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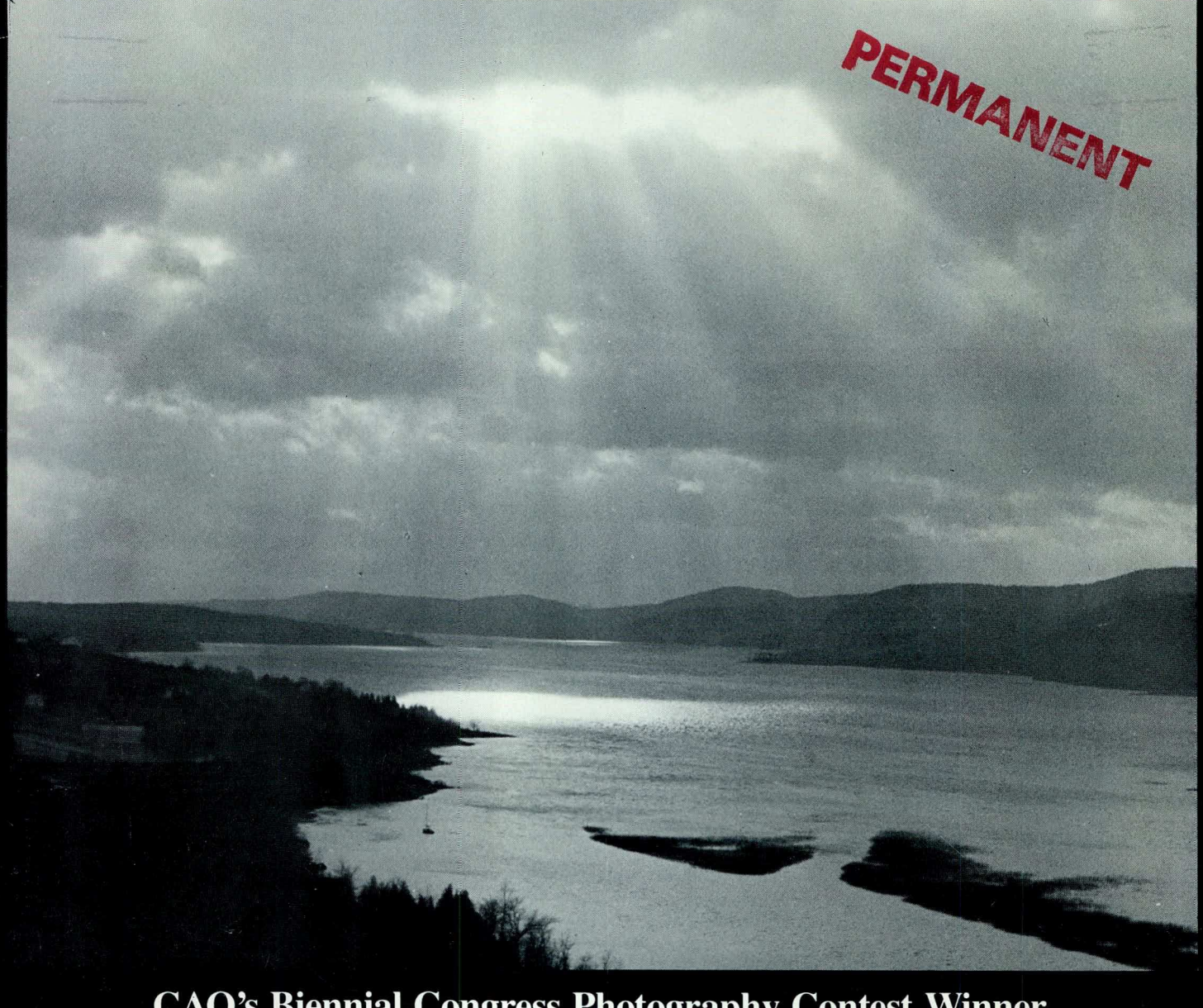
THE CANADIAN JOURNAL OF Optometry



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LA REVUE CANADIENNE d'OPTOMÉTRIE

DECEMBER/DÉCEMBRE VOL. 43 NO. 4

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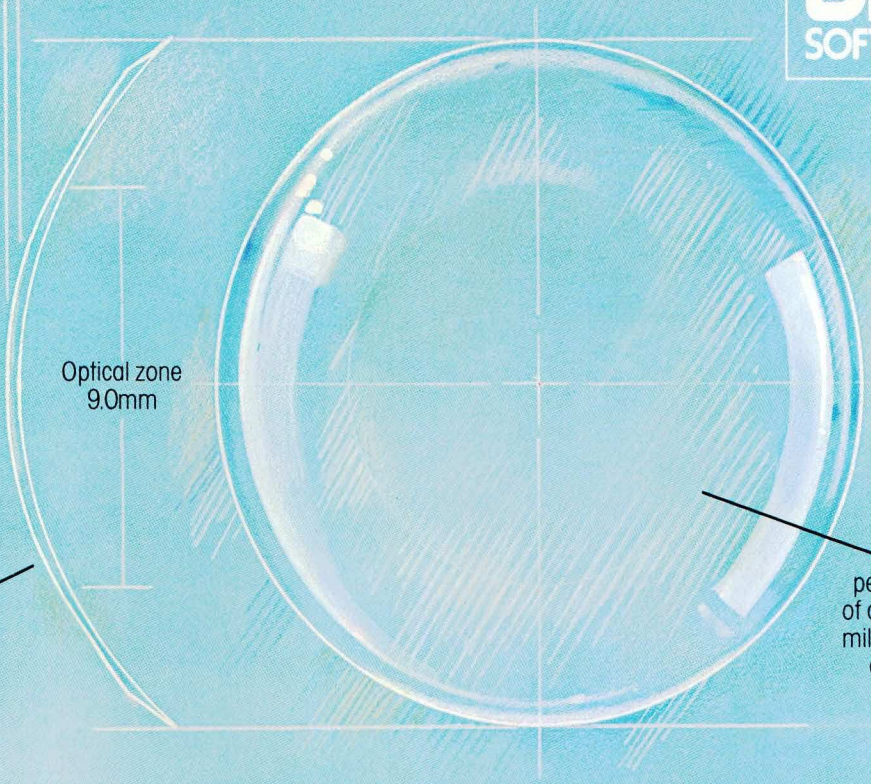

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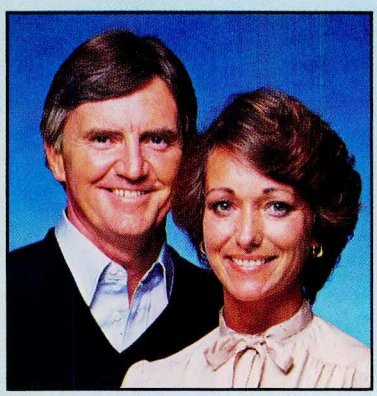

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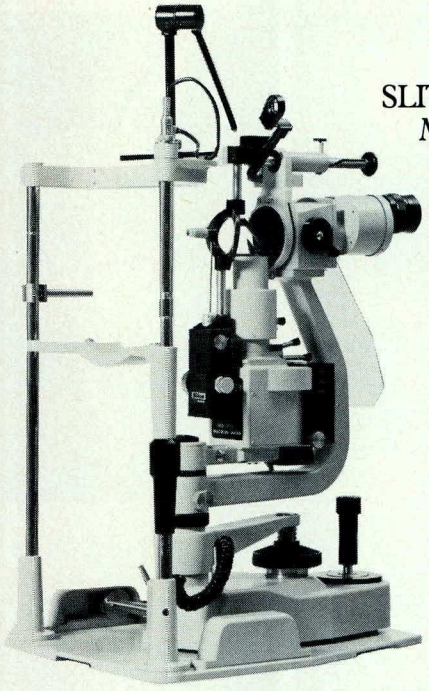

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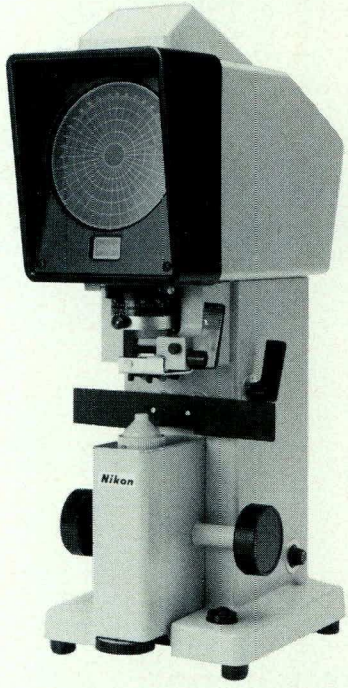

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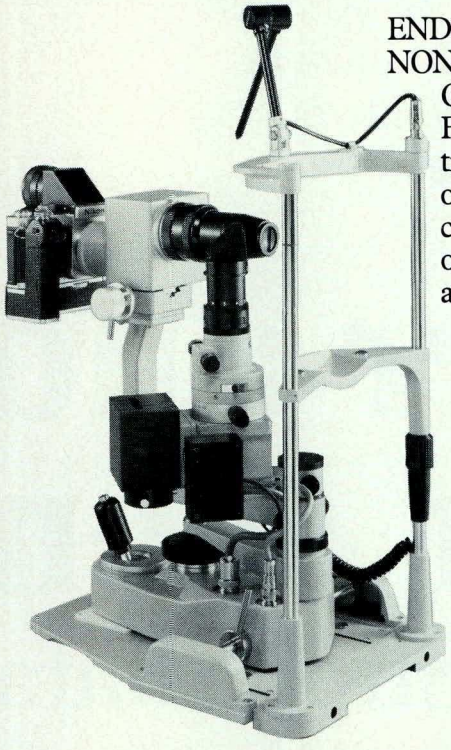

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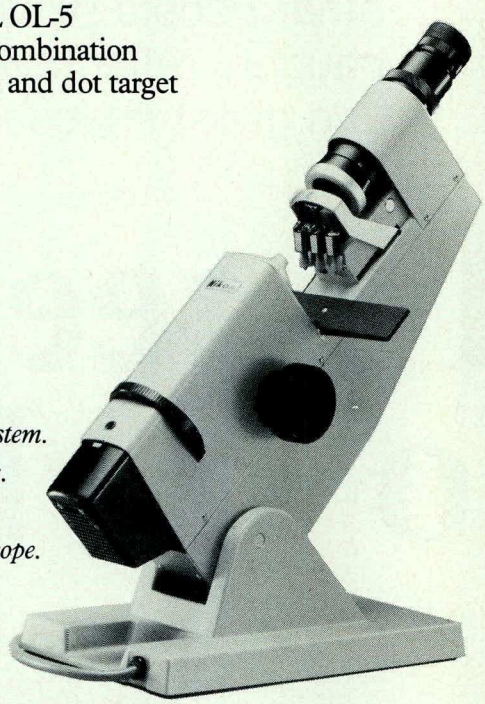

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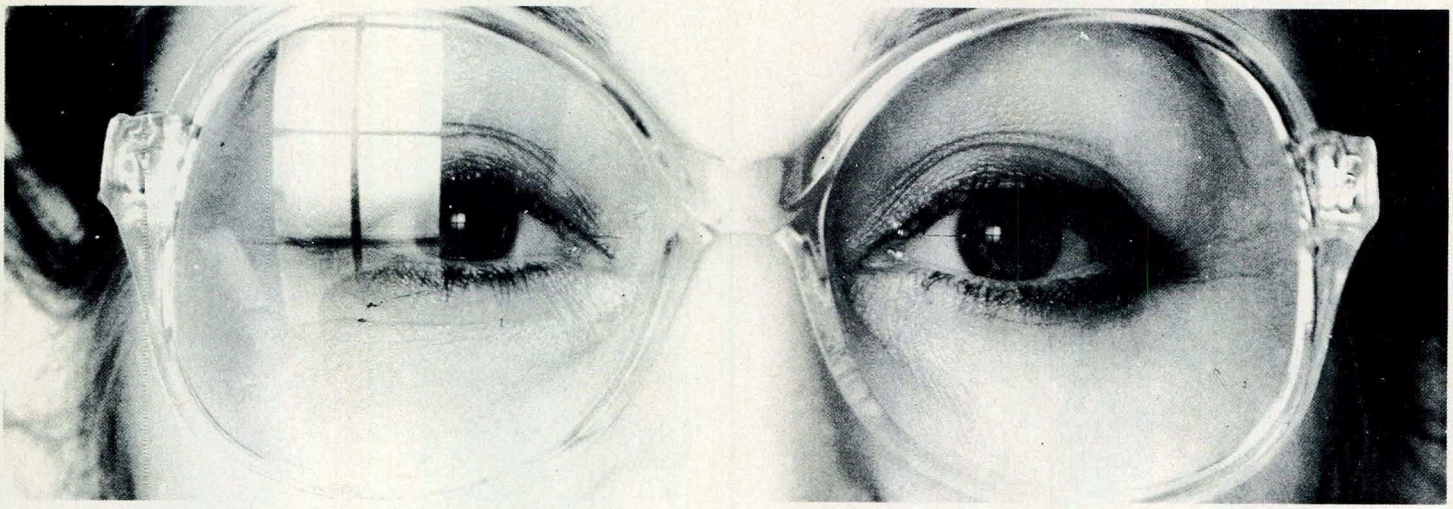

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THE CANADIAN JOURNAL OF OPTOMETRY

LA REVUE CANADIENNE D'OPTOMETRIE

Vol. 43 **OTTAWA, ONTARIO, DECEMBER 1981** **No.4**

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Cover Photo Our Congratulations to photo contest winner, **Dr. Arnold Brown, 39 Canterbury St., Saint John, N.B. E2L 2C6**

THE CANADIAN JOURNAL OF OPTOMETRY is the official publication of the Canadian Association of Optometrists and is published quarterly. All original papers, clinical reports, books for review, proceedings of provincial Boards, Associations and Societies should be addressed to the Editor, Canadian Journal of Optometry, 210 Gladstone Ave., Ste. 2001, Ottawa, Ontario, K2P 0Y6. Subscription and advertising rates are available upon application. The Canadian Association of Optometrists and the publishers of this Journal have no objection to the reprinting by other magazines of any of the articles in this issue, provided such reprints are properly credited to the Canadian Journal of Optometry. Reproductions of articles by other than professional journals with permission of editor only.

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EDITORIAL

CONTROLLING THE REFRACTIVE STATE OF THE HUMAN EYE

The true professional seeks to reduce the need for his or her services and to allay to the greatest degree the effects, both physical and psychological, to which the human body is heir.

The desire to rid oneself of glasses is universal and nowhere more evident than among the myopic population. Researchers and practitioners also share this objective although these groups are more realistic than laymen and recognize that there are limitations to the techniques employed and results to be expected.

In approaching this problem of control, one should keep in mind that control is not synonymous with cure, or the physical elimination of the defect, however desireable this objective may be. Control should be understood as the attempt to prevent the onset of a defect or refractive error, to slow down or retard, and in some specific cases to reverse the progress of an existing error, and to eliminate or reduce non-refractive anomalies which frequently accompany refractive errors.

Why so much emphasis has been placed on myopia and so little on the control of hyperopia and astigmatism, this writer has never been able to understand. Is it a "holdover" from the time-honoured era of the hunter whose livelihood depended on distance acuity and for whom near point activity was secondary? Is myopia a greater obstacle to a successful and enjoyable lifestyle than is hyperopia? Is not the myope a favoured individual in today's near-centered civilization?

The literature contains numerous papers treating the subject of the "Control of Myopia." Nutrition and dietary treatment, undercorrection, full Rx, prisms, drugs, bifocals, vision training have all had their proponents. Some success has been claimed for all these methods but in light of present day knowledge it is untenable to expect that these techniques can be universally applied.[1]

Vision training seemed for a time to be an answer but the results of the Baltimore project,[2] forty years ago, indicated that the refractive state cannot be changed by such procedures although visual acuity or the ability to interpret blur circles may be improved in some individuals. However, vision training may be of value in cases of hyperactivity of accommodation as could be prisms and bifocal prescriptions and drugs. Clinicians should not hesitate to apply those procedures which have proven useful in the past [1,12] but must exercise discretion and professional judgement in selecting those patients likely to benefit from the application of such procedures in order to avoid raising false hopes as to the eventual outcome. Needless to say, such professional decisions have to be based on more than a "quickie examination."

