spectacles. He had five children, the second oldest of whom was Felix.

Felix finished his study of optometry in 1912 and immediately took charge of his father's optical department in St. Genevieve where he practiced optometry for several years before opening practice in St. Louis, Missouri.

All of this points to the fact that Felix was steeped in optometry throughout his life, an indoctrination further enhanced by an optometrist brother and two optometrist sons as well as his extensive involvement in a variety of optometric organizational projects. Who could have written a history of St. Louis' optometry more authoritatively?

His published history labels pre-1900 optometry as "prehistoric," the first decade of the 20th century as the "Birth of Optometry", the second decade as the "Legislative Period", 1922-1935 as the "Skeffington-Kehl Era", and 1936-1948 as the "Present Era".

Today we can look quite legitimately at these labels as the provincial views of one who simply could not obtain the broader outlook possible with the passage of years and the accumulation of documents. There is nothing so easily misinterpreted as history in the making and at firsthand view. His own perceptions might well have changed in the '80s from those he described in the '40s.

A single example can clarify this. Dr. Koetting credited the drive to obtain an optometry law in Missouri to his assumption that, "Optometry became aware of its professional aspirations." Obviously he was unaware of the fact that in most of the 46 states that preceeded Missouri the optometrists demanded a registration law to prevent possible registration under the previously established medical boards.

The facts that Dr. Koetting reported speak for themselves and are undoubtedly accurate. This is what makes his paper a valuable document. His interpretations however require the leavening of time for the broader view. History is not an easy science.

Optometry in industry:

On page 5 and 6 of the January 1983 issue of the NOHS, Vol. 14, No. 1, Dr. Goodlaw dated the "first Optometric Industrial Vision Program in Los Angeles: as 1922.

In the files of the late Felix Koetting, O.D., was found a letter from Insurers Service Corporation of St. Louis, Missouri, dated May 4, 1928, to Eyesight Survey Corporation, 4196 Manchester Ave., St. Louis, Missouri, thanking Dr. Koetting for a copy of a report of a screening survey of the F. BURKHART MANUFACTURING CO. In the same file was an undated printed promotional folder of the Eyesight Survey Corporation entitled "Industrial Plants Having Adopted Our Service" showing "General offices" at the St. Louis address and "Service offices" at Alton, Illinois; Wilmington, Delaware; and Newark, New Jersey. It declares that "The Eyesight Survey Corporation places at your service a force of Optometric practitioners and engineers, especially trained to care for the eyes of industry." Over 400 companies in Missouri, Illinois, Indiana, Iowa, Maryland, New Jersey, New York, Ohio, West Virginia, and Georgia are listed.

Its stage of development suggests that the organization may have been functioning several years prior to the date of the 1928 letter, which would make it quite contemporary with the Los Angeles program. Is it possible that optometry's role in industry was blooming nationwide in that era and perhaps got nipped by the Great Depression?

Wilhelm Peter Söhnges, 1905-1985:

"Leben and Wirken Einer Personlichkeit" is the subtitle of a tribute to Söhnges in the May 20, 1985, issue of Deutsche Optikerzeitung, Vol. 40, No. 3, pp. 90-91, by Jürgen Reinhard. Sohnges' career is traced from his appointment as a branch manager of the long established Messter firm at age 21 followed by a brief study tour of Great Britain and North America, a long series of career episodes before and after World War II, his appointment at age 60 by the state of Bavaria as a consulate for Honduras, the vigorous pursuit of his seafaring hobbies in later life, and the acceptance of numerous honors from various sources.

Antique and early:

Hugh Orr, author and publisher of "Illustrated History of Early Antique Spectacles," has written to ask about membership in the O.H.S., and I responded promptly. He also enclosed an announcement of his book and a copy of a review of it in The Sunday Telegraph, and I have recommended its acquisition by the Indiana University library. According to an enclosed list of prior recipients of the book, a copy is already available at the International Library, Archives, and Museum of Optometry, St. Louis, Missouri.

From the announcement and review one learns that Mr. Orr is a British optometrist. His book contains over 200 pictures of items collected by him and his wife and is supplemented by numerous anecdotes of historical optical personalities. Says Deborah Stratton in her review, "Hugh Orr's book has an amateurish charm about it that gives it a certain value of its own. I doubt, for instance, whether a professional publisher would have allowed the book title to bear the tautology 'early antique.' However, the author's researches, enlivened by copious, usually dated, illustrations from his collection, spanning three centuries, are invaluable."

The book is available from Hugh Orr, 106 Hayes Lane, Beckenham, Kent, BR 3 2SP, England at the overseas price of £17.00 (ca. $20.00). The date of its publication is not stated.

