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La Revue Canadienne d'Optométrie

VOL. 47 NO. 4

DECEMBER/DÉCEMBRE 1985

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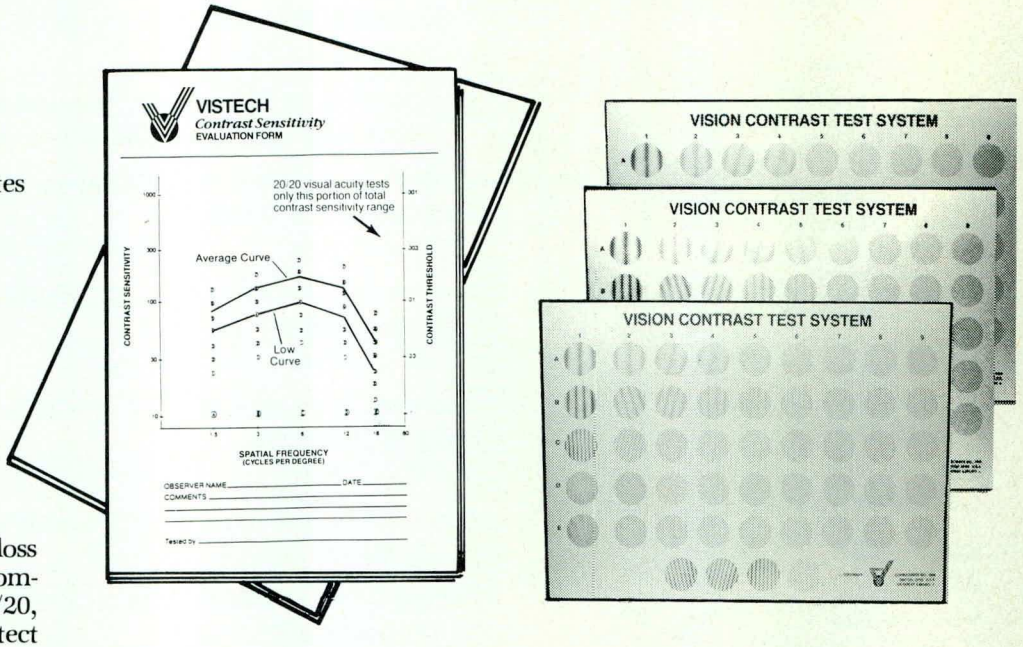

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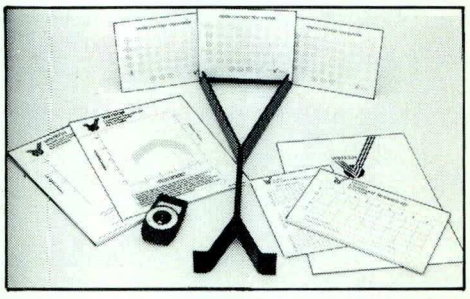

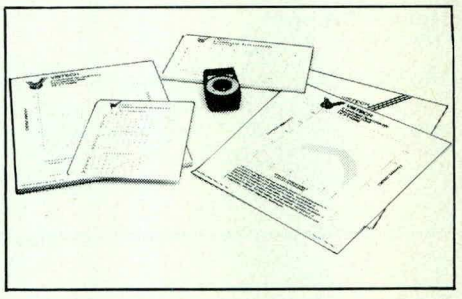

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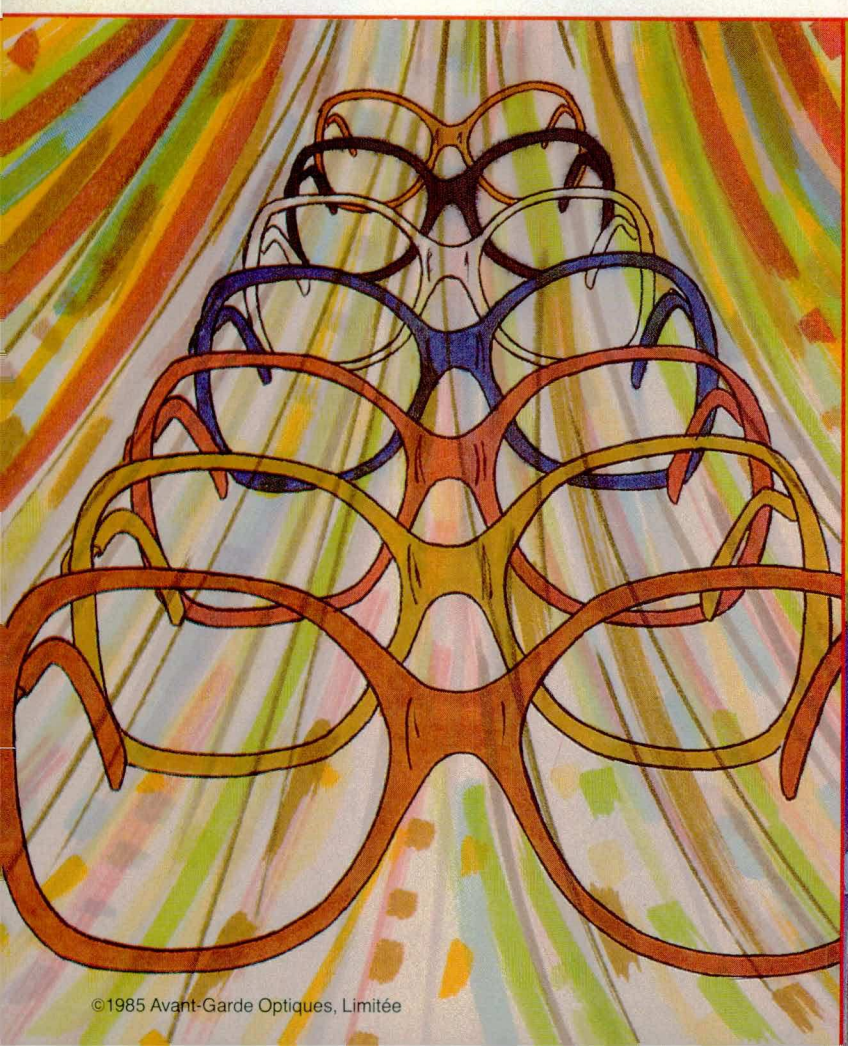