The clinical observations that many long-time hard contact lens wearers manifest a change in their refractive state and that these changes, in the majority of cases, are in the direction of decreased minus power, were first reported by Morrison[3] in 1957. This led to false conclusions that "hard contact lenses" would control the development of myopia or at least retard its progress. This observation, which one colleague described as "orthokeratology by accident",[4] led to the development of "orthokeratology" which is defined as "a programmed attempt to change the refractive state by the application of specifically designed contact lenses."[5]

Changes in the refractive state which are observed appear to arise from a moulding effect on the cornea and perhaps from some other changes in the media which as yet remain unexplained.[7]

But if hard lenses seem to produce a decrease in minus refractive states, why has the opposite trend not been observed in hyperopic refractive states? Is it because fewer hyperopes seek contact lenses and trends are more difficult to establish, or is there a true structural, anatomical or physiological difference between hyperopic and myopic eyes? Would the myopic eye be a softer eye or a less rigid eye? Does the explanation reside in true genetic differences or weak chromosomes more easily influenced by environmental factors?

Most fitters fit on "K" or flatter and the cornea tends to shape to the base curve, favoring a reduction of corneal curvature. The same philosophy applied to hyperopes would increase the hyperopia. Thus, to reduce the hyperope, a steeper than "K" fitting would be necessary. A perusal of the literature does not indicate any such study has ever been done. Perhaps it should! Some individual or institution might accumulate such data on hyperopes as a first step in solving this riddle.

Although the initial procedures proposed for the control of myopia did provoke some controversy as to their objectives and efficacy, none created the stir and violent opposition as did the application of orthokeratology. Dangers and risks to the health of the eye were emphasized and orthokeratology practitioners were accused of unethical, unprofessional practice, not to mention outright quackery.

Fortunately, this unreasonable attitude has changed to one of enquiry, of investigation to evaluate the

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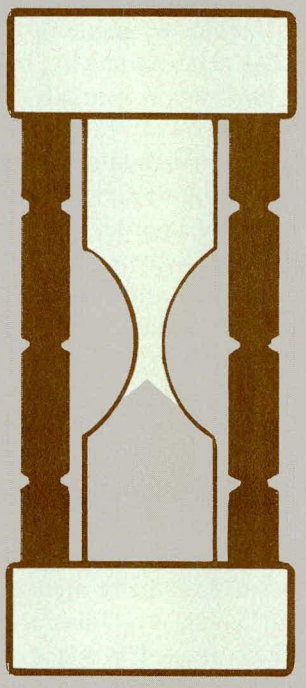

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clinical risk and results of the orthokeratology procedures.

It is strange that throughout this "O.K." battle, medical practitioners were practising surgical procedures with far more risk than that involved in orthokeratology. Such a procedure would be the removal of the crystalline lens but this is applicable to very high myopic errors and contact lenses or spectacles would be necessary in any case so why undergo the surgery? Moreover, Duke Elder suggests this is a very risky procedure to be used only rarely.

The Barraquer technique or corneal lamellar stromectomy has been used now for some 20 years. It consists of the removal of a thin layer of the stroma which is then frozen and its thickness reduced and curvature altered on a lathe in order to reduce the convexity of the cornea in myopia, or to increase its curvature in hyperopia, then replaced on the patient's cornea.[8,9]

A second surgical procedure is keratophakia. It is applicable to hyperopes only because it results in an increased curvature of the cornea.[8,9] It requires a donor cornea which is frozen and lathed to the shape of a small diameter meniscus lens. A thin lamella is removed from the recipient cornea. The donor cornea is placed on the recipient cornea and the lamella is placed over it and sutured back in place. There is always the risk of rejection of the donor cornea and possible visual damage. A safer procedure is to apply the donor cornea directly to Bowman's membrane after removal of the epithelial from the recipient cornea. If the graft does not take, little harm will result as the graft is external, not intralamellar.

The most recent procedure is a Russian technique of radial keratotomy[10] whereby some 32 (more or less) shallow radial incisions are made on the cornea from the optic cap outwards resulting in a flattening of the cap. It is a high-risk procedure due to possible infection and the unproven long range efficacy of the surgery and unknown possible complications.[10]

Whatever the procedure used, no true or permanent control can be hoped for until our knowledge of the aetiology of refractive states is better known and understood and the true effects of corporeal development, environment and heredity are appreciated to the fullest extent.

The establishment of an efficient system of control will depend as much on basic research including longitudinal epidemiological studies as upon the cumulative data and astute observations from clinical practice by interested practitioners who, although admitting the need for basic research, are not prepared to wait for the researchers. In their desire to meet an immediate challenge, the patient in the chair, they routinely use every procedure proven useful in preventing the onset or progress of new or existing conditions.

It is in this latter aspect that optometrists must direct their efforts if they are to be true primary care practitioners providing the high level of care available only where professional standards are met. Readers are encouraged to avail themselves of the reference list because it is only by offering a higher level of vision care that the professional practitioner will be able to combat effectively the "chain" or "discount house" practice.

G.M.B.

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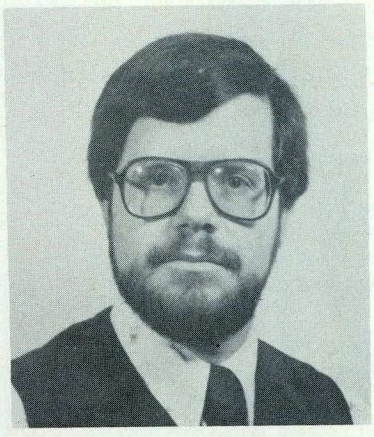
CAO Council Elects New Executive

During the CAO Council meeting in Ottawa, October 24-26, Councillors chose their executive members for the year 1981-82.

Dr. Hervé Landry of Moncton becomes Past-President (and New Brunswick Councillor) as former Vice-President, Dr. Reid MacDuff of Gander, Newfoundland assumes the President's position. Former Treasurer, Dr. Roland des Groseilliers of Ottawa, Ontario is now Vice-President but will also continue in the role of treasurer on a temporary basis. Dr. Jim Patriquin of Corner Brook, is the Newfoundland Councillor while Dr. MacDuff is President and Dr. Jim Kreuger of Saskatoon will represent Saskatchewan, replacing Dr. Jack Huber of Regina who leaves CAO, having served as Past-President. Dr. Ray Corbin of Edmundston also retires from his one-year service as New Brunswick councillor during Dr. Landry's presidency. Both Dr. Huber and Dr. Corbin receive a warm round of thanks and appreciation for their dedication and contributions while serving on Council.

CAO President Dr. Hervé Landry presents President-Elect Dr. Reid MacDuff with his Gavel and Badge of Office.

CAO'S NEW ? ADMINISTRATIVE PROGRAM CO-ORDINATOR



CAO's national office has successfully recruited a welcome addition to the CAO administrative team. For the newly-created position of Administrative Program Co-ordinator, Mr. Michael DiCola has been re-appointed to our staff.

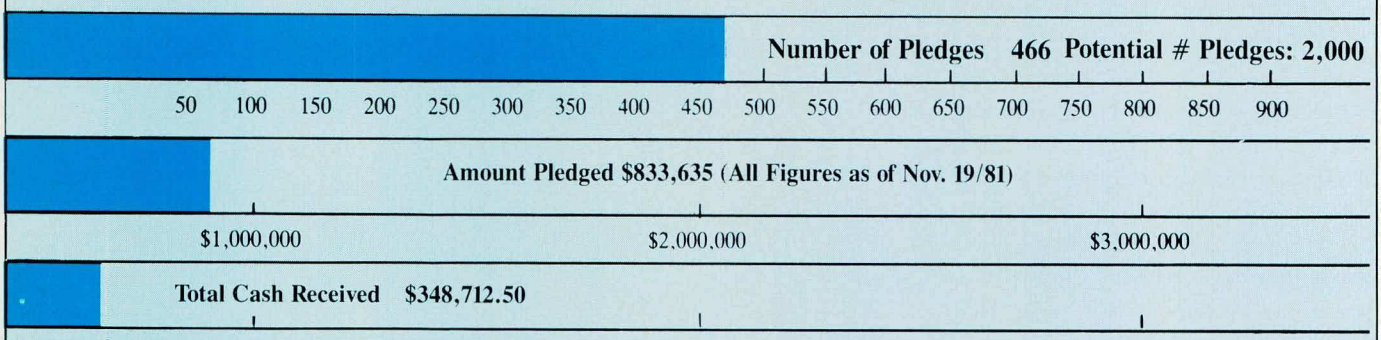
Many of you will remember Mike from his previous stint with the Association as Public Information Co-ordinator and CJO Business and Advertising Manager before Tom Little's arrival. Since then Mike has added to his academic credential of Bachelor of Journalism with a Bachelor of Education from the Ontario Teacher Education College. For the last three years he has held the position of Conference Co-ordinator for the Society of Management Accountants, based in Hamilton.

After a brief re-orientation to the changes in CAO's programs, he commenced full-time duties with CAO October 1. Among his responsibilities, Mike will administer CAO's Membership Programs, assist promotion of the Canadian Optometric Trust Fund, perform liaison with the Canadian Optometric Contact Lens Society, co-ordinate Biennial Congresses, and produce statistical reports.

In addition to the above duties, he will share responsibility for the production of the CJO with CAO 's PIC, Alex Saunders in order to allow Alex to focus more attention on our Public Information program in 1982.

Canadian Optometric Education Trust Fund Update

TRUST FUND: OUR GOALS ARE BEING ACHIEVED



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Dr. E.J. Spearman	Man.	Dr. Jim Patriquin	Nfld.
Dr. Betty Fretz	Ont.	Dr. John Rusk	P.E.I.

A Gift to the School of Optometry, University of Montreal.

An electronic digital pachometer was presented to the School of Optometry at the University of Montreal. At the formal presentation, Dr. D. Forthomme, Associate Professor of the faculty of Optometry, is shown accepting the traditional plaque from James L. Jansen, General Manager, Barnes-Hind Canada. Also present were, from left to right, Yvan Béliveau, Barnes-Hind Sales Representative for Quebec, Dr. David Geeting, Director of Clinical Affairs Barnes-Hind Inc. and André Desmarais, Barnes-Hind Representative for Quebec.

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OPINION

A special section of the Canadian Journal reserved for expressions of opinions by our readers on controversial topics or for putting forward new thoughts or philosophies to provoke discussion among members of the profession.

The Editorial Board reserves the right to select such papers and realizes that these papers *may not* always have the scientific tenure of an academic or research paper.

The Board considers these papers to be more than "letters to the editor". However, the opinions expressed are solely those of the author. Acceptance for publication does not imply endorsation of these opinions by the Editorial Board and the Canadian Association of Optometrists. We invite your comments on this, or any other article in the Journal.

Why Optometric Hypnosis?

Dr. Alex C. Willis O.D.*

Any profession should utilize every available "tool" for the betterment of the service it renders. When this "tool" serves a dual purpose of being a direct benefit to the patient as well as in creating a more controlled and relaxed atmosphere for the benefit of both the patient and the practitioner, this technique should be part of the armentarium of every optometrist.

Why has hypnosis been ignored, neglected and misinterpreted by a vast majority of all the professions in the health-care field? Ignorance! Failure to understand the basic underlying psychological principles of this natural ability possessed by every human mind or, more accurately, by every living creature. In recent times more and more members of the medical, dental and related professions are being educated and trained in the principles and practical applications of hypnosis. You, as part of the health team, must keep abreast of these developments if you are to maintain your ever-increasing status in the visual care field. This is not to be interpreted as being an encroachment on the services of the medical practitioner. Hypnosis can and is being used in many ways exclusively in the optometric field, providing a service to the patient, directly or indirectly, which cannot be provided in any other way but through the use and understanding of the principles of hypnosis.

The purpose of this article is not to teach you hypnosis. It is to try to show you that hypnosis does have a practical and useful place in an optometric practice and perhaps help to motivate you to further study.

Perhaps the most basic and most rewarding use to the optometrist is the increased control of the responses and reactions of the patient. Once the basic principles of hypnosis are understood, there are innumerable applications with almost every patient. A few examples will give you a better insight of this approach. We all have, on occasion, had the problem of a particularly sensitive patient being unable to maintain a steady lination during an ophthalmoscopic examination, and other times when a high intensity is required. Through a very simple-trained procedure, not only is any discomfort to the patient eliminated but because of a more stable and prolonged fixation and less resistance from the patient, a more thorough and accurate examination of the fundus can be made. A similar technique can be used with youngsters who tend to move and fidget. By creating a more controlled and relaxed situation, the examination procedure is much more pleasant for the patient and for the examiner. It is surprising how many adult patients suffer through an examination because of tension or nervousness. What a joy it is to be able to work relaxed and what a tremendous impression is created on the patient. This aspect of hypnosis alone can be utilized in many different ways and in itself would prove highly beneficial to an optometric practice.

In the opinion of this writer, in contact lens fitting, hypnotic techniques are practically indispensable. I use this in one form or another with almost every contact lens patient, having developed a training program which I feel is superior to most of those being used at the present time. However, many of you are possibly using similar methods without being aware of their relationship to hypnosis. A better understanding of these methods would enable you to make much better use of this phenomenon.

In special cases, hypnosis has been the only solution to the problem. The following will serve to illustrate such a situation. A young executive type lady of 34 had on two previous occasions tried to be fitted with contact lenses. Her motivation was more than adequate as she desperately wanted to be without glasses due to business reasons. However, on both occasions, the doctor was unable to insert the lenses even though, as she put it, "The second time two of them tried to hold me down and put in the lenses." Using a relatively simple hypnotic approach, the lenses were inserted in a matter of minutes without the slightest fear or discomfort on the part of the patient and the training and wearing schedule progressed normally thereafter. One case of excessive and continual lacrimation with contact lenses was solved after only one session as well as a severe case of photophobia.

I do not wish to give the impression that hypnosis is a panacea for, in many cases, this approach is useless but, where applicable, the somewhat astonishing results at times almost seem to border on the occult, only of course, to those unfamiliar with the basis on which hypnosis is founded.

Many more actual cases could be presented to prove the usefulness and practicability of the hypnotic approach in optometric practice, for in my practice the use of some form of hypnosis has become almost a routine procedure. At present experiments are being conducted in other aspects of visual problems. The most rewarding has been the reduction and/or prevention of myopia in

cont'd on page 130

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Exerpts From the Acceptance Speech of C.A.O. Presidents' Award Recipient Dr. E.J. (Woody) Spearman

PRESIDENT'S DINNER ST. JOHN'S, NEWFOUNDLAND
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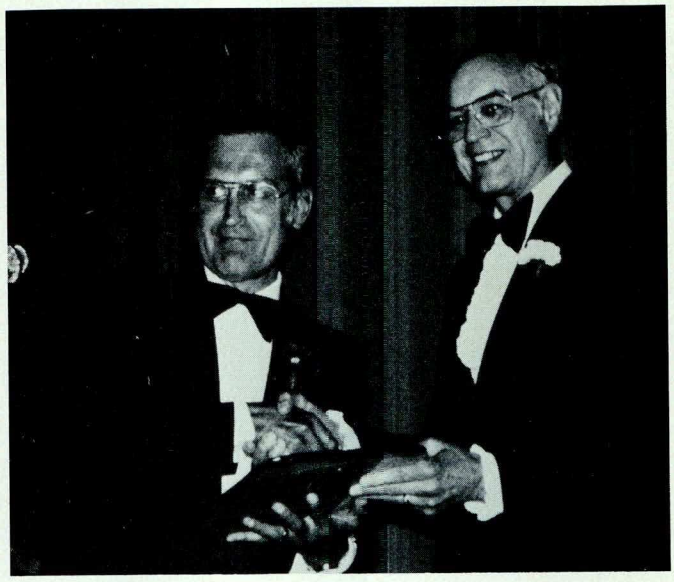


Mr. Chairman, Past-President Roy, Past-President Jack, Honoured Guests, Ladies and Gentlemen.

Someone once said "success is the ability to receive the credit for all the hard work that someone else has done" — and that's very much the way I feel this evening.

The dictionary tells us that success also means "good fortune" and certainly Marian and I have had the good fortune to be a part of optometry, to have the privilege of knowing so many wonderful people, of travelling to the different provinces and perhaps have had some input into the direction of the profession.

I think that good fortune may also mean "to be recognized" and that in itself is an honour — but to be recognized by one's peers is the greatest honour.

It is the greatest honour because your peers know you well — they know your strengths and they know your weaknesses, and best of all they are kind enough to dwell on the former and overlook the latter.

Optometry is a great teacher.