The horopter is old:

"Frances de Aguilon, S.J., (1567-1617), Scientist and Architect" is the title of a 151 page book by August Ziggelaar, S.J., published in 1983 by Institution Historicum S.I., Via dei Penitenzieri 20, 00193 Rome, Italy, and reviewed by Professor Rogers Reading in the September 1985 issue of the American Journal of Optometry and Physiological Optics, Vol. 62, No. 9, page 657.

Aguilon is credited as the inventor of the horopter concept and a contributor to our understanding of space perception, color perception, and photometry. Dr. Reading recommends the book as a valuable resource for those of us interested in the historical background of our optometric concepts and adds, "It is amazing how little has really been added in the intervening 372 years."

Unorthodox eye therapy:

Recently OHS member James Leeds, O.D., received an interesting letter from Olgierd Lindan, M.D., Ph.D., 1404 Dorsh Road, Cleveland, Ohio 44121, U.S.A. (Telephone 216-382-7113), which includes the following appeal:

> I presume you collect all types of books, including those dealing with "unorthodox" eye therapy. I know of the eye massaging devices, but there is practically nothing about electro-therapy of the eye. The widely used violet-ray machines had some specially designed glass electrodes, to be applied over eyes (eye-lids I presume). The booklets on violet ray machines shows those eye electrodes, but do not tell anything about the eye-problems to be treated. I would be grateful for any info on this subject.
>
> The healers of the past applied the faradic and galvanic currents to the deaf-ears. I have a couple of special devices used for this purpose. Did you ever come across the application of electric currents to the eyes? I imagine that people with advanced cataract could have experiences of light flashes if the optic nerve were stimulated by electrical impulses, applied by a bold healer across the temples.
>
> I am seeking contacts with other collectors interested in medical arts. It's very interesting and stimulating.

Dr. Leeds sent Dr. Lindan the names of four books on the subject, but he suggests that other O.H.S. members may have other items to mention.

Collectors club internationalized:

By means of a clipping from a recent issue of The Optician (London), OHS member Irving Bennett informs us that the word "International" is now included as part of the title of the Ophthalmic Antique Collectors Club, which was formed in 1982. Its membership now totals more than 125 from several countries. Further details are available from Richard Brown, Treasurer, 18 Albion Street, Dunstable, Bedfordshire LU6 1HX, England.

Kepler's Birthday

Johannes Kepler (1571-1630) is a giant in the history of science, so to honor his 400th birthday symposia were held in eight cities across the globe in 1971. The proceedings of these gatherings were published in 1975 by Pergamon Press Ltd. in a single volume entitled Kepler (Vistas in Astronomy Volume 18). All of the papers published in the volume have been translated into English when needed and many have been condensed. The number of papers is a staggering 127. The scope of Kepler's work can be felt by scanning the chapter titles in which the papers have been conveniently categorized. The

following is a sampling: Ch. 6 - Kepler and the New Astronomy, Ch. 8 - Mysticism, Astrology and Alchemy, Ch. 10 - Celestial Mechanics, Ch. 11 - Kepler as Mathematician and Physicist. Of particular interest is chapter 14 - Optics and Crystallography in which nine papers on Kepler's achievements in optics and vision are presented. Paper 14.4 by Vasco Ronchi of the University of Florence is titled "Johannes Kepler, Optician." In this paper Ronchi emphasizes Kepler's role in developing optics as we know it today. The following excerpt from Ronchi's paper begins by referring to the book Paralipomena ad Vitellionem published by Kepler in 1604.