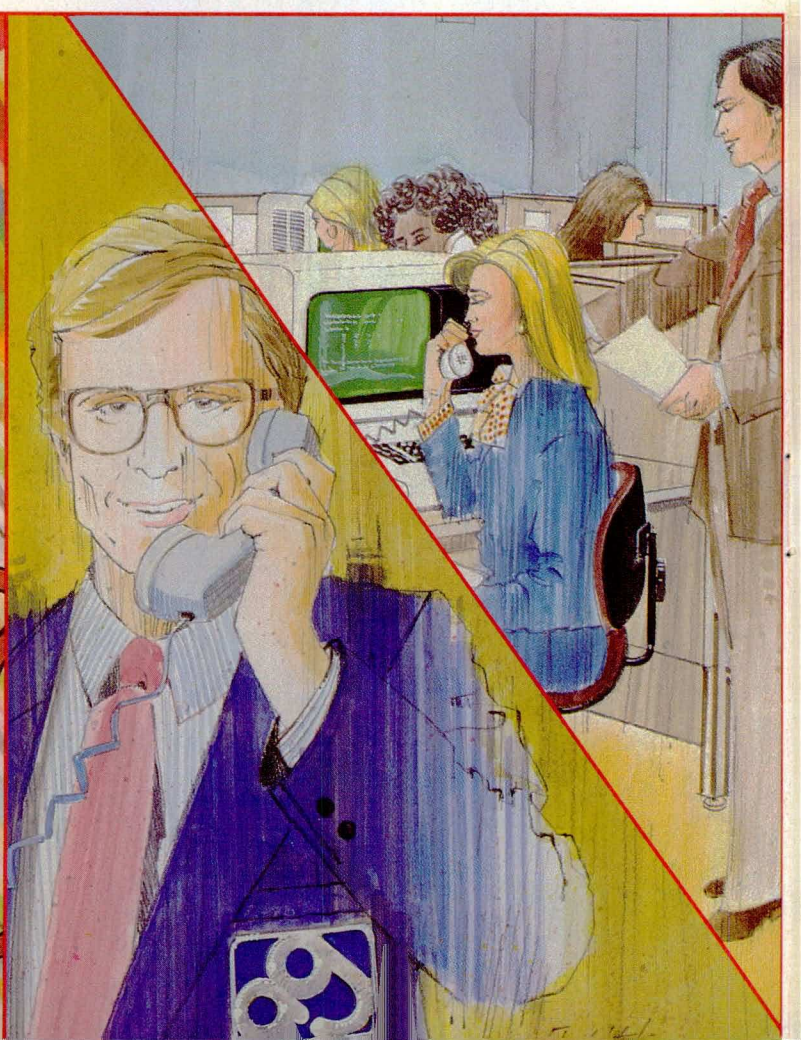

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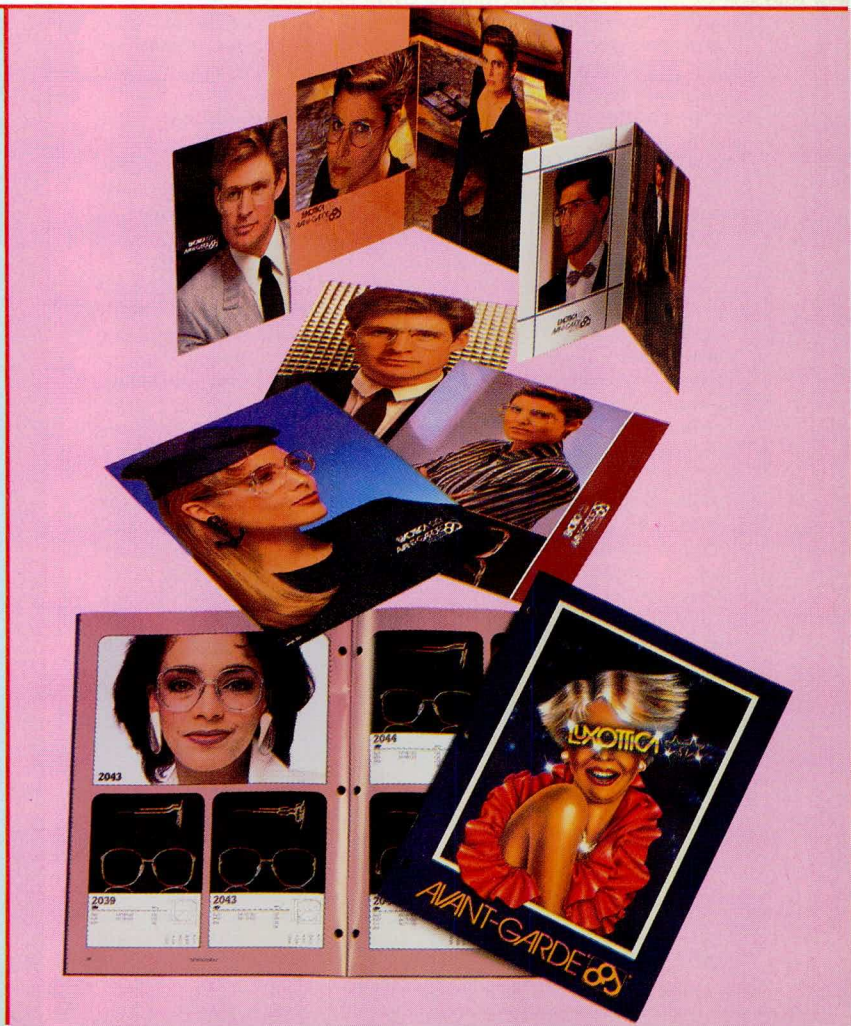
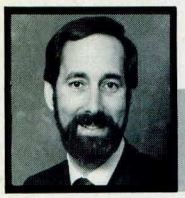




PRESIDENT'S PODIUM

Who Speaks for Optometry?

"Who speaks for Optometry?" is a basic question that optometrists and their patients are now asking when dealing with federal Ministries like Health and Welfare, the Ministry of External Affairs, the Ministry of National Defense, the Ministries of the Solicitor General and Finance, the CNIB, the various provincial Ministries and departments, including Education, Health and Social Affairs, etc.

The answer to this question should be "the vision care experts — optometrists."

It *should* be, but this, however, is not the case. As things stand presently, the profession has little or no representation at the bureaucratic and/or consultative levels to assist government and major vision care agencies in determining policy and direction for satisfying the vision care needs of *millions* of Canadians.

This is a ridiculous situation when one considers that 2,500 optometrists provide 75% of the vision examinations conducted in this country. As a university educated, primary health care practitioner, the optometrist's potential contribution in defining the visual health care needs of Canadians is simply not being developed, or even explored.

Why does this situation exist? For years, a perception shared by government, industry, other health professions and even the public has been that the medical specialty of Ophthalmology can provide all the expertise and insight necessary in planning for optimum vision and eye care in Canada. With only this limited specialty to draw on, however, a major emphasis has been placed on eye pathology and its medical treatment when this accounts for only about *five per cent* of Canadians' vision care problems. Most vision and eye care patients suffer from functional vision problems and the only specialists in this field are optometrists.

During the last twenty years, governments, both provincial and federal, have moved strongly into health care *planning*, since they control the "purse strings" through which vision and eye care services, among others, are paid. The limited scope of coverage, historically, has been directed from a narrow, medical base. Therefore, every day we see examples of optometric services' being misunderstood and the principle of sqeezing "round" services into "square" holes, as a result, has met with very limited success and with ever increasing resistance.