1. It teaches one to apply one's self to achieve a certain academic standard.
2. It teaches us to be aware of one's duty to society because optometry is a social science.
3. It teaches us to appreciate the tools which our leaders and academics have given us, that we may provide the best vision care possible.
4. It teaches us to appreciate the beautiful simplicity of children with their revealing answers from uncluttered minds.
5. It teaches us compassion for those less fortunate than we.
6. It teaches us that goals are important and sacrifices are necessary if we are to achieve those goals whatever the adversity.
7. It teaches us to do our homework that we may choose the right course and having chosen that course never to waver.
8. Optometry teaches us that kindness, love and concern are much greater and more effective forces than self-serving motivation.
9. It teaches us that optometry is a family affair whether it be the provinces that make up C.A.O., whether it be the individual optometrists that make up the provincial family or association, or whether it be the individual family with the optometrist and his wife, or her husband and the children, because every member of the family is involved directly or indirectly with optometry; it requires all the resources of a family and the whole family shares in the responsibilities, the privileges and the rewards of the profession.

In summary it has been my good fortune to have the support of many wonderful people.

I thank each and every one of you for the great honour which you have bestowed upon me this evening in the presentation of this award and I receive this award as a symbol of the contribution which each optometric family in Canada is making each day to the betterment of the profession. Thank you all so much.

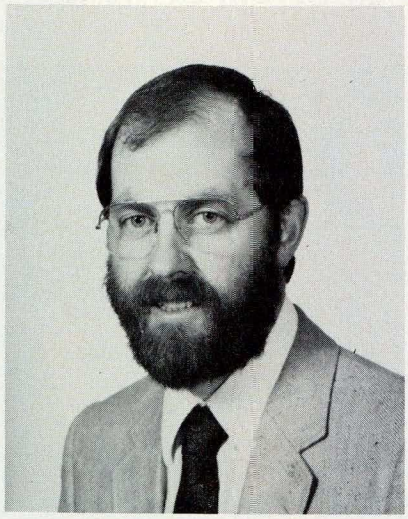
CAO President Dr. Reid MacDuff's Inaugural Address*

**Delivered at the CAO Biennial Congress President's Banquet & Ball, St. John's.*

It is indeed a pleasure to become President of the Canadian Association of Optometrists. Only those who have occupied this chair before me can know that feeling. When a man is judged by his peers to be capable of leading them, it is an honour and I hope that in the year ahead I will be able to lead the profession as well as my predecessors have done.

I do not foresee the coming year as being one of departure from the already-established aims of C.A.O. The objectives of the profession have been assessed and redefined and we will be placing additional emphasis on the areas of educational institutions and communications involvement of our membership.

On the former I would like to inform you that we will be pursuing the establishment of a school in eastern Canada as actively as we are pursuing a school in western Canada. The public needs our services and in order to satisfy this demand we must increase our numbers. Now I know that many practitioners feel threatened by the establishment of an optometric school in their area. However, let me assure them that they need not be. This is easily shown by the Waterloo experience. The operation of a professional school in either an eastern, or a western province will greatly enhance the image of optometry and apart from graduating additional optometrists to meet the needs of the public, there will also be a spinoff of increased public awareness of the profession which will undoubtedly have positive effects on practices.



In summing up on this vital C.A.O. program, I would like to say that considerable time and energy has been expended on this matter and if the governments continue to stall, then we as optometrists must appreciate the need to fund our own school. We have done it before, and we will do it again if the need arises.

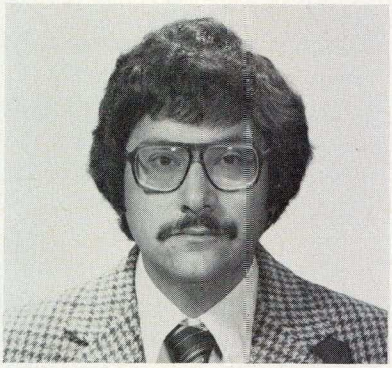
The other area to which I shall devote considerable time is intra-professional communications. We need a change in attitude in a great number of our colleagues; we need to establish in our members a desire to respond to the requests of C.A.O. If we are to achieve our five-year objectives, then all optometrists must first become well informed of the programs of C.A.O. and then become actively involved.

I am looking forward to these challenges over the coming year and meeting with each of you in your respective provinces. I assure you that I will work diligently to achieve the goals of Canadian Optometry.

Dr. Jacob Sivak Appointed Associate Director U.W. School of Optometry

Dr. Jacob Sivak has been appointed Associate Director, School of Optometry, University of Waterloo. He will be assisting Dr. Walwyn Long, Director of the School, in various administrative functions.

For over 10 years Dr. Sivak has been an active member of the Faculty and is an Associate Professor. His research interests are in the area of comparative anatomy and physiology of the eye with emphasis on refractive components, refractive state and accommodative mechanism.



Dr. Sivak holds his L.Sc.O. (Montreal), M.S. (Indiana), and Ph.D. (Cornell).

ERRATUM

The following References were omitted from the publication (September, 1981) of the co-authored paper 'Direct Ophthalmoscopy toward the Retinal Periphery' by T.D. Williams & A. DiPasquale. Our apologies to the authors.

Editor.

References:

1. Williams, T. David and Dennis A. Bader, Direct Ophthalmoscopy toward the retinal periphery: lens powers required, *Can J Optom* 42(3): 168-169, September 1980.
2. Riise, D., The nasal fundus ectasia, *Acta Ophthalmologica* supplementum 126, 1975.
3. Williams, T. David, Congenital Malformations of the Optic Nerve Head, *Am J Optom & Physiol Optics* 55(10): 706-718, October 1978.

Optometry Volunteers Needed for National Mature Driver Education Program – 55 ALIVE

A special Canada Safety Council mature driver education program, 55 Alive, is scheduled for nationwide release in 1982.

Optometry has been offered a key role in the success of this program—a role which will require the active participation of many CAO members in their own communities.

The purpose of 55 Alive, the first program of its kind in Canada, is to help drivers 55 and over update their driving habits, sharpen their driving skills and compensate for normal age-related changes in driving proficiency.

In a series of six separate sessions (3 sessions per day over 2 days), course participants learn safe driving, mainly through group discussion with their peers, instructor guidance and 35 mm slide shows which reveal perceptual problems in various driving environments.

Optometric participation in particular is invited for the 2nd session of the lecture series dealing with vision concerns of older persons. Using supplied slides approved by CAO and student workbooks, the participating optometrist will present a half hour outline of the structure of the eye, the importance of seeing for driving and common vision problems for older Canadians.

A second option open to the optometrist is to receive training so he or she may assume the role of group leader and course organizer for his or her own area.

The Canadian Association of Optometrists is pleased to endorse the 55 Alive program as an important contribution to the health and safety of Canadian citizens and urges every member to join in support of the program when it reaches their community.

To receive more information about becoming a 55 Alive guest lecturer or group leader in your area complete the questionnaire below and send to:

ALBERTA OPTOMETRIC ASSOCIATION EXAMINATIONS

The Board of Examiners in Optometry has scheduled the 1982 examinations. Applications must be received by **June 1, 1982** for the Alberta Optometric Examinations scheduled **June 24, 25, 1982.**

For application forms, contact:

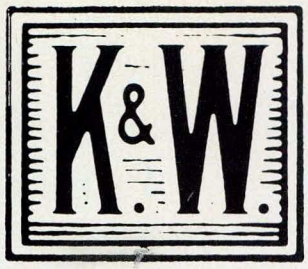
Board of Examiners in Optometry
Seventh Street Plaza
8th Floor, South Tower
10030 – 107 Street
EDMONTON, Alberta
T5J 3E4

Canadian Association of Optometrists
55 Alive
2001—210 Gladstone Avenue
Ottawa, Ontario K2P 0Y6

(Please Print)

Name_____ Age_____
Address_____
Province_____ Postal Code_____
Area Code_____ Telephone_____

I am interested in becoming—a) Guest lecturer _____ (Check one or more)
b) Group Leader _____
in receiving— c) Information _____



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CALGARY LONDON

The Museum of Visual Science and Optometry

Edward J. Fisher,*
Catherine R. Johnson,**

The Museum of Visual Science and Optometry is located in the Optometry building on the campus of the University of Waterloo. It forms part of the Waterloo Heritage Collections Association which also includes the Biology and Earth Sciences Museum and the Museum and Archive of Games. Administratively, this organization is separate from the University, but is closely related to it. The Museum of Visual Science and Optometry has its own board of consultants, consisting of several optometrists representing a cross section of the profession and its organizations.

The display area occupies approximately 100 square meters of space adjacent to the Visual Science Demonstration Theatre on the third floor of the Optometry building. Here, artifacts are displayed in six wall cases, two of which were donated by the Auxiliary to the Ontario Association of Optometrists and seven floor cases. As facilities are limited, the exhibits are changed frequently in order to utilize the entire collection. This problem will be alleviated in the near future when funding becomes available for six additional cases.

The collection includes early instruments and equipment, antique spectacles and cases, early diplomas, certificates and pictures, some rare books on Optometry and other materials of historical significance in the development of the profession and visual science in general.

The current exhibit includes a display tracing the development of the ophthalmoscope. Many of these early instruments were used primarily for indirect ophthalmoscopy. They were dependent on external sources of illumination, required a condensing lens, and were difficult to use by any direct method. Some were produced in 1865, an early date considering that Helmholtz first described his invention in 1850. Other instruments in the display include early battery type models by De-Zeng, Keeler, National Optical and General Optical Companies. Cameron Surgical Company and E.B. Meyrowitz furnish examples of instruments for use with transformers. The various styles illustrate different types of gear systems for manipulating the focussing lenses, and utilize both May prisms and plane mirrors. One interesting model consists, unfortunately, of the head only, of a Decagon Ophthalmoscope made by Keeler of London, England. It was designed in 1930 as a measuring instrument to determine refractive errors and the extent and depth of retinal lesions, by utilizing different types of monochromatic light. Also shown, are two indirect instruments developed about 1910. One is a Laurence-Wood Orthops Ophthalmoscope designed by the noted Lionel Laurence who resided briefly in Canada about 1895. The

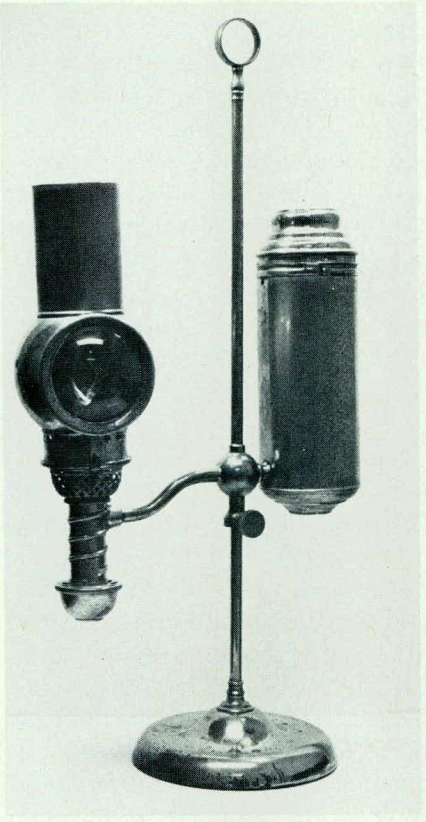

Fig. 1 Kerosene lamp used as light source for ophthalmometry and skiascopy, made by Manhattan Brass Co., New York & patented May 23, 1886 & June 15, 1886.

School of Optometry – U. of Waterloo
* M.A., D.Sc.
** B.A.

other is an instrument by Busch that uses the principles of Dr. Thorner who produced his first ophthalmoscope in 1899. Both are in the shape of small boxes measuring 25 × 8 × 5 cm. with an opening in each end. The objective condensing lens is replaced by a concave mirror and the eyepiece can be focussed. The instrument is placed close to the patient's eye which is shielded from external light by a rubber cup. The examiner then views the fundus which appears to be projected inside the box.

Another display presently on exhibit traces the development of the retinoscope and includes several non-illuminated mirrors from as early as the 19th century. There are plano and concave mirrors in several different diameters, some including axis-locating devices. All required an external source of illumination. One such source is exhibited and consists of two nickel plated cylinders; one contained kerosene and the other a lamp with a strong condensing lens. The light was adjustable so that it could be directed onto the retinoscope mirror. (Fig. 1) A considerable amount of skill was needed to catch the beam of light, direct it into the patient's eye and still observe the resultant shadow movement. It is no wonder that the development of an accurate subjective technique was essential.

Early keratometers comprise another area of the exhibit and a total of five distinctly different types are available for display. The earliest is a model produced by F.A. Hardy of Chicago, utilizing a metal and cardboard type of mire with light sources, consisting of four shielded lamps placed around the patient's head-rest (Patented May 9, 1849). Light from these lamps was reflected by the targets into the patient's eye. Each target was moved independently and the separation could be read from a scale that was then translated into the curvature measurement of the cornea. A later ophthalmometer, the Javal-Schiotz model was made by E.B. Meyrowitz about 1907 (Fig. 2). This was a forerunner of a third type shown, the Universal Ophthalmometer made by General Optical Company and used from 1910 to 1940 by many Canadian optometrists. There is also a

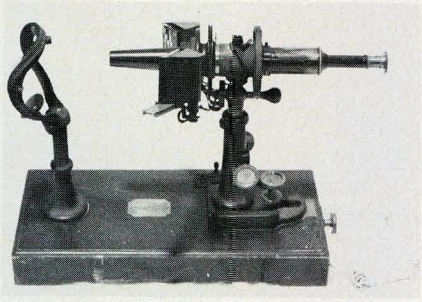

Fig. 2 Javal Schiotz Opthalmometer made by E.B. Meyrowitz and patented Dec. 31, 1907.

Chambers-Inskeep (C-I) instrument made by F.A. Hardy and Company about 1900. (Fig. 3) This type was later made by American Optical Company. While these may not be regarded as antiques in ordinary

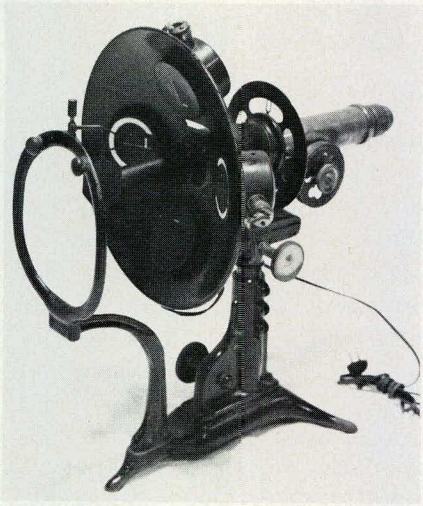

Fig. 3 Chambers-Inskeep Ophthalmometer manufactured by F.A. Hardy and Co., Chicago and patented July 16, 1901.

museum terms, it should be noted that the first development of such instruments by Jesse Ramsden took place in 1796, but they were not made at all practical until after the time of Helmholtz in 1856.

Other items shown include the Ives Acuity Apparatus described in the first volume of the Journal of the Optical Society of America in 1917. This device used a rotatable grating and created a form of Moire pattern to measure acuity. There is also a 1910 cabinet device for presenting single rows of Snellen letters to the patient through a mirror arrangement. The letters are on a scroll wound on rollers and the lines are changed by cords attached to a pulley.

A very unusual device for assisting in the selection of spectacles is also exhibited. To date no similar instrument has been located and the maker's name or date of manufacture are unknown. It is presumed that it dates from the latter part of the 19th century. The apparatus consists of a series of spectacle fronts with 34 different powered pairs of lenses which can be rotated in sequence before two eyehole openings. The patient viewed test letters through lenses ranging in power from +9.00 to −6.00 spheres. Perhaps this unusual device was a forerunner of the modern phoropter. (Fig. 4)

A display of early phoropters shows the development of the instrument from simple batteries of large open spherical lenses in front of each eye, through the reduction of lens diameters, the enclosing of the lens systems, the addition of cylindrical lens batteries, rotary prisms, Steven's phorometers and Maddox rods, up to the present time. There are a number of DeZeng instruments of succeeding issues, one Wolff Ski-optometer, and a Genothalmic Refractor, as well as more modern instruments.