> As indicated by the title, this work was intended as the continuation, or rather as an improvement of Vitelo's work, that is to say of the work of the Arab School. In reality this book is one of the most marvelous masterpieces; it contains scientific achievements of the greatest importance not only for the history of optics but also for the history of science in general, because in this work are to be found expounded for the first time concepts that still today form the foundations of entire branches of science. It is sufficient to recall that in it for the first time there is a description of the mechanism of vision which is even today considered to be correct; for the first time there is a construction of the retinal image; the explanation of the formation of images behind plane mirrors; the definition of the concept of optical images. The Arabs had demolished visual rays; Kepler demolishes also simulacra and gives birth to the optics of rays, that is to say, to present-day geometrical optics. It is one of the greatest contributions of a scholar to scientific progress.
>
> Five years later, Kepler intervened again in the history of optics with another fundamental contribution. He too, until 1610, had no faith in the "glass lentils" that had been on the market at an artisan level for three centuries, but had been irrevocably condemned by all scientific circles as being deceptive and illusory tools. But in 1609 Galileo stated his faith in the telescope, after having greatly improved it technically; now it appeared as a virtually new instrument compared to the one that, in 1604, Dutch artisans had attempted to put into circulation.
>
> Galileo's statement provoked a most violent reaction in the scientific world, which was still convinced of the correctness of the classical ideas with regard to lenses. Kepler -for a whole year- was very skeptical, but in August 1610, after having carried out accurate observations with Galileo's telescope, he was at once converted and wrote another great book, even if not of the same great significance as his work of 1604: in fact the Dioptrice, published in January 1611, contains a complete geometrical theory of the lenses and of the Galilean telescope, as well as a design of an astronomical telescope with a converging eyepiece. The concepts contained in this book are those on which modern geometrical optics is still based.
>
> Kepler's work was not understood by his contemporaries and was not appreciated. Soon it was completely forgotten. About half a century later the ideas which he had expounded in these two books silently reappeared and conquered the world of science. But their contriver remained unknown, so that even today it is rather rare to find a scientist who knows that modern optics is substantially Keplerian optics. This has been the effect of a philosophical evolution from which optics suffered consequences not always in its favour.

It's A Cat's World

The following has been taken verbatim from p. 637 of The Optical Journal, January, 1899 (Vol. IV, No. 11).

> The "Philadelphia Times" is responsible for an article alleging that a cat of that staid city now wears a pair of gold-rimmed spectacles. Its owner, noticing the feline's growing inability to catch mice, concluded that "Thomas" was becoming myopic, and upon consultation with a local oculist, in view of the cat's illiteracy, they hit upon the happy scheme of making an image of a mouse and placing it at various distances. "Thomas's" punctum remotum was estimated at the furthest distance he could recognize the rodent, and by this means alone was he fitted to glasses.

Very well illustrated:

Occasionally while perusing library stacks one finds an unexpected gem. Such was the case several weeks ago as I roamed the physics section of Indiana University's main library. In front of me appeared a huge and pristine set of volumes entitled Handbuch Zur Geschichte Der Optik (Handbook to the History of Optics) by E. H. Schmitz. Since my German is poor, to say the least, I would have normally quickly slipped through the books enjoying what pictures could be found and calling it quits, but this was different. What I found was a six volume pictorial goldmine. The six volumes trace the history of optics from antiquity (the first chapter is titled,'In the beginning there was glass') to the dropping of the atomic bomb! To describe in any detail the content, even in terms of chapter headings, would require many pages, but suffice to say the scope is huge and includes many sections on the development of spectacles and visual testing equipment, and even a small section on the legislative origins of Optometry in America. The total page number for the six volumes is 2,572 with 4,633 footnotes. The number of illustrations, portraits, and photographs would also be several thousand, but unfortunately I cannot be positive because they are not numbered nor are they referenced to their original sources.

This may all sound a bit too glowing of a 'review' considering I can't read the text in detail, but I guarantee the reader several hours of fascinating viewing. Hopefully the publisher (Wayenborgh, Bonn) will come out with an English translation but don't hold your breath, the six volumes were only recently published between 1981 and 1984.

D.K.P.

Scottish Scientific Instrument-Makers 1600-1900:

In 1972 the Royal Scottish Museum (Edinburgh) published a booklet with the above title authored by D.J. Bryden. The purpose of this report as described in the foreword was to make available information on the rich collection of early scientific instruments held in the museum and, in addition, provide some historical scholarship on the scientific instrument trade.

So who were these instrument makers, what did they make, and for whom were they making these instruments? The first question concerning identity has been covered very well with a sixteen page alphabetical catalogue listing

all known Scottish scientific instrument makers during the period 1600-1900. Each entry details known street addresses, years of business and what instruments they produced. Concerning clientele, an essay on p. 7 titled 'The Maker - Customer Relationship' categorizes the instrument maker's customers into three groups.

> The market served by the scientific instrument-maker may be classified into three broad groups of customers or varieties of demand; the 'scientific', the 'professional' and the 'dilettante'. Serving the 'scientific' customer the instrument-makers' technical expertise was extended to satisfy an initially unique demand, or an existing skill was utilised in a way not previously considered. The 'professional' user of scientific instruments, in contrast, required standard apparatus made to known and accepted basic designs, or made to a new design using existing constructional techniques. Within this second group S A Bedini has distinguished between the instruments and apparatus used for demonstration and teaching on the one hand, and the equipment required by industry, commerce and the mathematical practitioners, on the other. For the third group of customers, the 'dilettante', the instrument-maker was primarily supplying scientific toys with a modicum of educational value, and gimcracks for customers with at the worst no more than a passing interest in and superficial knowledge of contemporary science.
>
> This classification into groupings of demand does not necessarily suppose mutually exclusive classes of customers, the individual might use the instrument-makers' services at all three levels. Equally, certain makers served a particular section of the market, concentrating their efforts on attracting and satisfying specific interests and demands. Many instrument-makers were more than simply competent artisans; technical expertise and mechanical prowess was, on occasions, backed by comprehension of the scientific principles underlying the work undertaken, thus assisting the interplay of ideas between the maker and his scientific and professional customers.