It is time to reshape the vision and eye care model in Canada and to utilize the optometrist's training and expertise in many areas, including: public health, sports, low vision, industrial and environmental vision, vision therapy and orthoptics, contact lenses, vision standards, material standards, learning disabilities, geriatric and pediatric vision, military vision and eye care, education, research, to name just a few areas which come immediately to mind.

And how is this to happen? This profession must move from its strong and established service mode and expand into a *planning* mode by placing optometrists not only on Boards and Commissions, but also, right within the bureaucracy as part-time and full-time consultants. With this in mind, the Canadian Association of Optometrists is approaching the various federal agencies and requesting this type of representation. Provincial Associations are being encouraged to move in this same direction.

Comprehensive vision care services to the Canadian public will be achieved only when a proper voice is provided to Optometry!

Bruce N. Rosner, OD
President, CAO

Qui parle pour l'optométrie?

"Qui parle pour l'optométrie?" Voilà une question fondamentale que les optométristes et leurs patients ont appris à poser dans leurs rapports avec les ministères fédéraux, dont le ministère de la Santé et du Bien-être social, le ministère des Affaires extérieures, le ministère de la Défense nationale et les ministères du Solliciteur général et des Finances, avec l'INCA et avec les divers ministères provinciaux, dont l'Éducation, la Santé et les Affaires sociales, etc.

La réponse devrait être: "Les spécialistes de la vision, c'est-à-dire les optométristes".

Cela *devrait* être, mais cela n'est pas. Au point où nous en sommes, la profession a peu ou pas de représentation aux niveaux bureaucratique et (ou) consultatif pour aider le gouvernement et les principaux organismes des soins de la vision à déterminer la politique et l'orientation à suivre pour répondre aux besoins en soins de la vision de *millions* de Canadiens.