Another component of this display, the Andrew J. Cross skiameter, was created by an ingenious arrangement of lens combinations. It

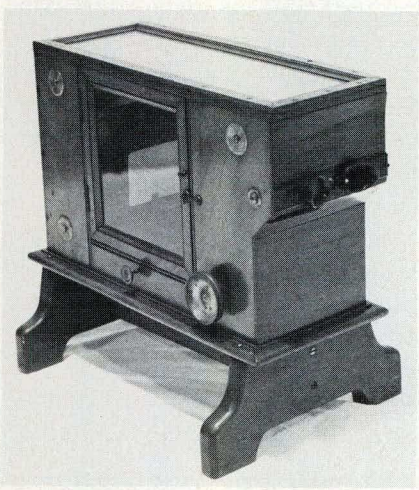

Fig. 4 Device for selection of spectacles, late 19th century.

was a device for measuring refractive errors. Various vertex powers were obtained in front of each eye by altering the separation of the lenses in the system, rather than changing the lenses themselves. This adjustment of the separations was controlled by looped cords fitted to pulleys. The length of the cords was such that the examiner could manipulate them at the correct distance for retinoscopy. The patient held the instrument and looked through the lens system, while the examiner used his retinoscope to neutralize the refractive error. As with most inventors, Cross was very proud of his instrument and described it in his book "Dynamic Skiametry" published in 1911.

Office furniture plays an equally important role and a fine example may be found in the 1860 examining chair presently on exhibit. Due to damage sustained in a fire in the Optometry clinic in 1969, this chair has been completely restored. It has stuffed mohair upholstery, mahogany arms, and adjustable head rest and can be tilted backwards. A bracket on the arm supports a holder designed to hold an oil lamp for retinoscopy. (Fig. 5) Dr. M. Stark of Toronto located this chair and also the light source mentioned above in an antique shop.

A 75 year old fitting table owned by the late Dr. N. Penwarden who practiced in Welland from 1915 to 1972 is another interesting addition to the collection. This double pedestal piece comes equipped with six drawers, the upper two lined with felt formed the display trays, while the lower four were used to store tools. Heavy plate glass covers the extreme right and left of the desk top affording the patient a full view of the "latest in spectacles."

The museum has a number of early spectacles dating from 1650. A valuable pair of Chinese tortoise shell were the proud possession of an English family for over 150 years. At some point, the elaborately carved bridge was broken but was skillfully repaired with a sterling silver plate on the back. A large number of 17th, 18th and 19th century spectacles are also in the collection. Some are made from sterling silver and are hallmarked, others are made from brass, blued steel, white metal, or horn. Dr. C. Tait of Toronto donated an extensive collection that enables us to display good examples. Many others have donated to swell the total to over 350 different types.

Fig. 5 Examining chair; cast into the iron base is the patent date, Sept. 4, 1860.

More recent models of celluloid and plastic are also featured. They illustrate all changes in spectacle construction from small oval and square shaped lenses to the larger round lenses of the 1920's. Temples show interesting changes including the hinged swivel design of early library straightback temple and the early sliding side types. Several are equipped with loop ends which were used to attach "ribbands" for security. About the turn of the century temple styles became curved to wrap around the ear. There were simple riding bow types of extremely fine wire as well as the more comfortable cable style.

A number of early spectacle lenses are found in the collection. There are a few quartz lenses, originally called pebble lenses and thought to have had very beneficial effects on the eyes, flat glass lenses principally with spherical corrections and others that are variously coloured. There is also a stock set of Perfection bifocals containing a number of oval shaped distance lenses of varying powers with a small semi-circle removed from the bottom of the lens. Semi-circles of additional powers were neatly fitted into these spaces and held in place by the metal eyewire of the spectacle frame. It would have been possible with this set to fit a patient while he or she waited. Several cement bifocals have been located and a very unusual cemented trifocal. The latter was made about 1930 by a St. Thomas optometrist, who mounted them in the fashionable rimless mounting of the day. The lens library is being developed to include examples of different lenses which have been available in the past, as well as a complete collection of lenses available at the present time.

A number of early spectacle cases form yet another interesting display. Some of these are made from wood and date from 1850. Some are plain and some are elaborately carved; some are open ended and some are equipped with either a hinged cover or a slide on cap. One is carved in the form of a small book. Others are made from black-japanned metal, papier mache, cardboard or leather. Several dated about 1890 have inlaid designs of mother-of-pearl.

Much of the historical data regarding the early days of optometry in Ontario has been donated to the Museum by the College of Optometrists and the Ontario Association of Optometrists. This material includes a framed copy of the first Ontario Optometry Act passed in 1919, the original charter of the Ontario Association of Optometrists issued in 1907, and the first minute books of both the Board of Examiners in Optometry and the Ontario Association. There is also a picture of the first Board of Examiners, and copies of the first qualifying examinations.

One of the more colorful displays is a collection of postage stamps from around the world depicting items of visual or optical significance. A number of countries have issued stamps on blindness prevention, stamps commemorating Ophthalmological Congresses and still others depicting famous scientists such as Pavlov, Von Graefe, Helmholtz and Galileo. Recently West Germany has issued several stamps with illustrations of instruments found in the Zeiss museum in Jena. While some stamps include illustrations of people wearing various styles of spectacles, it is interesting to note that very few subjects wear glasses in portrait stamps. Perhaps it has been a traditional courtesy not to display any physical weakness of a prominent figure.

Though the museum of Visual Science and Optometry is still in its infancy, much progress has been made toward developing this as a public resource. The materials in the museum have been catalogued in accordance with standard museum practice. A card index has been completed to aid in locating any particular artifact. Co-ordination with other museums is being developed through the Ontario Museum Association. Efforts have been directed toward the creation of a system that will benefit all levels of interest: the professional optometrist, the researcher, the museum curator or the Sunday historian. Exhibits are geared not only toward fulfilling the needs of the academic community but also toward accommodating a growing public awareness of the necessity to preserve history. Indeed, it would appear that interest is spreading for the museum has received articles from people throughout Canada. All of these contributions are greatly appreciated and it is hoped that suggestions and inquiries will follow. It is the aim of the museum to benefit the public at large as well as those with a closer professional interest.

Any person who has historical material pertaining to Optometry or Visual Science is asked to contact the Museum. While any early materials are useful, there is a particular need for early optical instruments, telescopes, microscopes as well as archival material dealing with Optometry's early history. Contact:

Prof. E.J. Fisher, Curator, Museum of Visual Science and Optometry, c/o School of Optometry, University of Waterloo, Waterloo, Ont. N2L 3G1.

Opinion - Hypnosis *cont'd from pg. 122*

school children. Much more research needs to be done and it is hoped that this article has created enough interest so that you will want to learn more about the possible uses of hypnosis in optometry.

How to start? Some excellent literature is available. Local societies often conduct courses. Possibly a lay hypnotist can provide a basic knowledge. There are a variety of courses conducted in the United States. Unfortunately very little of what is available is optometrically oriented but any knowledge can be useful. As the basic principles of hypnosis are assimilated and better understood, these can more and more readily be adapted to optometric use. As more optometrists show an interest in this field, it is hoped a course in optometric hypnosis can be established.

In the meantime, at least, keep an open mind – for the benefit of yourself and your patient.

Contact Lens Patient Referrals

Cedric Passmore*
Brian Garnett**

You require contact lens information immediately concerning a patient who has come into your office from another city. A simple phone call to the original fitter's office should suffice. That is assuming however, that his receptionist doesn't put you on hold for 10 minutes, and can find the file, or if, when you call, the practitioner is not on holidays, taking a course, out to lunch, or too busy to come to the phone.

Once you reach him, confusion abounds and you hear frantic rustling of papers. You start to wonder just how accurate the information is you are receiving, because you remember being on the other end of these calls yourself. You remember either having given outdated specifications, or having found that more useful information could have been provided had you taken the time to study the record more thoroughly.

Problems with transfer patients are going to occur no matter how well-organized we are, but they can be reduced by the more frequent use of referral letters.

It would be useful if any patients that are known to be moving were given the names of optometrists whom they should consult, and a copy of a referral letter given either to the patient or to the optometric colleague. This relieves the patient of the worry of finding a competent and ethical practitioner, and ensures that at the patient's first visit, problems can be dealt with efficiently.

A sample of a form referral letter is reproduced which is intended to minimize practitioner time, and to provide all pertinent information. This particular form is printed in duplicate so that each practitioner has a copy.

Optometrists are the most respected professional group in contact lens care. That respect can be maintained in part by the efficient referral of patients to competent colleagues for continuing care.

Cedric Passmore O.D. Brian Garnett O.D.

OPTOMETRISTS

P.O. BOX 2753, LONDON, ONTARIO
N6A 4H4

_____ Date _____

_____

_____ Patient _____

_____

____ This contact lens patient is being referred to you for continuing care.

I hereby grant permission for the above practitioners to exchange information from my case records.

____ This contact lens patient has come to our office. Please supply necessary information for our records.

Signed _____

ORIGINAL FITTING DATA:

Date of initial contact lens fitting

K readings O.D. O.S.

Refraction O.D. O.S.

Best corrected V.A. with spectacles O.D. O.S.

Best V.A. recorded with contacts O.D. O.S.

CURRENT CONTACT LENS SPECIFICATIONS:

	Base	Sec.	P.C.	Power	Diam.	O.Z.	C.T.	Lot No.
O.D.								
O.S.								

Laboratory

Lens material Tint

MOST RECENT EXAMINATION: Date

Purpose

Spherical over-refraction O.D. V.A. O.S. V.A.

K readings O.D. O.S.

Spectacle refraction O.D. O.S.

Lens fit

Comments (special duplicating instructions, previous contact lens problems, other oculo-visual problems)

* O.D.
** O.D.
P.O. Box 2753
London, Ontario
N6A 4H4

"GOOD WILL" or "ANOTHER ONE BITES THE DUST"

by Sander S. Dorfzaun, O.D.

(Reprinted by permission from June, 1981, Southern Journal of Optometry)

What is good will?

The word "good" means ". . . considerable; not insignificant, admirable, honorable."

The word "will" means ". . . the power of choosing."

So "good will" means "the power of choosing honorably."

For the senior practitioner this means making the right decisions throughout his career. For the young associate it means being the hand-picked doctor to carry on the established practices of the senior practitioner. Can the good will of a doctor be "passed on" if he is deceased? Possibly in a small way, but basically NO.

It takes three people to pass on good will. Notice I said to pass on good will. It takes the senior practitioner introducing the junior practitioner to the patient.

True, some of your patients would be happy seeing anyone at your office. They really don't care who. Another percentage of your patients can have your good will passed on by your office staff when that type of patient calls for an appointment. Other types of patients will have to be personally introduced by you to your new associate. And the last type of patient is the one who you will personally introduce to your associate only after you have just completed his examination, spending much of the exam time talking about your great new associate who is just what he or she needs for whatever special reason.

How long must you stay around your practice to pass on your good will adequately? Well, if your practice is similar to mine, some of your patients return every three or four years. Therefore, you have to be around three or four years to maximally pass on your good will.

Remember good will must be passed on, not bought or sold. If a practitioner dies and does not have an associate, or sells his practice and retires a month later, the purchasing O.D. does not inherit much of the good will.

Do you think Mrs. Jones, who lives forty miles away from the office and who has been your patient for the last fifteen years—because you are the only doctor who truly understands and can deal with her problem—is going to travel those forty miles to see a kid whom she has never met?

NO! If the doctor died she doesn't want to return and get depressed about her friend and meet a counterfeit. And if her doctor sells the practice and leaves the next day, Mrs. Jones is going to feel abandoned and will never want to return to that office.

But, if the junior associate has had that good will passed on to him, then when Dr. Smith dies all those Mrs. Jones' will want to return to the office to pay their respects.

Now most of the practice management books say your practice is worth one year's gross income or two years' net income.

For example, let's say you are grossing $120,000 and netting $50,000. You will want to sell your practice for $110,000. At 16% interest over a five year period the yearly payment will be $32,040. A moderate home nowadays costs $70,000 and at 17% interest with 5% down that comes to $11,000 in payments per year. What does the young O.D. have left over at the end of the year? He has $70,000 and by the time he gets done with groceries, medical expenses, and taxes he's in the hole.

Now if you take in an associate four or five years before you retire he can start paying you out earlier and decrease that big chunk at the end. Besides, you will have that money to hide in your pension plan or invest in whatever you wish. It helps the both of you in the short run and in the long run he will be able to afford to buy your practice. But if you have not left any good will, due to death or abandonment, what is your practice worth? That is, if it can be sold?

I guarantee you that at least 25% of your patients will not return to your office, and usually the percentage is higher. If you deduct 25% of your gross, your practice is probably now worth $70,000 or $75,000, provided someone buys it soon after you die. If it takes six or eight months to sell, it really is almost worthless.

Now I know what you are thinking, "None of this applies to me because I am from a smaller city or town." Perhaps you are even the only eye doctor in town. However, think a moment, how many of your patients come to you from across the city or from the next town up the way that has an eye doctor? They won't come anymore, not if you haven't passed on the good will. And, if you are the only eye doctor in town and you feel you have got a monopoly, why would a young graduate even want to pay you for your practice? All he has to do is open up across the street and take over the monopoly himself. This leaves your spouse holding a major portion of your estate that has just become worthless. He is in demand, and you are in the ground.

So start thinking about taking in an associate now, not when you have passed away or are ready to retire. You have put years into building

your practice. Don't let it die when you leave.

There have been four wonderful and dedicated O.D.'s who have passed away this year in Georgia. One of them had an associate and his widow is getting paid for his years of service. The other three had no associates and as of yet no one has bought their practices. As I have said, the longer that their practices sit the less that they are worth.

Get a young O.D. into your practice. Get him in on a part time basis if that's all you can comfortably handle. Let him work the periods when you are not normally there; for example, on Saturdays or in the evenings. Have him build your practice in areas of care that you don't cover or are not secure in.

For instance, it costs about $500 to satisfactorily equip a visual therapy room. You all see at least one strabismic a month and at least one amblyope. How many of you question the parents of the children you examine to see how well their kids are doing in school? If you did, you would end up finding two children a month with perceptual motor problems. In this way within a three month period you could have twelve or fifteen training patients in your office. This would pay for an associate's salary for a day.

Notice I said a day, not a week. You don't have to have a full time associate. Get together with three or four O.D.'s in the area and find the young O.D. some work. Explain to your new associate that your practice is not large enough to support two full time people. He is going to have to beat the bushes to create his own niche and expand the practice to fit him.

If he is working in your practice even part time he is garnering your good will. Hopefully, in a few years your associate will have generated a large enough practice to be full time, especially if you are looking to cut down on the amount of time you spend at the office. At least if you have an associate in your office, even if it is only one day a week, and your health should fail, you do have someone who has your good will. He can carry on the maintenance of your practice smoothly and possibly purchase it while it still has its full value.

Another item you are concerned about is equipment. You can furnish a lane for $6,000-$7,000 with good used equipment, and equipment is an investment nowadays. Considering investment tax credit, depreciation, and resale value you have made a good investment whether or not your associate works out. You can't lose. As a matter of fact, if your associate does work out you will sell the equipment to him.

The point is, don't let your practice die. There are ways to get an associate in the door. The few dollars you are going to spend is going to put a lot more money in your pocket when the practice is sold.

Young O.D.'s have been told throughout school that it will be tough to make it out there. Therefore, most of them are willing to try to work along with you if you show you are trying to work along with them. Give the young a chance. After getting out of school with an accumulation of $20,000 in loans it is almost impossible to borrow another $50,000 to set up a new office and make ends meet. That only leaves them one place to go. Commercial.

If you wish to see optometry run the same course as pharmacy, die with your practice. If you want to see private practice survive, take in an associate.

CAO TRAFFIC LIGHT VISIBILITY SURVEY

As the representative of the CAO on the Roads and Transportation Association of Canada, I have undertaken a study of the visibility of arrows used in traffic lights. These traffic light arrows are available in many patterns but the most common ones indicate one direction per signal unit. These arrows may be displayed with red or amber lights or may be displayed alone. One signal light may consist of a solid red, solid amber, and solid green lights along with one or more of the following: an arrow pointing to the right; an arrow pointing to the left; an arrow pointing up (indicating straight ahead movement).

The initial phase of my study is to determine whether or not a problem exists among drivers in determining the direction indicated by the arrow(s). With this in mind, I am soliciting your assistance by answering a couple of questions below. You may, if you wish, provide further assistance by spending a four-week period keeping more precise statistics of those who present themselves with a complaint of difficulty with the traffic lights (Please do not ask patients if they have problems with the arrows; wait for them to mention the problem).

Your co-operation is much appreciated.