As for what these instrument makers made which qualified them as scientific instrument makers is not so clear. This is illustrated by the guide to symbols which appears at the beginning of the directory list and is reproduced below.

SYMBOLS

IM = Instrument-maker	N = Nautical -
B = Barometer-(maker)	O = Optical -
C = Clock -	Op = Optician
Ch = Chemical - (instrument-maker)	Ph = Philosophical -
Cr = Chronometer -	W = Watch
M = Mathematical -	Other trades given in full

An optical, mathematical or philosophical instrument-maker was often described as an 'optician'. An entry Op implies a lack of information as to whether the man was an instrument-maker or solely an ophthalmic optician. Craftsmen trading solely as ophthalmic opticians are not included.

Simply stated, many of the ophthalmic opticians were instrument makers, or vice versa if you like.

The wares of the instrument maker were either directly commissioned or sold through general merchants. The advertisement shown here originally appeared in the Glasow Courant September 22, 1755.

JOHN CARLILE, at his Shop, the Entry into Bell's Wynd above the Croſs, Glaſgow, at the Sign of the ROSE, ſells Wholeſale or Retail,

SILVER and China Handled and other Kinds of Table and Deſert Knives and Forks, with Shagreen Caſes for Do. Silver Table Spoons, Tea Spoons and Tongs; Silver Shoe-Buckles, Stock-Buckles, and Claſps; Silver Caſtors, and Salts, Corals and Gum-ſticks, Silver Thimbles, Do. with Steel Bottoms, Silver Spurs, Silver plated Buckles and Spurs; Variety of Lancet-Caſes, in Silver and green Skin; Coral Beads; Shoe, Stock, Girdle, Stay, and Hat Buckles, of Stones ſet in Silver; Broatchets ſet in Gold and Silver; Sleeve Bottons of various Kinds: Complete Sets of Tea-China, Breakfaſt and Afternoon Cups and Saucers, Punch-Bowls, Slab-Bowls, Sugar-Diſhes, Tea-Pots, and Milk-Pots: Fine Violins, German and common Flutes of all Kinds, Hautboys, French-Horns, Violin-Strings new imported, Hadley's Quadrants, and common Quadrants, Gunter's Scales and Compaſſes, complete Sets of Mathematical and Surgeons Inſtruments; Everard's, Brenaun's, and Leadbetter's Rules, Ivory Foot Rules, Bradford's new-invented Sliding-Rules, alſo his new-invented Inſtrument for preventing Frauds by counterfeit Gold; beſt London Razors, Pen knives, Lancets, and Scizars; Backgammon-Tables, Mogul and Meſſage Cards, Dantzick and Engliſh Gunpowder, beſt Shot, Horn and Leather Powder-Flasks, and Shot-Bags, London Gloves, for Men and Women: Variety of Necklaces, Pendants, and Ear-rings of the neweſt Patterns; beſt Spectacles, Reading-Glaſſes of all Kinds, Teleſcopes, Microſcopes, and Proſpects, Thermometers; Pomatum in Rolls and Cakes, Soap-Balls, plain and ſcented; Hair-Powder, Jeſſamin-Oil in ſmall Bottles; Hungary, Lavendar, Benjamin, and Orange-flower Waters, Daffey's and Godfrey's Elixirs, beſt Stoughton, fine Room, Fire and Candle Screens, ſind Canes, mounted and unmounted, with Variety of other Staves; Choice of Silver, Tortoiſe-ſhell, indented, enamel'd, and Paper Snuff-Boxes; Chains, Springs, Glaſſes, Keys and Hooks for Watches, fine poliſhed Steel Candleſticks and Snuffers, Coffee and Chocolate Mills, Nutmeg-Graters, Punch Spoons, Silk Purſes, Cane and Watch-Strings, Gauze Handkerchiefs, with Variety of other Goods, more particularly mentioned in his printed Catalogue.

Commiſſions from the Country will be careſully anſwered.

Although not intended to be a work on ophthalmic opticians per se, this booklet shows indeed that Optometry's heritage is long and rich.

Henry W Hofstetter
Douglas K. Penisten, Editors