Situation absurde, lorsqu'on songe que 2 500 optométristes font 75% des examens de la vue effectués au Canada. L'optométriste, diplômé d'université, se situe au premier niveau des professionnels de la santé; sa contribution éventuelle à la définition des besoins en soins de la santé visuelle des Canadiens n'est tout simplement pas développée, ni même explorée.

Pourquoi cette situation? Pendant des années, le gouvernement, l'industrie, les autres professions sanitaires et même le public ont pensé que la spécialité médicale de l'ophtalmologie procure toutes les connaissances et les perceptions nécessaires pour planifier les meilleurs soins de la vision et de la vue au Canada. Mais, en ne s'appuyant que sur cette spécialité limitée, on a mis un accent considérable sur la pathologie de l'oeil et son traitement médical, qui ne représentent pourtant qu'environ 5 % des problèmes de soins de la vision des Canadiens. La plupart des malades qui ont besoin de soins de la vision et de la vue souffrent de problèmes fonctionnels de vision. Or, les seuls spécialistes dans ce domaine sont les optométristes.

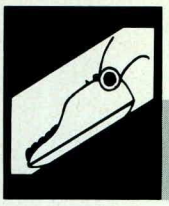
Au cours des vingt dernières années, les gouvernements, tant provinciaux que fédéral, se sont résolument orientés vers la *planification* des soins de santé, puisqu'ils détiennent les "cordons de la bourse" lorsqu'il s'agit de payer les soins de la vision et de la vue, entre autres. La gamme limitée de la couverture a toujours été assurée par une base médicale étroit. Par conséquent, nous voyons chaque jour des exemples d'incompréhension des services optométriques et l'inadéquation des services et des besoins a donc permis des succès très mitigés et a soulevé une résistance accrue.

Il est temps de refaire le modèle des soins de la vision et de la vue au Canada et de faire appel à la formation et aux connaissances spécialisées de l'optometriste dans un grand nombre de domaines, dont : l'hygiène publique, les sports, la faible vision, la vision industrielle et environnmentale, la thérapie de la vision et l'orthoptie, les verres de contact, les normes de la vision, les normes du matériel, les troubles d'apprentissage, la vision gériatrique, les soins de la vision et de la vue dans les forces armées, l'éducation et la recherche, pour ne nommer que quelques domaines qui viennent immédiatement à l'esprit.

Et comment cela se fera-t-il? La profession est en mode de service fort et établi; elle doit passer en mode de *planification* en faisant non seulement accéder ses membres à des postes au sein des conseils et des commissions, mais encore en leur faisant une place au coeur même de la bureaucratie en tant qu'experts-conseils à temps partiel et à plein temps. C'est dans cette optique que l'Association canadienne des optométristes prend contact avec les divers organismes fédéraux et réclame ce genre de représentation. Les associations provinciales sont invitées à se donner la même orientation.

Ce n'est qu'en donnant à l'optométrie un porte-parole compétent que l'on donnera au public canadien des services complets de soins de la vision!

Bruce N. Rosner, OD
Président de l'ACO



EDITORIAL

The Price of Freedom is Eternal Vigilance (2)!

We have used the title of this editorial on a previous occasion (CJO, Vol. 46, No. 3, September, 1984), but its importance cannot be underestimated or we stand the risk of losing our status as an autonomous profession.

The European Economic Community (EEC), to most of our readers, would seem to be solely interested in economic, financial and trade relationships among its national members (Belgium, Denmark, England, France, Germany, Ireland, Luxembourg and the Netherlands). But it is far more than such a limited organization. It has ramifications for all aspects of social, legislative and economic matters. The question of reciprocity of trade and professional qualification has come to the fore on many occasions on the floor of the European Parliament in Strasbourg.

Medical domination in health matters in these countries is all pervasive and aggressive. Continental ophthalmology aims at suppressing optometry and has succeeded in *banning* optometry in Greece. That ophthalmology is making use of the EEC in its attacks can be seen from a proposition to the EEC Parliament by the Italian representative, himself the President of the Association of Italian Physicians and the brother of an ophthalmologist. The following is taken from an editorial in the Journal of the Belgian Association of Optometrists/Opticians:

> Considering that scientific progress has shown a relation between myopia and certain ocular pathologies, to wit retinal detachment and glaucoma;
>
> Considering that diagnostic techniques are available to the specialist to permit him to observe peripheral changes in the retina of the myopic patient which could lead to retinal tear and detachments;
>
> Considering that ophthalmological techniques can be preventive in nature in such lesions and this reduces the seriousness of such conditions should such a detachment occur;
>
> And realizing that such techniques, diagnostic and preventive, are exclusively prerogatives of the physician, preferably the specialist;
>
> And recalling that, contrary to the above, several jurisdictions, for decades now, allow optometric care of the myope by technicians unqualified in pathology recognition and without the necessary diagnostic and preventive training in such conditions;
>
> Considering that the myopic patient is thus deprived of qualified medical care and given over to the care of a practitioner who has no legal responsibility should he fail to recognize the pathology and, furthermore, the patient's right to a health care benefit under the public health law is completely nullified;
>
> Be it therefore resolved that
>
> The commission prevail upon the states who permit partially qualified practitioners to provide care to myopics, to withdraw completely such privileges because the optometric exam is incomplete and does not guarantee full care to myopic subjects;
>
> The Commission present to the EEC Parliament the results of any action based on the above resolution;
>
> That the President of the EEC institute a committee of experts to study this matter;
>
> That the President present this resolution to the Commission in whole and to the Council.