1. *Within an average month, approximately how many patients have volunteered information that they have difficulty determining the direction indicated by traffic light arrows:*
   - *a. no patients*
   - *b. 1- 5 patients*
   - *c. 6-10 patients*
   - *d. 11-15 patients*
   - *e. 16-20 patients*
   - *f. 21 or more patients*
   - *g. unable to answer (i.e. no arrows in community, or unaware of a problem with arrows)*
2. *Of those patients noted in 1. (above), approximately what percentage would you say present themselves to you with acuity of $^{20}/_{40}$ or better (i.e. acuity measured as the patient is normally driving* before *any correction you may prescribe).*
3. *City, municipality, or location of your main office (i.e. where the majority of your patients are seen).*
4. *(Optional) Name and Address.*

Please forward all replies, within 60 days, to:

Dr. Steven Mintz
212A Regent Ave. W.
WINNIPEG, Manitoba
R2C 9Z9

TRAFFIC LIGHT SURVEY

Please check the appropriate answer for questions 1, 2, and 3. Question 4 is optional.

1. (a) no patients ——
   (b) 1– 5 patients ——
   (c) 6–10 patients ——
   (d) 11–15 patients ——
   (e) 16–20 patients ——
   (f) 21 or more patients ——
   (g) unable to answer ——

2. (a) 0– 25 % ——
   (b) 26– 50 % ——
   (c) 51– 75 % ——
   (d) 76–100 % ——
   (e) unable to answer ——

3. City or municipality of main office

   _____

   Approx. no. of patients per mo. ——

4. (Optional)
   Name & Address

   _____

   _____

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- ☐ A diagnostic set.

- ☐ Have a sales representative call.
- ☐ Send me the most advantageous plan for my current volume.

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Chemical Components of Contact Lens Solutions

V.J. Lum*
W.M. Lyle†

With the myriad of contact lens solutions on the market today, it becomes difficult to choose the appropriate contact lens system for the patient. Three major factors to be considered in the choice are safety, efficacy and cost. To determine the efficacy of a solution, an understanding of its components is required. Unfortunately, certain manufacturers are unwilling to disclose their formulations. The authors encourage practitioners not to use such solutions. Most manufacturers, however, do list the active ingredients.

Most solutions contain more than 95% purified water. Small quantities of preservatives, wetting agents, viscosity building agents, buffers, surfactants, cleaning agents and disinfecting agents are added to give the solutions different functions. These basic components are used time and again in various combinations and concentrations to make up new solutions. Each component will be discussed with respect to known efficacy and potential to cause adverse effects. It should be noted, however, that individual patient characteristics also play a factor in determining efficacy and safety.

With long term contact lens patients, cost may be an important factor in choosing the right solutions. This will also be discussed. Appendices I and II summarize the commercially available contact lens solutions in Canada, their components and approximate retail cost.

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This study was made possible by a grant from the Canadian Optometric Education Trust Fund and was carried out at the School of Optometry, University of Waterloo.

PRESERVATIVES

Preservatives in contact lens solutions are to provide protection against chance contamination. Current evaluation of the antimicrobial activity of preservative systems, apart from manufacturers' studies have yielded conflicting results because of the lack of standardization in testing techniques.[1] More in-field evaluations of contact lens solutions are required to fully elucidate the effectiveness of preservative systems. However, the antibacterial effect of the individual components have been well documented. Benzalkonium chloride, alkyltriethanol ammonium chloride organomercurials, chlorhexidine, ethylenediaminetetra-acetate (EDTA) and its salts, sorbic acid and chlorobutanol are the usual preservatives in contact lens solutions at present. Other antibacterials used for disinfecting and cleaning lenses such as isopropyl alcohol, iodine and hydrogen peroxide are discussed in a later section.

Benzalkonium Chloride (BAK)

BAK is an antibacterial agent effective against both gram-positive and gram-negative bacteria. Its mechanism of action includes surface activity on living cell surfaces and interference with respiration and glycolysis of the organism.[2,3] The concentration of this preservative is especially important in determining its efficacy and safety in the eye. Too high a concentration may be injurious to the corneal and conjunctival epithelium and too weak a concentration may be ineffective in providing a germicidal effect.[4,5] The effect of BAK is cumulative; a single application may be well tolerated, but the second or third may produce irritation. Solutions of 0.02% are apparently well tolerated even when used three or four times daily.[6,7] BAK should not be used in soft lens solutions because of adsorption by the HEMA polymer and subsequent rapid release of the preservative causing ocular tissue damage. BAK is also adsorbed by CAB lenses but its clinical significance has not yet been determined.[8-11]

A 0.01% solution of BAK has been shown to be effective even against resistant strains of pseudomonas if given sufficient time.[12] However, its germicidal activity at that concentration is rather slow. Other antibacterial agents should be used in combination to enhance its effect.

BAK is also a cationic surfactant and can be used for its cleaning properties. Because of its ionic nature, many drug interactions are possible. BAK is incompatible with nitrate, thimerosal in certain concentrations, salicylate, fluorescein solutions, some local anesthetics and sulfonamides.[13] The bactericidal activity is also reduced in the presence of cotton, methycellulose, soaps, metallic ions and rubber.[6,14] Thus contact lens cases should be thoroughly rinsed of soap and rubber ring case liners should be avoided if optimum activity of BAK is to be obtained.

BAK is employed at minimum concentration in wetting solutions because it can decrease the wetting properties of polyvinyl alcohol. Conversely, polyvinyl alcohol can decrease the preservative activity of BAK.[15,16] Thus, wetting solutions for hard lenses are generally poor antibacterials. BAK can also enhance the transcorneal penetration of drugs.[13,17] Both EDTA and chlorobutanol are synergistic with BAK; the BAK/EDTA combination being the best system available at this time

in polymethyl methacrylate contact lens solutions.

Adverse ocular reactions to even low concentrations of BAK are not uncommon. Most damage is fairly superficial (i.e. epithelial damage, conjunctivitis or disruption of the pre-corneal tear film) and is reversible after the drug is discontinued. However, punctuate keratitis, loss of endothelium, permanent vascular changes and corneal edema have been reported.[7,17,18] As well, retardation of epithelial regeneration can occur with the use of BAK[19].

Organomercurials

The two most commonly used organomercurials are thimerosal and phenylmercuric nitrate. These agents are primarily bacteriostatic and fungistatic but they have a notoriously slow rate of kill.[20-22] They act through the sustained release of the mercurial ion which penetrates into the bacterial cell and combines with the sulfhydryl groups of respiratory enzymes to inhibit metabolism.[23] Pseudomonas organisms can survive exposure to a 0.04% solution for longer than one week. The mercurial ion may also bind to other tissues such as the conjunctiva, cornea, and tear proteins so that it becomes unavailable to the microorganism.[6,22,23] Mercurial deposits are seen around blood vessels near the cornea, in the periphery of Descemet's membrane and possibly on the crystalline lens around the pupillary area.[17] However, mercurialentis has not been seen with thimerosal at concentrations of 0.005%.[17,26] Organomercurials are generally used at concentrations of 0.002% to 0.004%. The maximum concentration of thimerosal for use in the eye is 0.01% and that of phenylmercuric nitrate is 0.004%.

Thimerosal, a basic salt, can be inactivated by corneal fluids and must be used in neutral or slightly alkaline conditions. At a pH greater than 5.0, thimerosal does not bind to polyHEMA lenses.[11,27,28] Most soaking solutions are manufactured between pH 6-8. Phenylmercuric nitrate is not precipitated in an acid pH. However, phenylmercuric nitrate binds to soft lenses and is readily precipitated by halide ions.[29,30] Both agents are said to be incompatible with rose bengal and with BAK in certain concentrations.[14] Both agents are also reported to be inhibited by EDTA and are inactivated by rubber.[6,15,31,32] The effectiveness of the thimerosal and alkyl triethanol ammonium chloride combination is still controversial.[33,34]

Most adverse effects to the organomercurials are allergic. Chemosis, keratitis, conjunctival hyperemia, burning and irritation have been reported. Most of these adverse reactions are reversible upon discontinuance of these agents.[17,18,26] However, most reactions to combinations of organomercurials and E.D.T.A. solutions are probably toxic.

Chlorhexidine

Chlorhexidine is one of a number of biguanides with potent antiseptic activity. Chlorhexidine is effective against both gram-positive and gram-negative organisms although it is somewhat less effective against the latter. A solution of 0.005% was found to be bacteriostatic to both *Pseudomonas pyocyanea* and *Staphylococcus aureus*.[35] The agent disrupts the plasma membrane of the bacterial cell and is most potent at neutral or alkaline pH.[23,25] Chlorhexidine is a more effective germicide than thimerosal. However, at low concentrations (e.g. 0.005%) the clinical effectiveness of chlorhexidine is variable. Optimal activity is obtained when used in combination with thimerosal and EDTA, but soaking or disinfecting requires a minimum of four hours, preferably more (i.e. overnight).[36-39]

Chlorhexidine binds strongly to polyHEMA lenses especially in the presence of other adjuvants such as electrolyte or hydrophilic polymers.[11] However, its binding capacity is about one sixth that of BAK and a large percentage is absorbed by tear proteins which subsequently flow from the eyes via the canaliculi.[10,40-26]. Protein can also sequester and increase the concentration of chlorhexidine in a lens. Thus it is important to remove protein deposits regularly before soaking in chlorhexidine. Reports indicate that chlorhexidine can eventually cause lens filming, yellowing and decreased wettability.[37,42]

Chlorhexidine is incompatible with soaps, other anionic materials and fluorescein solutions. Cork, starch, magnesium, zinc and calcium compounds inactivate chlorhexidine.[23,35] Chlorhexidine is incompatible with many anions.[14]

With extended contact time, solutions of 0.005% appear noncytotoxic to eye tissues. However, skin sensitivities, eye discomfort and irritation of the conjunctiva have been reported. Direct instillation may cause circumcorneal injection and conjunctivitis.[19,23,40]

Chlorobutanol or chlorbutol

Chlorobutanol is used in only two contact lens solutions; Blink n Clean and Soquette. It is a volatile, relatively insoluble, slow-acting bactericide which has no advantages over BAK. Because of its volatility, exposed solutions may fall below effective concentrations.[41,42] It is also susceptible to thermal decomposition and cannot be autoclaved.[35] At concentrations greater than 0.35% chlorobutanol is bacteriostatic against both gram-negative and gram-positive bacteria. It also inhibits fungi and pseudomonas. It is bactericidal only when exposure is prolonged for more than 24 hours.[11] Chlorobutanol is effective only after it permeates into the bacterial cell. It is converted to an epitoxoid by the bacterium and thereby becomes lethal to the organism.[7,13]

Chlorobutanol is synergistic with phenols and quaternaries such as BAK, but it can only be used in solutions having a pH of less than 6 because of chemical breakdown to hydrochloric acid and other hydrocarbons (eg. carbon monoxide and acetone).[12,47,48] The use of chlorobutanol in Blink n Clean and Soquette is not appropriate since these

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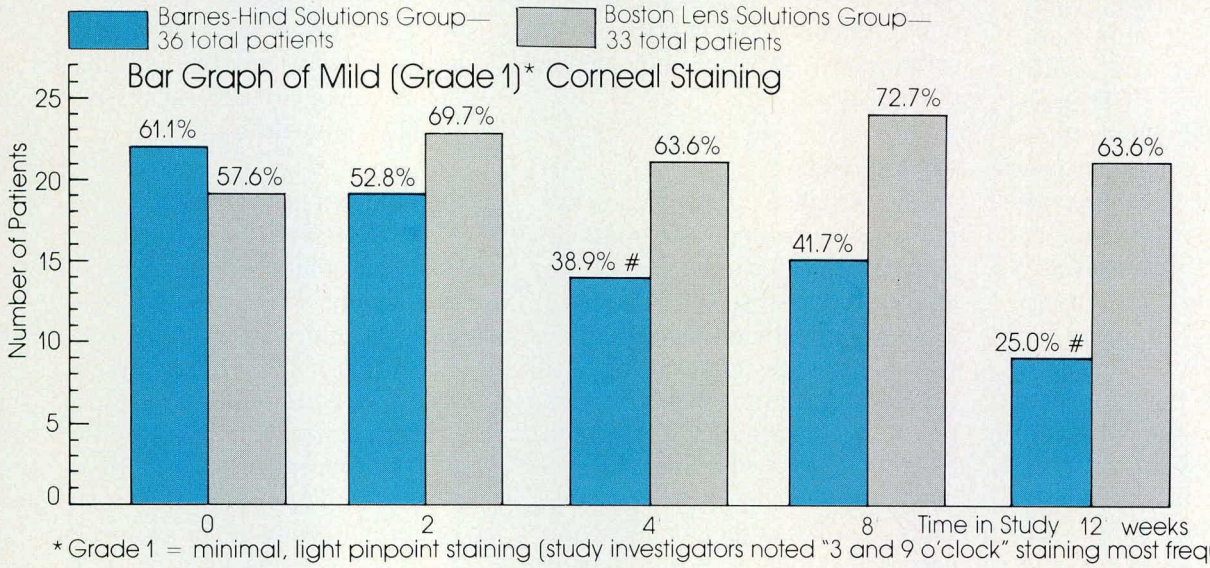

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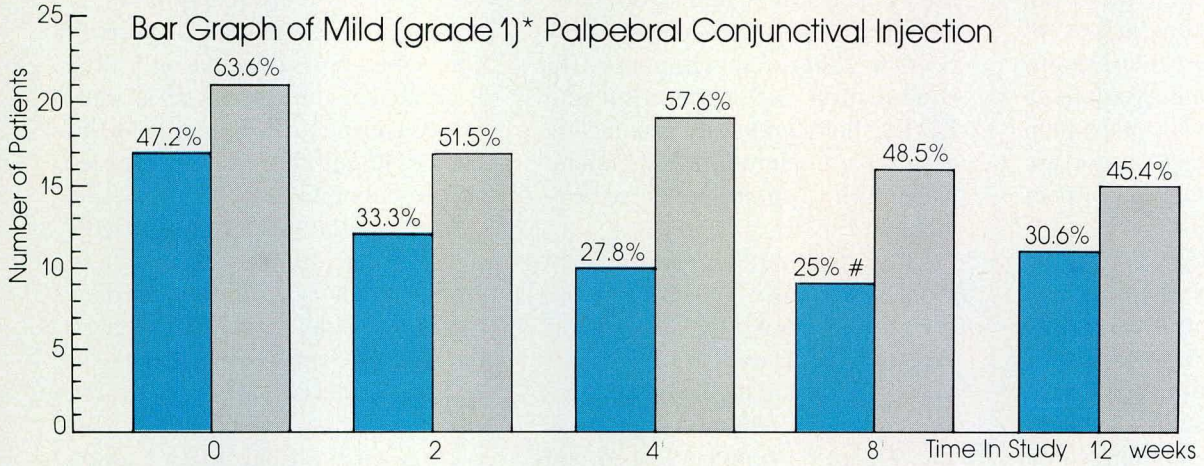

*Grade 1 = mild, diffuse injection.
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solutions are manufactured at pH's greater than 7. The pharmacologic activity of ophthalmic medications is not reduced by chlorobutanol.

Prolonged contact with chlorobutanol solutions may cause epithelial damage to the cornea lasting several hours. Biochemical studies indicate that chlorobutanol inhibits oxygen utilization by the cornea and reduces epithelial adhesion to the basement membrane.[13,19]

Alkyltriethanolammonium Chloride (AKTAC)

AKTAC, like BAK is a quaternary ammonium compound. It acts as an antimicrobial agent, and a surfactant. However, its antimicrobial effects outweigh its surfactant property. The disinfecting action reported by the manufacturer is slow but effective.[14] A 0.03% solution of AKTAC was found to alter the physical parameters of a hydrogel lens by only a small amount over a period of 365 days. The water content of the lens increased by 9.0% and the refractive index decreased by 0.3%. These changes were found to be reversable upon saline soaking. Absorption of AKTAC into the lens matrix was minimal (solid/solution = 0.05 to 0.70)[37]

With respect to toxicity a 0.03% solution of AKTAC alone will cause corneal erosion in less than 6 hours. However, in formulation, no detectable corneal problems arise in greater than 180 days. AKTAC is apparently complexed or bound when in soaking solutions, thus minimizing toxic effects to the eye.

Cetylpyridinium chloride

This cationic disinfectant resembles cetrimide and might cause sensitivity reactions.[21] Concentrations should be between 0.001% and 0.01%.