Because of the very serious implications for the legal status of optometry in the EEC countries, we communicated with Professor David Pickwell, President of the International Optometric and Optical League (IOOL), and Director of the School of Optometry in the University of Bradford, for some comments on this development.

"Things," he replied, "are developing fast. I think that a 'directive' (rules) will be considered in the near future by the Parliament in Strasbourg that will give recognition to registered professions where they exist. This is likely to mean that, in a country like Britain, where optometry is statutorily registered, rules can be made to require anyone coming into the country from another EEC country to have the same standards of qualification, or to take such training and exams necessary to bring them up to that standard. In Italy, there are no licensed (registered)

Continued on p. 191

CAO COMMUNIQUÉ

The CAO* Communiqué *is a bulletin of information developed by the CAO office in Ottawa and circulated, approximately once every two months, to current members of all ten provincial optometric Association Councils, as well as to both Schools of Optometry in Canada and CAO's past national Presidents.

***Written and assembled under the direction of the national Association's Executive Director by CAO's Director of Communications,* Communiqué *has, in the two years since its inception, served as an extremely useful vehicle by which a mountain of CAO administrative information is sifted and disseminated to the provincial Associations. The goal in its development was to provide each Association with material which could be priorized and circulated to their individual members through their own Association bulletins or newsletters. Regular sections in* Communiqué *include* News in Brief from the Office of the Executive Director; The Federal Scene, *a distillation of the current political information coming out of Ottawa;* News from the Provinces, *containing bulletin information carried by respective provincial newsletters, but perhaps not being received by Councillors in every other province;* The Peripheral View: Notes from in and around the Profession, *which is a blend of health care information received from groups as diverse as the American Optometric Association and the Helmholtz Institute of Eye Surgery in Moscow. In addition, it contains information from and about health care groups other than those involved directly in eye care: nursing, pharmacy, medicine and even acupuncturists.* The Peripheral View's *borders are limitless and international stories have appeared in every issue of* Communiqué. Clippings *is self-explanatory. CAO receives hundreds of items clipped from papers and magazines all across Canada and this section offers a chance to circulate some of the more interesting and controversial from among them.*

But in addition to its wide range of information,* Communiqué *is not without humour and its pages are frequently broken up with tidbits and cartoons related to eye care, health care or even bureaucracy.

***The CAO* Communiqué, *we are happy to report, has been playing to very good reviews from the national and provincial Councillors who receive it. So much so that CAO Council has requested the culling of* Communiqué *material by the CJO's Managing Editor to enable its circulation to the full slate of Association members through the* Canadian Journal of Optometry.

This section of the CJO, then, will serve to introduce you to some of the items which appear in recent issues of the CAO* Communiqué. *Rarely will they appear here exactly as they appear in the* Communiqué. *That would defeat the purpose of both publications. But this Section of the CJO will keep the grass roots membership informed regarding the information being distributed to their designated Councillors. And if your interest is piqued beyond what this distillation provides, ask your Councillor if you can borrow his/her copy of the CAO* Communiqué. *In the meantime, the Editors are delighted to welcome this Section to the CJO and hope that you will enjoy it.

No Need for Public Alarm over AIDS from Contact Lenses

In early October, every optometrist in Canada received a copy of a special bulletin issued by CAO. Based on information received from Health and Welfare Canada (who, in turn, had received it from the US Centres for Disease Control in Atlanta, Georgia), the AIDS bulletin directly addressed the question of virus transmission via unsterilized contact lenses.

"Although trial fitting lenses are re-used, they are sterilized after each use according to approved and proven techniques, and are not sold to the public," is an essential part of a subsequent news release sent out as a joint bulletin issued by H and W's Laboratory Centre for Disease Control, the Canadian Association of Optometrists, the Canadian Ophthalmological Society and the Board of Ophthalmic Dispensers of Ontario.

In addition to the news release, the information carried in *Communiqué* was supported by the statement issued by CAO to its members and the original background material provided by H and W Canada and the US Centres for Disease Control.

Optometry in the Canadian Encyclopedia

". . . the profession of examining eyes for faults of refraction and motility and of the treatment of abnormal conditions with correctional lenses and orthoptics."

So begins a full column entry under "Optometry", written by Dr. ME Woodruff, and included in the newly published 3-volume set, *The Canadian Encyclopedia,* issued by Hurtig Publishers.

The complete entry goes on to highlight the training of the optometrist, the academic programs at Montreal and Waterloo, the profession's regulatory structure, notes on the wide range of practice areas that are encompassed by the term "Optometry" and concludes with a brief paragraph on occupational vision.

Similarly, "Ophthalmology" is also covered as a separate entry in the Encyclopedia as "the medical specialty concerned with the eyes and their relationship to the body."