Sorbic Acid

Sorbic acid is an antibacterial and antifungal agent. It is active against moulds and yeasts and to a lesser degree against bacteria. Sorbic acid is most effective at a pH of 4.5 and is not effective at a pH greater than 6.5. The use of sorbic acid in wetting and soaking solutions is not justified since the pH of these solutions is about 7. Its fungistatic activity is increased by the addition of acids and sodium chloride. It is effective as a preservative at concentrations of 0.1% to 0.2%.[3,23]

The concentration of sorbic acid in a polyHEMA lens is minimal and it diffuses freely from the lens to the surrounding fluid.[9] It is compatible with nonionic surfactants and is relatively nontoxic. However, irritation of the eyes and allergic dermatitis have been reported.[23]

EDTA and its salts

Ethylenediaminetetra-acetate is an antimicrobial agent which disrupts the integrity of bacterial cell walls by a detergent action.[12,37] It enhances the activity of BAK, chlorobutanol, chlorhexidine and thimerosal by chelating divalent calcium and magnesium ions which compete with preservatives for sites on the organism.[37,43,49] Some reports indicate that EDTA can antagonize the action of thiomersalate.[14] EDTA can also remove superficial calcium deposits from the eye at a concentration of 0.35% to 1.85%[50] As well, it possesses a weak buffering capacity[3] at pH 6 to 8. The salts of edetate, disodium edetate and trisodium edetate differ somewhat in solubility but do not differ significantly in capacity to chelate deposits.

Irrigation of the human cornea for periods of 15 to 20 min with a 0.01M solution of sodium edetate at pH 8.0 does not cause recognizable ocular damage.[13] However, conjunctival chemosis, hyperemia and irritation are possible and edema of the corneal stroma has been reported.[18,26] As a preservative the usual concentration of EDTA is between 0.01% and 0.1%.[12]

Wetting and Viscosity Agents

Wetting is an important phenomenon in the use of hard contact lenses. A wetting agent aids the spreading of a liquid over a solid surface by lowering the interfacial contact angle. The contact angle is the angle between a liquid droplet and the surface over which it spreads. An angle of zero degrees signifies complete wetting and an angle of 180 degrees signifies lack of wetting. Wetting agents are colloidal surfactant molecules of irregular shape with polar and non-polar groups. With a hydrophobic solid such as a contact lens, the wetting agent adsorbs onto the surface such that the polar groups face the liquid making the surface appear more hydrophilic.[3,51,52] The critical surface tension of PMMA is 39 dynes/cm. Commercial plastics may have other additives which bring the critical surface tension up to about 41 to 42 dynes/cm. To obtain maximum wetting of the plastic, a contact lens solution must have a surface tension of less than 39 dynes/cm.[3,46]

Soaking solutions commonly contain the same preservatives as wetting solutions but the concentration may be greater in the soaking solution.

The human tear film is an amazing fluid. It wets and hydrates the cornea, provides an optically smooth curved surface, provides a source of nutrients, has buffering capacity and antibacterial activity. The probable wetting agent in the tear film is sialomucin, a high molecular weight glyco-protein. This is secreted by the goblet cells and is spread over the cornea by the blinking action of the lids. The surface tension of mucin is 38 dynes / cm and it is an excellent wetting agent for PMMA, provided lipid (i.e. meibomian gland secretions and sebum) is not coating the lens.[53] Some feel that the tears are such good wetting agents that a wetting solution is not required while others feel that wetting solutions may lessen the symptoms of some patients who suffer from an overproduction of lipids which disrupt the mucoid layer.[54-57]

The three most commonly used wetting agents are polyvinyl alcohol (PVA), polyvinyl pyrrolidone (povidone or PVP) and adsorbobase povidone. These are all synthetic polymers which have lipophilic and

hydrophilic groups. They mimic the action of mucin by orientation of the lipophilic group towards the contact lens and the hydrophilic group towards the tear film.[51]

A 1.4% solution of PVA has a surface tension of 47 dynes/cm. Commercially available solutions have lower surface tension due to the presence of other surfactants such as BAK and the use of partially acetylated PVA. The higher the residual acetate, the greater the surface activity. However, in alkaline pH, this form of PVA can decompose into polyvinyl alcohol and acetic acid which irritates the eyes. Thus many wetting solutions are adjusted to a pH between 5 and 6.[16,53,58,60] PVA also has some viscosity building effect and unlike some viscosity agents (e.g. methylcellulose) does not retard the regeneration of the corneal epithelium.[12]

A 1% solution of PVP has a surface tension of 68 dynes/cm. The presence of PVP is reported to greatly reduce the chemical binding characteristics of the soft lens without reducing antibacterial activity.[11,61-63] However, its wetting capacity is less than that of PVA.

Adsorbobase povidone is a product of Alcon/BP. The exact structure has not been released for proprietary reasons. This polymer has mucomimetic properties and is capable of forming a hydrophilic coating on solids. However, it has very little surface activity. The surface tension of Adapt is 53 dynes/cm.[53,58,59]

The effect of wetting agents is not long lasting; generally about 5 to 15 min. They aid in reducing the foreign body sensation on insertion of the lens. They are fairly inert chemicals but may slightly retard healing of the corneal epithelium, and may reduce excess mucus on some eyes.[26,56] Allergic reactions to PVA have been reported.[18,63]

Viscosity building agents are large colloidal molecules dispersed in a liquid to give greater resistance to flow. This imparts a cushioning effect which acts as a shock absorber and a lubricant between the lens and the eyelid and the lens and the cornea. These agents are indicated when the tear film is thin and easily disrupted. Use of viscosity agents in soaking solutions is not recommended since the diffusion of lens contaminants into the solution is retarded.[57,65]

The two most commonly used viscosity agents are methylcellulose and hydroxyethylcellulose. Thixotropic gels may be used as vehicles for cleaning agents. Thixotropy refers to the ability of some gels to decrease in viscosity upon agitation.

Methylcellulose is a long-chain cellulose polymer in which, on an average, two hydroxyl groups in each hexose unit have been methylated. By varying the length of the polymer chain, wide variations of thickening capacity have been obtained. The viscosity range is from 10 to 15,000 centipoises (soft gel) for 2% solutions.[60,66] Methylcellulose is nonionic and therefore stable over a wide pH range. There is practically no limit on the alkaline side (stable to pH 12), but on the acid side (below pH 2) the viscosity drops. Temperatures greater than 50°C cause precipitation of the macromolecule in water.[66]

Methylcellulose is nearly inert chemically and is entirely compatible with the drugs commonly used topically on the eye. Methylcellulose will form complexes with most of the hydroxybenzoates.[21] Growth of micro-organisms is not supported by methylcellulose.

Hydroxyethylcellulose is another synthetically modified cellulose, in which the hydroxyethyl group is the substituent. Like methylcellulose, it is nonionic and water soluble. Various viscosity grades can be obtained by varying the chain length. The viscosity dispersions in water are unaffected by pH variations between 5 and 10. Unlike methylcellulose, hydroxyethylcellulose is not precipitated from water by elevated temperature.[66]

Adverse effects of the cellulose derivatives are few although granulation on the eyelids and conjunctiva is possible under dry conditions. Corneal edema has also been reported to occur with the instillation of methylcellulose.[16,43]

Buffers

Buffers are compounds or mixtures in solution which resist changes in pH upon the addition of small quantities of acid or alkali. The magnitude of the resistance of a buffer to pH changes is referred to as the buffer capacity and depends on the amount and type of buffer added.[3,51]

Buffers are used in contact lens solutions to stabilize the components and improve comfort on instillation. Normal tears have a pH of 7.4 to 8.0 and possess a high buffering capacity due to their protein constituents.[67] The instillation of one or two drops of solution into the eye stimulates the flow of tears and the rapid neutralization of any excess hydrogen or hydroxyl ions within the capacity of the tears.[46,67] In general, solutions of pH 6 to 8 can be readily tolerated.[46,67,68] Thus, solutions which are acidic or alkaline (to insure ingredient stability) should be unbuffered or minimally buffered such that rapid neutralization by the tears can occur upon instillation.[16,60]

The following buffers are used in contact lens solutions at present: sodium carbonate, boric acid, sodium borate, sodium citrate, EDTA salts, potassium bicarbonate, sodium bicarbonate, sodium phosphate and disodium phosphate. Most of these buffers have only weak buffering capacity. Buffers can also be used along with sodium chloride to make solutions isotonic. The disodium phosphate and sodium phosphate system has the greatest buffering capacity and provides a choice of pH ranging from 5.9 to 8.0.[3,67] However, one author advocates the use of a borate buffer system on the basis of patient acceptance.[5]

Irrigation of rabbit eyes with weak buffer solutions showed no corneal damage. Only when these solutions are excessively alkaline or acidic can corneal damage occur.[26] A clear solution of borate buffers will react

with PVA forming a gummy precipitate. Thus mixing of solutions with these components is not recommended.[5,16,160]

CLEANING AND DISINFECTING AGENTS

Surfactants

Surfactants or surface active agents are composed of molecules with polar and nonpolar groups. Like polymers they can also lower interface tension. They exert a cleaning action by solubilizing unwanted particles through micelle formation. Micelles are aggregations of 50 to 150 single surfactant molecules oriented in a near spherical structure such that the polar groups are oriented towards the water while the nonpolar groups are oriented in toward one another. The daily accumulated residue of oil and sebaceous deposits on contact lenses become entrapped in the nonpolar centres of the micelle and thus become solubilized. The effectiveness of the surfactant depends on the degree of polarity of the groups.[51] Physically rubbing the lens helps to loosen the particles and rinsing frees the lens of the surfactant and solubolized deposits. Surfactant based cleaning products will effectively retard deposit formations if used vigorously and regularly but are incapable of removing previously formed deposits.[69-71] Adequate cleaning of lenses facilitates disinfection of the lens and helps to prevent accumulation of deposits on the lens surface.

The classification of surfactants is arbitrary, but one based on chemical structure is most popular in the pharmaceutical industry. The major polar groups found in most surfactants are (1) anionic (negatively charged) (2) cationic (positively charged) (3) amphoteric (positively and negatively charged) and (4) nonionic (no charge). Only anionic and nonionic surfactants are listed in the presently available contact lens solutions.

Anionic surfactants such as sodium lauryl sulfate react with cations such as calcium, magnesium and BAK by forming precipitates; thus their effect may be limited in hard water which is high in ion content. As well, solutions containing BAK should not be used in conjunction with these surfactants. Generally anionic surfactants are less stable than nonionic surfactants.[3,16,43]

Nonionic surfactants such as poloxamer 407 are advantageous with respect to compatability, stability and potential toxicity. There is a wide range of choices and they generally function quite well as cleaners.[3]

Because cleaning of the lens is performed while the lenses are off the eye it is possible to employ somewhat stronger agents than would be safe directly on the eye. Surfactant solutions should be thoroughly rinsed from the contact lens and hands since chemical keratoconjunctivitis, stinging, allergic reactions, conjunctival hyperemia, eyelid edema and injection can occur. As well, a surfactant residue may produce a permanent coating on the lens if the lens is subjected to repeated heat disinfection treatment.[18]

Enzyme Cleaners

Papain is a proteolytic enzyme derived from the fruit of the tropical melon tree, *Carica papaya*. The enzyme exhibits broad spectrum specificity. Peptides, amides, esters and thioesters are all susceptible to papain-catalyzed hydrolysis.[3] Papain has no deleterious effects on the lens polymeric matrix and is effective in retarding the formation of protein deposits and removing some previously formed protein deposits.[68-76] Papain may be more effective when used with heat disinfection.[77] This occurs because the enzyme attacks denatured protein more readily and the heat (temperatures from 40-60°C) denatures protein more easily than chemical disinfectants. Papain is ineffective against lipid, lipid-protein complexes and non-proteinaceous deposits.[24]

Papain can adsorb onto HEMA lenses and cause adverse ocular responses. Burning, pain, photophobia, conjunctival hyperemia, punctate keratitis, corneal edema, giant papillary conjunctivitis, and chemosis have all been reported. Thus thorough rinsing of the lens after enzyme cleaning is important.[16,18]

Isopropyl Alcohol

Isopropyl alcohol is a disinfectant and solvent. As a cleaning agent, it solubolizes lipid and proteinaceous build-ups[78,79] It is compatible with both hard and soft lenses but adsorbed into soft lenses. Thus the solution must be thoroughly washed out and the lens soaked in saline to remove residual isopropyl alcohol. Severe burning and corneal epithelial damage is possible if isopropyl alcohol is allowed to contact the eye.

Hydrogen Peroxide

Hydrogen peroxide acts as a germicide which is active by the release of nascent oxygen. It is a very short acting compound for the reason that this release occurs rapidly. The effervescence caused by the release of oxygen affords a secondary mechanical means for the removal of debris from the matrix of the soft lens.[3,78] Lens expansion helps to crack deposits. Thus, the removal of proteinaceous build-up can be facilitated by hydrogen peroxide. Cleaning the lens with a surfactant, followed by thorough rinsing and then ten (10) minutes of soaking in 3% hydrogen peroxide, disinfects the lens.

Hydrogen peroxide is decomposed by practically all organic matter and other reducing agents. Light accelerates its decomposition.[3,23] However, decomposition to water and oxygen by a catalyst (Septicon Disc) is important in reducing the concentration of the peroxide in the lens to an ocularly acceptable level. A severe burning sensation will be experienced if hydrogen peroxide comes into contact with the eye. However, according to Gasset et al. instilling 3% hydrogen peroxide into the eyes three times a day for 5

days did not initiate any damage.[80] Reports concerning the effect of hydrogen peroxide on contact lens integrity vary. Some authors report no increased rate of deterioration while others indicate there is gradual deterioration.[81]

Iodine

Elemental iodine in the form of solutions is widely used as a germicide and fungicide. Unfortunately, in aqueous solutions it is ineffective against spores.[3,78] When iodine is solubilized in the presence of surface active agents it is known as an iodophor.[82] Only a few drops of an iodophor solution are required to disinfect a lens. A slow acting (2 to 4 hours) neutralizing solution must also be added to reduce the iodine to the iodine ion.[70,78] There is a potential for iodophors to stain high water content lenses.[38,83] Iodine vapors can irritate and stain the corneal epithelium. If inadvertently instilled into the eye the corneal epithelium will slough off and the eye will be temporarily painful and inflamed.[26]

Improper methods

Patients should be warned not to attempt lens cleaning or disinfection by use of unauthorized methods. Some have used toothpaste, laundry detergents, dishwater detergents, hair shampoo, and skin cleansers with harmful effects on the eyes and on the lenses.

COST

Regular lens cleaning and changing of storage solutions is very important in obtaining optimum results in the care of contact lenses. However, compliance to the proper use of solutions may be hindered because of high costs. The cheaper solutions are not necessarily the best to recommend, but selecting a care system of lower cost could help to persuade the patient to carry out proper lens hygiene.

Many solutions are completely interchangeable; they have the same constituents, in the same concentrations, and may even be manufactured by the same plant. Yet the cost difference between interchangeable solutions may be as much as $2.50 per bottle. Table I summarizes the solutions which are interchangeable.

The suggested retail costs as of July 1981 from Drug Trading Company, a major pharmaceutical wholesaler in Ontario, are tabulated in the appendices. The exact pricing of products may vary from pharmacy to pharmacy, but the suggested retail costs are used as a guide. The costs were calculated assuming use of the solutions in the largest available sized container. The estimates used in determining cost are listed in Table 2.

Conclusions:

The components of the contact lens solution determine its effectivity, its reactivity with other solutions or materials and potential to cause adverse ocular reactions. Careful consideration of the components and cost of the contact lens solution is suggested before selecting the care system for the patient.