The entry includes a history of ophthalmology in Canada and explores briefly some of the modern surgical techniques and equipment available to the medical eye care practitioner.

Waterloo to Host International Low Vision Symposium

The Centre for Sight Enhancement at the School of Optometry, University of Waterloo will be the site of a major international Symposium on Low Vision June 25-27, 1986.

The event is sponsored, in part, through a grant from the Canadian Optometric Education Trust Fund (COETF).

Information about the event can be obtained from either Professor George Woo, Chairman, or Dr. Rodger Pace, Secretary General, International Symposium on Low Vision, School of Optometry, University of Waterloo, Waterloo, Ontario, N2L 3G1. Telephone (519) 885-1211.

Health and Welfare Awards a Series of Grants to Volunteer Groups

Grants totalling over $3,000,000.00 have recently been announced by Health and Welfare Canada to 51 separate groups whose interests include concerns as diverse as Alzheimer's Disease, Arthritis, Addiction, Narcolepsy, Diabetes, Smoking and Health, Child Health, Huntington's Disease, Spina Bifida, Planned Parenthood and Traffic Injury Research to name just a few.

The Ministry also announced the awarding of a grant of $150,000.00 to a group called AIDS Vancouver, for a project developed specifically to assist victims of Acquired Immunodeficiency Syndrome (AIDS). Part of the planned allocation of this grant will be for the organizing and running of six forums aimed at the general public to ensure the greatest possible awareness of the virus, how it is spread, and the care of AIDS patients.

Reader's Digest Large-Type Edition

Reader's Digest (US) is now available in a special large-type edition geared to visually impaired readers. The text is printed in blacker ink on a whiter page and letters are approximately 6/30 (20/100) in size.

A check with the *Digest*'s Canadian offices in Montreal has confirmed that, for the present, the publication is available only in the US edition. Canadians interested in subscribing (at $10.95 US per year) may write to *Reader's Digest Large-Type Edition*, PO Box 241, Mount Morris, Illinois, 61054, USA.

Soviet Technique Combats Squinting

A Soviet optician claims to have developed a method for curing eye squints in children.

According to a press report issued by the USSR Embassy in Canada, a doctor at Moscow's Helmholtz Institute of Eye Disease employs a prism which, when placed in front of the eye, produces a double image that causes the weak eye to blink rapidly as it tries to adjust.

By having the eye forced into doing extra work, says Dr. Edouard Avetisov, the child strengthens the eye muscles and eliminates the need for the healthy eye to compensate by squinting. Dr. Avetisov says that about 15 sessions are usually enough to "wake up" the weak eye.

Is the "Crown" in Canada Really Immune?

A new book issued recently by the Law Reform Commission sets out to review the existing status of the Canadian federal administration's legal position.

Several section titles point out the complexities of the task: "Absence of a Modern and Coherent Status"; "Fragmentation of the Federal Administration"; "Continuing Misconceptions"; "Terminological Confusion"; "Uncertainty as to the True Identity of the Crown"; "Obfuscating Contemporary Reality".

Central to the conclusions contained in the report, however, is a considerably more optimistic recommendation for an overhaul of the system. "The legal status of the federal administration," says the Commission, "must reflect a better balance in relations between the administration and individuals. The concept of equality adopted by the Charter of Rights appears to be one of the most important components of a critical re-examination of the present status of the administration."

International Rehabilitation Week 1986

April 6-9, 1986 is International Rehabilitation Week (IRW) and, in conjunction with the event, a New York based Management Group is sponsoring an Exhibition and Conference at the Jacob K. Javits Convention Centre in New York City.

IRW is designed for the purpose of enhancing the lives of disabled and handicapped people the world over and the Conference will bring together for the first time major Associations, manufacturing and service companies, scientists, physicians, researchers, engineers, professionals in the rehabilitation field and leading public and private sector figures for an exchange of technology, services and information among groups and individuals concerned with disability.

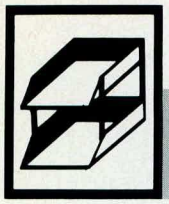
Honorary Co-chairpersons for the event are former US Presidents Jimmy Carter and Gerald Ford, and NY Governor Mario Cuomo.

Further information is available from: EJJ Management Inc., 225 W. 34th Street, New York, NY, 10122, USA. Telephone (212) 563-4867.

You Know You're Getting Older When . . ."

(compliments of the *Journal of the American Optometric Association)*

— Everything hurts and what doesn't hurt doesn't work.
— The gleam in your eyes is from the sun hitting your bifocals.
— You feel like the morning after the night before and you haven't been anywhere.
— Your little black book contains only names ending in M.D.
— You get winded playing chess.
— Your mind makes contracts your body can't honour.
— You know all the answers, but no one is asking you the questions anymore.
— Your favourite part of the newspaper is *25 Years Ago Today.*
— You sit in a rocking chair and can't get it going.
— Your knees buckle and your belt won't.
— Dialing long distance wears you out.
— Your back goes out more often than you do.
— You dim the lights for economic, rather than romantic reasons.
— You sink your teeth into a steak and they stay there.