TABLE I (Interchangeable Products)

Hydrocare Tablets	*	Soflens Cleaning Tablets
Hydrocare Cleaning and Soaking Solution	*	Soflens Soaking Solution
Allergan Saline Solution	*	B & L Saline Solution
Hydron Comfort Drops	*	Hydrosol
Hydron Cleaning Solution	*	Hydroclean
Hydron Soaking Solution	*	Hydrosoak
B & L Daily Cleaner	*	Preflex
B & L Lens Lubricant	*	Adapettes
Flexcare	*	Normol

* interchangeable with

TABLE 2 (Estimates for Cost)

Products	Volume/period of time
Lubricant and rewetting drops	3 ml/week
Cleaning solutions	4 ml/week
Wetting solutions	3 ml/week
Soaking solutions	5 ml/week
Gel cleaners	1.75 g/week
Heat disinfecting solutions	5 ml/day
Salt tablets	30 tab/month
Rinsing solutions	4 ml/week
Hydrogen peroxide	7.2 ml/day
Lensrins	14.4 ml/day
Enzyme cleaners	2 tab or packets/week

APPENDIX I

Hard Contact Lens Solutions

Product (Manufacturer)	Suggested Use	Wetting And Viscosity Agent	Preservative	Other	Approximate Cost/Mo.**
(1) Lubricating/Rewetting Solutions					
Adapettes (Alcon/BP)	rewetting	Povidone 1.67% water soluble polymers	thimerosal not exceeding 0.004% edetate disodium 0.1%	buffers unspec.	$3.18
Adapt (Alcon/BP)	preinsertion	adsorbobase povidone	thimerosal not exceeding 0.004% edetate disodium 0.1%		$3.10
Aquaflow (Cooper)	rewetting		benzalkonium chloride 0.0002%		$2.51
Blink n Clean (Allergan)	rewetting cleaning (within eye)	polyethylene glycol 300	chlorobutanol 0.5%	polyoxy 40 stearate buffers	$2.95
Comfort Drops (Hard) (B-H)	rewetting	wetting agents unspecified	benzalkonium chloride 0.005% edetate disodium 0.02%	nonionic surfactant	$2.67
(2) Cleaning Solutions					
Boston Lens Contact Lens Cleaner (Polymer Tech. Corp.)	cleaning			anionic sulfate surfactant	$1.17
Cleaning Solution Gas Permeable (B-H)	cleaning		thimerosal 0.004% edetate disodium 2.0%		$1.46
Clens (Alcon/BP)	cleaning		benzalkonium chloride 0.02% edetate disodium 0.1%	poloxane derivatives sodium phosphate	$1.01
D-Film Cleaning Gel (Cooper)	cleaning			nonionic detergent	$4.88
Gel-Clean (B-H)	cleaning			thixotropic gel - nonionic surfactants	$3.94

** *Based on Drug Trading Co. (Toronto) suggested retail cost to the patient as of July, 1981.*

Product (Manufacturer)	Suggested Use	Wetting And Viscosity Agent	Preservative	Other	Approximate Cost/Mo.
LC-65 Solution (Allergan)	cleaning		thimerosal 0.001% edetate disodium	buffering and stabilizing agents	$1.95
Titan (B-H)	cleaning	viscosity building agent unspec.	benzalkonium chloride disodium edetate	nonionic surfactant buffering agent	$1.54
(3) Wetting Solutions					
Hy-Flow (Cooper)	wetting	wetting agent unspecified	benzalkonium chloride 0.01% edetate sodium	mildly hypertonic	$0.97
Liquifilm Wetting Solution (Allergan)	wetting	polyvinyl alcohol methylcellulose	benzalkonium chloride 0.004% edetate disodium	NaCl KCl	$0.72
Wetting Solution (B-H)	wetting	polyvinyl alcohol	benzalkonium chloride 0.004% edetate disodium 0.02%		$0.68
(4) Soaking Solution					
Soquette (B-H)	soaking	polyvinyl alcohol	benzalkonium chloride 0.01% chlorobutanol 0.4% disodium edetate 0.2%		$4.21
(5) Cleaning and Soaking Solutions					
Clean N Soak (Allergan)	cleaning soaking		pherylmercuric nitrate 0.004%	buffers	$5.61
Cleaning and Soaking Solution (B-H)	cleaning soaking		benzalkonium chloride 0.01% disodium edetate 0.2%	cleaning and buffer agents unspec.	$5.00
Duo-Flow (Cooper)	cleaning soaking		benzalkonium chloride 0.013% edetate sodium 0.25%		$6.33
(6) Wetting And Soaking Solutions					
Boston Lens Soaking and Wetting (Polymer Technology Corp.)	wetting soaking				$5.19

APPENDIX I *(cont'd)*

Product (Manufacturer)	Suggested Use	Wetting And Viscosity Agent	Preservative	Other	Approximate Cost/Mo.
Soaclens (Alcon/BP)	wetting soaking		thimerosal not exceeding 0.004% edetate disodium 0.1%	hydration factors	$5.02
Wetting and Soaking Solution Gas Permeable (B-H)	wetting soaking	wetting agent unspecified	thimerosal 0.002% chlorhexidine gluconate 0.003% edetate disodium 0.02%	isotonic buffered vehicle	$5.40
(7) Multifunction Solutions					
Lensine-5 (Cooper)	cleaning wetting soaking cushioning rewetting	polyvinyl alcohol hydroxyethyl-cellulose PEG 6000	benzalkonium chloride edetate disodium	poloxamer 407 NaCl KCl	$13.00
One Solution (B-H)	wetting cleaning soaking	wetting agent unspecified	benzalkonium chloride 0.01% edetate disodium 0.03%	isotonic, cleaning agent unspec.	$5.70
Total (Allergan)	wetting soaking cleaning	polyvinyl alcohol	benzalkonium chloride edetate disodium	buffers unspec. isotonic	$8.71

APPENDIX II

Soft Contact Lens Solutions

Product (Manufacturer)	Suggested Use	Wetting And Viscosity Agent	Preservatives	Other	Approximate Cost/Mo. **
(1) Lubricating/Rewetting Solutions					
Adapettes (Soft Lenses) Alcon/BP	rewetting	povidone 1.67%	thimerosal not exceeding 0.004% edetate disodium 0.1%	water soluble polymers buffers	$3.34
Clerz (Cooper)	rewetting		sorbic acid 0.1% edetate disodium 0.1%	poloxamer 407 Na Borate 0.2%	$2.87
Hydron Comfort Drops (Hydron)			thimerosal 0.0025% EDTA 0.1% chlorhexidine gluconate 0.0025%		$1.81

** *Based on Drug Trading Co. (Toronto) suggested retail cost to the patient as of July, 1981.*

Product (Manufacturer)	Suggested Use	Wetting And Viscosity Agent	Preservatives	Other	Approximate Cost/Mo.
Hydrosol (Contactisol Ltd.)	preinsertion wetting		thimerosal 0.0025% EDTA 0.1% chlorhexidine gluconate		$2.07
Soflens Lens Lubricant (B&L)	rewetting	povidone	thimerosal 0.004% edetate disodium 0.1%		$3.00
Soft Lens Comfort Drops (Alcon/BP)	rewetting		thimerosal 0.004% edetate disodium 0.1%	nonionic surfactant buffer	$2.83
(2) Cleaning Solutions					
Hydroclean (Contactisol Ltd.)	cleaning		thimerosal 0.0025% EDTA 0.1% chlorhexidine gluconate 0.0025%	surfactants unspecified	$2.81
Hydron Cleaning Solution (Hydron)	cleaning		thimerosal 0.0025% EDTA 0.1% chlorhexidine gluconate 0.0025%		$2.79
Lens Cleaner (Softcon)	cleaning		thimerosal 0.004% edetate disodium 0.1%	cleaning agent (unspecified)	$1.64
Mira Flow (Cooper)	cleaning		isopropyl alcohol 20%	detergent	$4.33
Pliagel (Cooper)	cleaning		sorbic acid 0.1% trisodium edetate 0.5%	poloxamer 1.5% unspecified surfactants	$2.81
Preflex (Alcon/BP)	cleaning	hydroxyethyl-cellulose polyvinyl alcohol	thimerosal 0.004% edetate disodium 0.2%	phosphate buffer NaCl, tyloxapol isotonic	$1.41
Soflens Daily Cleanser (B&L)	cleaning	hydroxyethyl-cellulose, poly-vinyl alcohol	thimerosal 0.004% edetate disodium 0.2%	Na Phosphate buffer, NaCl, isotonic, tyloxapol	$1.37
Softcon Lens Cleaner (Softcon)	cleaning		thimerosal 0.004%	isotonic	$2.20
Soft Lens Cleaning Solution (B-H)	cleaning		edetate disodium 0.2% thimerosal 0.004%	nonionic surfactant	$1.46

APPENDIX II *(cont'd)*

Product (Manufacturer)	Suggested Use	Wetting And Viscosity Agent	Preservatives	Other	Approximate Cost/Mo.
Soft Lens Weekly Cleaning Solution (B-H)	cleaning		thimerosal 0.001%	surfactants	$2.44
(3) Chemical Disinfecting Solutions					
Flexcare (Alcon/BP)	rinsing soaking disinfecting		thimerosal 0.001% edetate disodium 0.1% chlorhexidine 0.005%	Na Borate Boric Acid NaCl	$2.63
Flexsol (Alcon/BP)	storage disinfecting	adsorbo base povidone	thimerosal 0.001% edetate disodium 0.1% chlorhexidine 0.005%		$3.51
Hydrocare Cleaning & Soaking (Allergan)	soaking cleaning		thimerosal 0.002% alkyl ethanol ammonium chloride	surfactant in special polymer vehicle	$4.00
Hydron Soaking Solution (Hydron)	storage disinfecting		thimerosal 0.0025% EDTA 0.1% chlorhexidine gluconate 0.0025%		$3.94
Hydrosoak (Contactisol Ltd.)	storage rinsing sterilizing		thimerosal 0.0025% EDTA 0.1% chlorhexidine gluconate 0.0025%		$3.46
Normol (Alcon/BP)	rinsing		thimerosal 0.001% edetate disodium 0.1% chlorhexidine 0.005%	NaCl	$2.43
Permasol (Cooper)	storage wetting irrigation		sorbic acid 0.1% disodium edetate 0.1% thimerosal 0.001%	sodium borate 0.22% poloxamer 407	$4.55
Soflens Soaking Solution (B&L)	soaking		alkyl triethanol ammonium chloride thimerosal 0.002%	surfactants in a special polymer vehicle	$3.09
Soft Lens Rinsing & Storage (B-H)	rinsing storage		chlorhexidine gluconate 0.005% thimerosal 0.001% edetate disodium 0.2%	buffers unspec.	$2.86

Product (Manufacturer)	Suggested Use	Wetting And Viscosity Agent	Preservatives	Other	Approximate Cost/Mo.
(4) Thermal Disinfecting and Rinsing Products					
Alcon/BP Saline Solution	heat disinfecting rinsing storage		thimerosal 0.001% edetate disodium 0.1%	boric acid Na Borate NaCl 0.7%	$3.12
Allergan Saline Solution	heat disinfecting rinsing storage		thimerosal 0.001% edetate disodium	NaCl	$4.36
Aquaflex Tablets (Union Optics)	heat disinfecting			NaCl 270 mg./ tablet	$0.58
Barnes-Hind Saline Solution	heat disinfecting rinsing storage		thimerosal 0.001% edetate disodium 0.1%		$3.90
Bausch & Lomb Saline Solution	heat disinfecting rinsing storage		thimerosal 0.001% edetate disodium 0.1%	NaCl buffers unspec.	$4.42
Bausch & Lomb Salt Tablets	heat disinfecting			NaCl 250 mg./ tablet	$0.68
Boil N Soak (Alcon/BP)	heat disinfecting rinsing storage		thimerosal 0.001% edetate sodium 0.02%	boric acid Na Borate NaCl 0.7%	$4.78
Hydrocare preserved Saline (Allergan)	heat disinfecting rinsing storage		thimerosal 0.001% edetate disodium 0.01%	NaCl 0.85%	$4.36
Pliasol (Cooper)	heat disinfecting rinsing		sorbic acid 0.1% edetate disodium 0.1%	Na Borate 0.2%	$3.03
Soft Lens Buffered Tablets (B-H)			edetate disodium	buffers unspec. Na Bicarbonate NaCl 270 mg./ tablet	$0.65
(5) Enzyme Cleaners					
Clean-O-Gel (Alcon/BP)	protein remover			bacterial enzyme extract	$4.76
Hydrocare Tablets	protein remover			papain 10 mg.	$2.98
Soflens Cleaning Tablets	protein remover			papain	$2.60

APPENDIX II *(cont'd)*

Product (Manufacturer)	Suggested Use	Wetting And Viscosity Agent	Preservatives	Other	Approximate Cost/Mo.
(6) Disinfecting Systems					
Lensept (Softcon)	disinfecting		hydrogen Peroxide 3%		$2.76
Lensrins (Softcon)	rinsing		thimerosal 0.001% edetate disodium 0.1%	NaCl 0.85% buffers unspec.	$2.76
Septicon Disc (Softcon)	neutralizing hydrogen peroxide				$1.09
Pliacide (Cooper/Flow)	disinfecting		0.12% iodine		$4.79
Nutraflow (Cooper/Flow)	neutralizer for pliacide		sorbic acid 1 mg./ml edetate disodium 0.1%	Na Borate 0.2%	$5.55

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BOOK REVIEWS

HANDBOOK OF COMMUNITY HEALTH
By: Murray Grant
(Published by Lea & Febiger, Philadelphia, Pa., Third Edition, 1981)

This "introduction to the field" provides an excellent example of the expanding role of Community Health. The twenty-one brief chapters deal with a variety of subjects ranging from the construction of a septic tank in Chapter Seven (Environmental Factors in Disease Prevention) to atomic attack in Chapter Fifteen (Planning for Disaster). Chapters that are especially relevant to Optometry include: Four - Principles in the Prevention of Chronic Disease, Five - Geriatrics, Eight - Maternal and Child Health and Nineteen - Health Manpower. The entire book should be read as each Chapter is interesting.

The philosophy of Community Health is found in a single statement in Chapter Six, "From the perception of Community Health, it is important that services be *available* to people who *need* them and who can most *benefit* from them - and it is essential that the *quality* of these services be maintained and developed." Grant refers to primary care as fundamental and continuing care and the foundation of the health care system. For the optometrist who is concerned about the apparently new emphasis on primary care the following quote is pertinent, from Chapter Eighteen,

> "……the primary care physician has to decide what is potentially serious and what is minor; what has to be dealt with urgently and what can wait; what can be managed and what has to be referred to a specialist."

This is the role that optometrists fill in the field of eye care.

The only criticisms of the book involve style and inconsistency of terminology. The great jumps in topic between successive chapters were a little disconcerting at times and the book would definitely be improved if the chapters were grouped into appropriate sections. The author also switches from the use of the term "RUBELLA" to "GERMAN MEASLES" in Chapter Eight. The uniform use of "RUBELLA" would eliminate any possible source of confusion.

The author's purpose in writing this handbook was to whet the appetite of the reader to explore the subject in further depth. Another paperback that will aid in this pursuit is "Epidemiology and Statistics for the Ophthalmologist" by Alfred Sommer. Sommer only deals with the topics in the first two chapters of Grant's book but his many interesting examples should convince any doubters of the relevancy this subject has to Optometry.

A final quote from Grant, with respect to Optometrists, "The important role that this profession plays in community vision programs should not be overlooked." This book is recommended as a guide for helping us to see just where we fit in the complex world of Community Health.

Barbara E. Robinson, O.D., M.P.H.
Consultant
Public Health, Department of Health
New Brunswick

Atlas of External Diseases of the Eye- Cornea and Sclera, Vol. III; David D. Donaldson, The C.V. Mosby Co., Toronto, 2nd ed., 1980, 506 pp., with illus., $133.00, cloth.

This volume is the second edition of a series of atlases comprising external and anterior segments of the eye. The other texts comprising the series are: Congenital Anomalies and Systemic Diseases (Vol. I), Orbit, Lacrimal Apparatus, Eyelids, and Conjunctiva (Vol. II), Anterior Chamber, Iris, and Ciliary Body (Vol. IV), and Crystalline Lens, (Vol. V). The textbook is divided into two sections, the cornea and the sclera, and then subdivided into chapters based on etiology of external and anterior ocular disease. The author introduces each disease entity with a brief description and then proceeds to further discussion of selected clinical cases that are illustrated with black & white text figures and full-colour stereoscopic photographs that require a stereoviewer.

The clinical examples presented have been case histories that the author has collected over his many years as a member of the Massachusetts Eye & Ear Infirmary. The clinical information gained from these concise, but detailed cases and photographs is immense. For those keen biomicroscopists, contact lens practitioners, and those with added interest in ocular pathology, this atlas is a worthwhile reference text.

Joseph Mittelman O.D., F.A.A.O.

The Ocular Fundus, Methods of examination and typical findings, 4th edition, by Arno Nover, translated from the original German by Frederick C. Blodi, Lea & Febiger, Philadelphia, 1981, 189 pages & index.

While designed by the author to assist students learning ophthalmoscopy, this book has developed into a small ophthalmoscopic atlas of ocular disease. For the eye care practitioner, the major advantage of consulting such an atlas periodically is the opportunity to confirm or revise his/her clinical impressions. Everyone has a few patients who present out-of-the-ordinary ophthalmoscopic features. Using Nover's book it is possible to look up typical fundus photographs and determine how well they agree with appearances in a particular patient. Alternatively, it is possible to use this book as a sort of self-administered test by flipping through the photographs and seeing if one can identify the problem before referring to the text.

The first third of the book contains a brief review of the techniques of ophthalmoscopy and retinoscopy (!), and a succinct presentation of normal fundus details (including congenital anomalies). The author shows a strong interest in diseases of the optic nerve: optic neuritis, papilledema and optic atrophy occupy 24 pages (including 22 figures). This chapter on optic nerve disease also includes an excellent table for differentiating among papilledema, optic neuritis, central retinal vein occlusion, and hypertensive retinopathy. The following chapter addresses retinal diseases, and encompasses 77 pages. This chapter also includes 139 of the total of 182 figures. Since this chapter covers some 41 disease entities, it is clear that the text is necessarily quite brief. The final chapter is concerned with choroidal disease (19 pages, 21 figures).

None of the chapters contains a bibliography, although this is not a major fault in an atlas. The brevity of the text cannot be criticized, for the same reason. The short clinical descriptions of each disease entity make this book very useful in an office setting. Of considerable use is a listing of differential diagnoses which is provided for each condition. The book is extensively cross-referenced to assist in such differential diagnosis.

All of the photographs (there are no drawings of fundus details, thank goodness) are clearly and uniformly presented: what the text says you can see is actually visible in the figures. I notice that there are no specific photographic credits: this is an omission which is only slowly being rectified in the ophthalmic literature.

In conclusion, this small volume is a very useful resource: it would more likely be found on a writing surface in an examining room than on a shelf at home.

T.D. Williams
School of Optometry
University of Waterloo

Current Ocular Therapy, F.T. Fraunfelder & F.H. Roy; W.B. Saunders Co., Toronto, 1980, 647 p.p.

This textbook provides a quick and concise reference source for almost every particular ocular problem. Over 300 consultants have contributed to this text. Each contributor explains his/her method of treatment in a concise manner emphasizing recent therapeutic development. Each condition is introduced in general terms and specifies the ocular problem. Therapy is outlined in systemic and ocular terms, medically or surgically. A list of ocular or periocular manifestations follows. The author offers a note on "precautions" and a final commentary on the condition. A short, current bibliography of the condition follows.

The conditions covered are not confined to specific ocular diseases but also ocular disorders encountered in general medicine such as generalized infectious diseases, metabolic and dermatologic disorders, and neoplasms.

The drugs listed in this text are given in their generic or nonproprietary names. A complete Drug Roster is alphabetically listed at the end of the book giving generic names and then proprietary or trade names with preparations and usual dosages indicating routes of administration.

Although the field of medical therapeutics is continually changing, this textbook offers the busy practitioner an exact outline of therapy for a particular ocular problem. It is certainly a most handy reference.

Joseph Mittelman, O.D., FAAO.

Binocular Vision and Ocular Motility — Theory and Management of Strabismus — 2nd Edition — GUNTER K. VON MOORDEN — the C.V. Mosby Company — 1980. $75.00.

The purpose of this book is to convey the physiologic basis of the work of Hering, Helmholtz, Tschermak, and Hofmann upon which was built the clinical work of Javal, Worth, Bielschowsky, Duane, Landcaster, and more recently, Harms, Cuppers, Lyle, Bagolini, Burian and von Noorden. The material is presented simply and concisely and includes reference to recent studies in the area of electro physiology.

Although the authors of this book are essentially nativists (believing that binocular vision and spatial orientation are given to man through anatomical and physiological organization of the visual system), as opposed to the theory of empiricism in which binocularity and spatial orientation are learned functions, the book shows an interesting awareness of both approaches.

A short chapter is devoted to accommodative — convergence relationships in near vision. The use of a myotic (Phospholine Iodide) to reduce convergence is discussed. Research has shown that since this drug is a cholinesterase inhibitor, it enhances the effect of the acetylcholine on the ciliary muscle — thus with this drug less impulses are required to obtain a unit contraction of the ciliary and the AC/A ratio is reduced. Such a myotic is used as a diagnostic tool. If the myotic causes a significant reduction of near deviation, the patient will benefit by the correction of the hypermetropia or by the prescribing of bifocals to control the esotropia.

General recommendations include the full correction of refraction in early years up to school age, regardless of blurring of distance vision by the glasses, the avoidance of prescribing refractive error under + 2.00 in infants, the prescribing of cylinder of 1.00 dioptre or more to obtain a clear optical image and the preference of most ophthalmologists to select two years of age as being the most beneficial age for surgery in the control of strabismus.

In addition, differentiation is made between the non-accommodative and accommodative elements of squint. The use of bifocal lenses to control the AC/A ratio is recommended. The importance of fusional amplitudes is recognized. The work of Flom, Fry and Hoffsteter is referred to.

In the chapter on non-surgical treatment, orthoptics is discussed. "The goal of orthoptic treatment is to give the patient secure, comfortable binocular vision. All treatment is the responsibility of the physician".

The author states that a truly scientific validation of orthoptics treatment has never been published and therefore the value of orthoptics is variously assessed by different ophthalmologists. He suggests that a study is urgently needed to either accept or refute the value of orthoptics. The author appears unaware of the reasonably high successful rate of the control of strabismus by visual training when carried out by optometrists who specialize in this field. This is enforced by the absence of optometric references in the chapter "Principles of Non-Surgical Treatment".

Primarily, this book is well written in the context of its sub-title "Theory and Management of Strabismus". The chapters on esodeviations, exodeviations, cyclovertical deviations, A and V patterns, paralytic strabismus, special forms of strabismus, anomalies of convergence and divergence and principles of surgical treatment, including in detail the different types of surgery, perhaps do not represent much new information from books by previous authors.

However, the information is presented in an interesting, clear and concise manner and perhaps just as important, with practical application made possible by many years of experience.

In addition, the frequent references to the physical and physiological, if not the psychological aspects of binocular vision is a refreshing change from previous medical authors.

This book provides an informative and up-to-date review of the ophthalmological approach to the management of strabismus, particularly for the optometrist involved in visual training. Perhaps its greatest value would be as a text book or required reading for the optometric student.

E.J. Spearman, O.D.

Strabisme: diagnostic, formes cliniques, traitement. J. Lang, avec une preface de R. Witner. Traduction de la 2ième édition allemande par Etienne Ott. 1981 Editions Hans Huber, Berne.

L'auteur s'adresse au jeune ophtalmologiste et il réussit bien a cerner les méthodes d'investigation actuelles à décrire et analyser les différentes manifestations et formes du strabisme, ainsi qu'à définir les objectifs que les thérapeutiques actuelles permettent d'atteindre et les moyens utilisables pour y parvenir.

Sa démarche est ordonnée, pédagogique, claire et simple.

Il s'attarde longuement au diagnostic et aux différents types de déviations et de troubles de la motilité en ne se conservant qu'une trentaine de pages pour le traitement.

L'optométriste pourra trouver son utilité à mettre à jour ses connaissances de base sur le sujet même si les méthodes de traitement ne le concernent que peu. L'auteur explique certains des moyens employés comme l'atropinisation et la chirurgie, qui sont d'intérêt mitigé pour l'optométriste. Il traite, par contre, de l'oclusion, des corrections par lunettes et de l'orthoptique. L'éditeur adresse d'ailleurs ce livre aux orthoptistes, aux pédiatres, aux cliniques, aux bibliotèques.

Le relevé de la littérature traitant de ce sujet, de même que les ouvrages de référence sont très fouillés.

Dr Jacques Vinson
Hull, Québec.

I.E.S. Lighting Handbook, John E. Kaufman, Editor, Published by the Illumination Engineering Society of North America, 1981. Two volumes. Hardcover.

This is the most recent publication put out by the Illumination Engineering Society in its "75th year of continuous dissemination of knowledge relating to the advancement of the art and science of illuminating engineering."

The Handbook consists of 29 chapters in two volumes of which the Reference Volume would be of review interest to most optometrists, with its chapters on the physics of light, and light and vision. The latter chapter includes detailed discussions of glare and of the relationships among lighting visibility and task performance. The next two chapters discuss photometry and colour. The remainder of this volume deals with a discussion of the various lighting fixtures and light sources in use. This includes most interesting descriptions of the construction and characteristics of different types of light sources.

The Second Volume or Application Volume contains recommendations on design considerations for offices, schools, commerce, industry, and residences. As well, it covers lighting design for all modes of transportation. The second-last chapter discusses the non-visual effects of radiant energy. This most interesting topic studies "the interaction of biological systems of radiant energy in the ultraviolet visible and infrared portions of the electromagnetic spectrum."

The Handbook is laid out as a reference manual and is at times difficult to read because it assumes the reader already has some knowledge of the subject he is reading. As well, there are many arithmetical calculations that would exceed the requirements of the average optometrists. However, I would highly recommend the Handbook to anyone involved in lighting consultation. Also, it should be included in the library of local optometric associations to serve as a reference source for any optometrists who have questions on lighting.

Steven L. Mintz, O.D.

COMING EVENTS

FEBRUARY

N.B.O.S. Continuing Education
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For Date
Contact: N.B.O.S.
(506) 454-0223

14–16
B.C.O.A. Continuing Education
VANCOUVER – B.C.

Contact: B.C.O.A.
414-1033 Davie Street
Vancouver, B.C.
V6E 1M7
Tel: (604) 685-1810

MARCH

3–7
Ontario Optometric Association
Annual Meeting
Toronto, Ont.

Contact: OAO
(416) 923-1173

March 31 – April 1,2, 1982

Quebec Association for Children
with Learning Disabilities
Congrès 1982

(7th Annual International
Conference)
Queen Elizabeth Hotel
Montreal, P.Q.

Contact: QACLD Congrès 1982
C.P. 997, Snowdon,
MONTREAL, P.Q.
H3X 3Y1

APRIL

11–4
Manitoba Optometric Society
Annual Meeting
WINNIPEG, MAN.

Contact: Dr. Harry Basman
M.O.S. Exec. Dir.
(204) 268-2388

MAY

11–14
S.O.S. Continuing Education
SASKATOON, SASK.

Contact: Dr. R. Gulka
(306) 242-8086

May 15–18, 1982

Optica 82
International Trade Fair for
Ophthalmic Optics
Stuttgart, West Germany

May 16–19, 1982

British Columbia
Optometric Association
Convention & Annual General Meeting
Island Hall,
Parksville, B.C.

Contact: Nina P. Cline
Exec. Secretary
B.C.O.A.
(604) 685-1810

JULY

1–4
4th Asian-Pacific
Optometric Congress
MANILA-PHILIPPINES

Contact: 4th Asian-Pacific
Optometric Congress
Room 211, Executive
Wing
Century Park Sheraton
Malate, Manila,
Philippines

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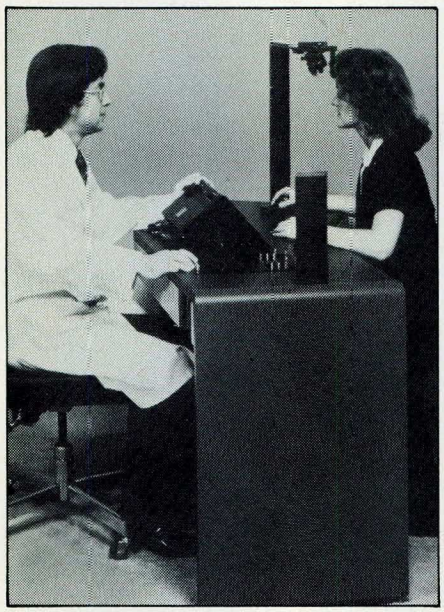

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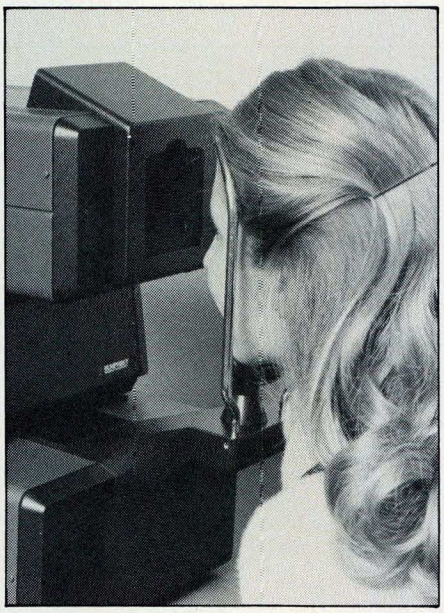

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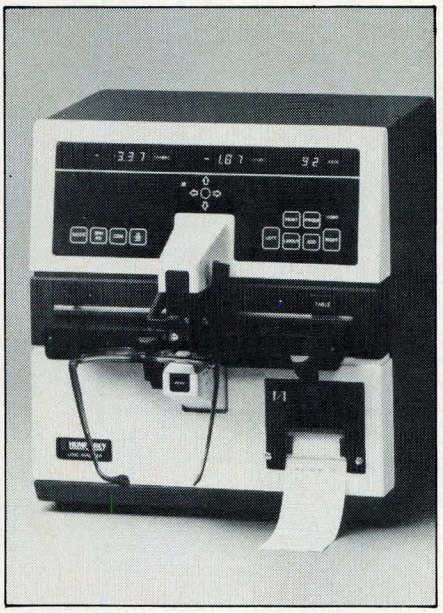
Here's an automatic keratometer which is so simple to operate that anyone on your staff can obtain objective measurements of the curvature of the cornea and contact lens base curves with unsurpassed accuracy, reliability and all in just seconds. You get an instantaneous digital display in diopters or millimeter radius plus the option of an additional hard copy printout.



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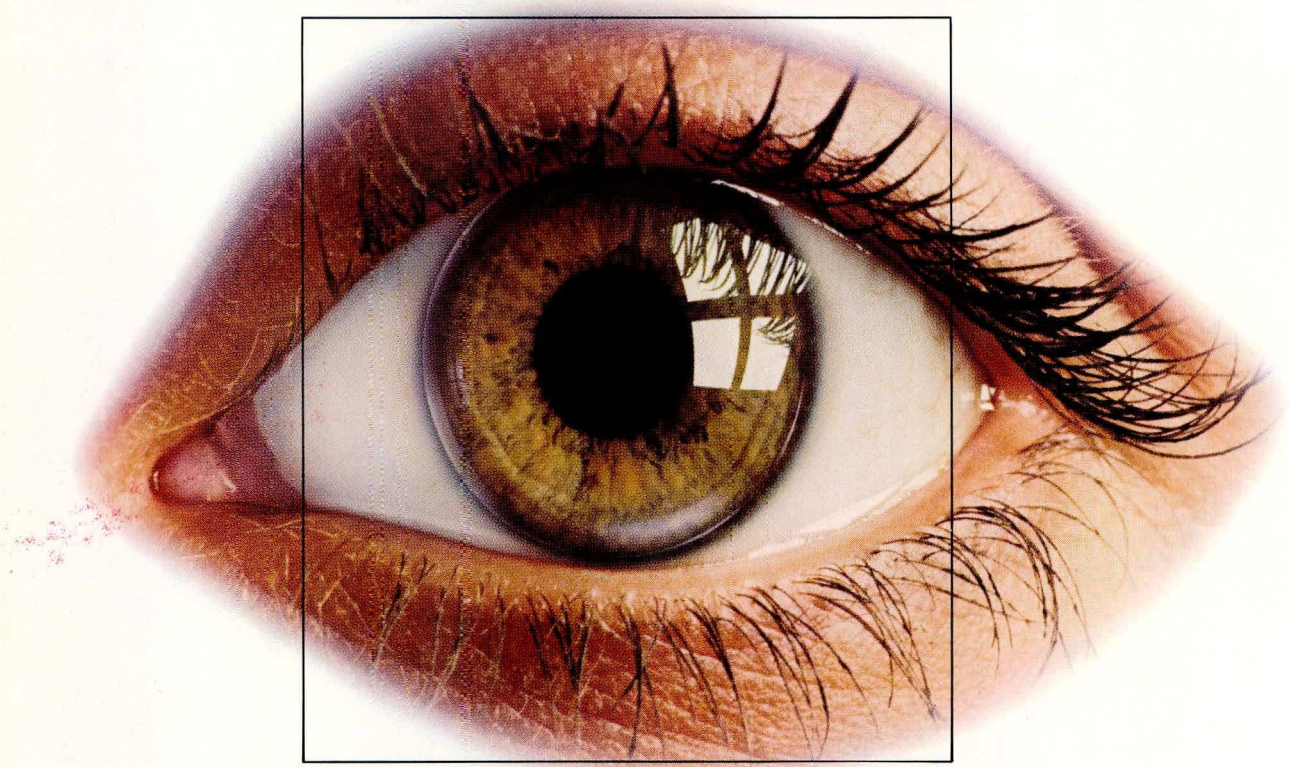

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