ADMINISTRATION

1985 Congress Business Report

As reported in the last issue of the CJO, the Social Program organized and mounted by the Regina Local Arrangements Committee under co-Chairpersons Dr. Len Koltun and his wife, Betty Lou, provided many memorable highlights of the 1985 Biennial Congress.

But a Social Program alone doth not a Congress make and, as is the case with all CAO Biennial Congresses, the Association took advantage of the presence of virtually all national and provincial Association representatives to conduct an extensive program of CAO Business meetings: Interaction '85; CAO Council's annual summer meeting; the annual summer meeting of the COETF Board of Trustees; a meeting of the provincial Association Presidents; CAO Section Information Sessions and, as required by our Constitution, our Biennial General Business Meeting.

Following, then, are a few of the representative highlights from some of the above meetings.

Interaction '85

Optometric personnel, the current needs, the future crisis — problems and solutions. That, in brief, summarizes the focus of this year's Interaction meeting.

Developed under Committee Chairperson and (then) CAO President-elect Dr. Bruce Rosner, Interaction '85 set out to identify the present and projected optometric personnel needs of the profession across Canada. It began with a historical review by Dr. Jack Huber of the activities of a number of CAO Committees, including the New Academic Facilities Committee and the President's Committee for a Western Canadian School of Optometry. Dr. Huber, in addition to having served as CAO President from 1979-80, chaired the New Academic Facilities Committee for several years.

The program was also designed to observe and discuss potential solutions as are presently being addressed by a number of specific groups, including the BC Optometric Association, l'Association des Optométristes du Québec and the School of Optometry, University of Waterloo*.

In late 1984, several provincial Associations conducted extensive optometric personnel surveys and, in a few cases, were shocked to discover that their future needs, even in the short term, pointed to a crisis in terms of the number of practising optometrists available to meet the growing demand for vision and eye care services.

Interaction '85 laid the groundwork for the development of a co-ordinated national program to meet that need in provinces where the requirements will be particularly acute in the years ahead.

CAO Section Information Sessions

As the profession of Optometry grows in Canada, so too does the diversity of special interests of our members. One means of enabling a practising optometrist to focus his or her enthusiasm for a specific aspect of practice is through membership in a body of people with similar backgrounds, and similar interests. Such was the guiding principle behind the scheduling of CAO Section Information Sessions in conjunction with the 1985 Biennial Congress.

Prior to the Congress, provincial Associations were solicited for information on those areas which would elicit the strongest favorable response from among their members, were such areas to be developed into formalized Sections of CAO. Sports Vision, Children's Vision, Aviation Vision, Contact Lenses and Volunteer Optometric Services were the most consistently cited, with several others proposed as having the potential for future development.

In the post-Congress analysis, the two most popular areas proved to be Children's Vision and Sports Vision, co-ordinated under CAO Councillor for Ontario, Dr. Margaret Hansen des Groseilliers and (then) CAO President Dr. Ralph Rosere respectively. Contact Lenses, under CAO Councillor for Manitoba Dr. Keith Letts, Aviation Vision, under CAO Secretary Treasurer Dr. Tom Adamack and Volunteer Services, under (then) CAO past President Dr. Roland des Groseilliers were also explored, with the former two now being developed towards formal Section status. As reported by Dr. des Groseilliers, at present, there does not seem to be sufficient committed interest to warrant the development of

*__Editor's Note:__ Dr. Tony Cullen, Associate Director of the School of Optometry, University of Waterloo, delivered a presentation on that institution's present contribution to the profession in Canada, and its options in dealing with future personnel needs. Dr. Cullen's presentation is currently being edited for presentation in a coming issue of the CJO.

volunteer services as an independent Section of CAO.

At its Fall, 1985 meeting in Montreal, CAO Council was delighted to approve the founding documentation of the CAO Section on Children's Vision, making it the first officially struck Section of the national Association. Future issues of the CJO will carry ongoing news from this and other Sections as they are developed and expanded.

1985 General Business Meeting

Whether because of the extensive package of pre-meeting reports, or whether because of the firm gavel wielded by (then) President and Meeting Chairperson Dr. Ralph Rosere, no one is entirely certain, but the 1985 GBM left many veteran Congress delegates scratching their heads over its smooth dispatching of a lengthy agenda in the space of only one afternoon.

In the post-Congress evaluation forms returned by over 100 of the delegates, many noted the lack of controversy and commentary from the floor at this year's GBM. In a few cases, it was missed; in other cases, its absence was lauded by the delegate. In either case, there is no doubt that it was an exceptionally smooth meeting.

The abbreviated format this year was necessitated by the scheduling of CAO Section Information Sessions on the afternoon normally reserved for Day II of the General Business Meeting. Needless to say, Chairperson Dr. Rosere did express some pre-meeting concerns during the Council discussion that resulted in this decision. As a result, a good deal of extra effort was put into soliciting, developing and early circulation of all pre-meeting reports well in advance of the Congress. As delegates were advised going into the meeting, time would thus be taken up not with the delivery of the report from the Committee in question, but rather with questions from the floor.

One of the highlights of the meeting was a presentation by newly elected President of the American Optometric Association, Dr. Gerald Easton. Dr. Easton tackled the issue of commercialism within the broad field of vision and eye care, and spent a few minutes examining how it is being addressed by the AOA, and by various state Associations.

The Post-Congress Evaluation

This year, every registered Congress delegate, whether optometrist, spouse or junior delegate, received a short questionnaire after returning home from the Congress, soliciting comments and suggestions about the 1985 Congress in particular and about future Congresses in general.

The bottom line: a hearty round of congratulations to the entire 1985 Local Arrangements Committee, to the chefs who produced the food, to the bands who produced the music and to the organizers of the class reunions; indeed, to the entire Province of Saskatchewan and the City of Regina for showing us what real Western hospitality is all about.

CAO's **Merry-time Mingle** is already in the works for August, 1987 in Saint John, New Brunswick. Watch the CJO pages in the months ahead for early information about our 20th Biennial Congress.

MJ DiCola

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An Evaluation of the Microcomputer as a Vision Screening Medium

G.A. Edworthy*

Abstract

A vision screening programme using a microcomputer as the presentation medium was instituted. Tests of acuity, accommodation, accommodative facility, stereoacuity, vertical and lateral phoria, positive and negative vergence limits and saccadic vision proficiency were included in the pilot study. These results were compared to the findings of a routine optometric examination. Repeatability and accuracy of the programme were evaluated. Results indicated which tests should be retained in the computer programme.

Résumé

On a utilisé un micro-ordonnateur pour monter un projet de dépistage visuel. Le programme comprend des tests d'acuité, d'accommodation, facilité d'accommodation, acuité stéréoscopique, phorie laterale et verticale, amplitude relative de convergence et la précision des saccades oculaires. Ces résultats ont été comparés aux données d'un examen optométrique regulier. La fidélité de repetition et la précision du programme ont été évaluées. Ces résultats ont determinés quels tests seraient maintenus au programme.

Introduction

Vision screening programs have taken many forms over the years. These have varied from the Snellen Chart used in most schools and public health units across the country, to professionally conducted programs like the Modified Clinical Technique (MCT).[1-5] With the introduction of computers into schools, a whole new medium exists with which to present vision screening programs. This new medium has the potential to offer many advantages over existing vision screening methods. A computer program would enable all of the testing to be done on one instrument, the computer. Instructions to the operator could be automatically presented when required. The computer could be used to do the testing, using animated graphics and text, and also to determine who should be referred for further evaluation. No paperwork would be required since the computer could keep track of all results on diskettes and could even write referral letters outlining test results. The net result would be a screening system which could be operated easily by people with no optometric background or computer experience, could be used for individual or mass screenings, and would be relatively inexpensive because the hardware is already present in schools.

*O.D., Calgary, Alberta

The purpose of this study was to develop and evaluate a vision screening program using the microcomputer as the presentation medium. The program was designed to evaluate the following areas: visual acuity, accommodation, accommodative facility, stereoacuity, vertical and lateral phoria, positive and negative fusional vergence limits, and saccadic version proficiency. It was programmed to run on an Apple II+ or IIe. These computers were chosen because most schools in Calgary use them.

Methods

The program was evaluated using the population of a Calgary elementary and junior high school. Eighty one students aged 7 to 16 were screened using the computer. The screening was done by a layman with no previous experience in visual assessment or computers. All 81 students were screened twice, a week apart. During the intervening week, all were given a complete optometric examination against which the screening results were evaluated.

The screening tests were carried out in dim light levels of 5 to 10 foot-candles. The exact procedures used to test the students are as follows:

1) *Visual Acuity:* Students stood 5.5 m away from the computer screen and wore glasses with cross polarized plano lenses. The top half of the screen was polarized opposite to the bottom half, so the

student saw the top half with one eye and the bottom half with the other. Acuity lines using tumbling E targets and representing 20/20 and 20/30 (6/6 and 6/9) were displayed on the top half of the screen, then the bottom half of the screen, thus testing each eye individually.

2) *Accommodation:* Students were checked for uncorrected hyperopia using a similar procedure as for visual acuity testing, but using 20/45 (6/13.5) acuity with a +2.00 cross polarized lenses. Again this tested each eye individually without the need to occlude the other eye.

3) *Accommodative Facility:* The students wore cross polarized lenses with +1.50 in the right lens and -1.50 in the left. Words were displayed alternately on the top half and the bottom half of the screen. Students were advised to read each word aloud when it was clear. The operator would then press a key on the computer, erasing that word and displaying the next on the other half of the screen. Ten words, or five cycles, were presented. The computer timed the test.

4) *Stereoacuity:* Students were seated 50 cm from the screen wearing plano cross polarized lenses with vertical prism to fuse the top and the bottom halves of the screen. Three rows of letters and numbers were presented on each half of the screen with two digits offset in each row to create crossed and uncrossed disparities. Students were asked to state which letter or number in each row appeared farther away than the others, and which appeared closer than the others. The disparities presented were 126, 63, and 32 seconds of arc. The operator pressed the number on the keyboard corresponding to the row correctly identified.

5) *Lateral distance phoria:* Students stood 5.5 m from the screen and wore plano cross polarized lenses containing a total of 4 dioptres vertical prism to dissociate the two eyes. They were asked to look at a stationary flashing arrow and to tell when a moveable flashing arrow was lined up vertically above it. The operator then pressed a key and the amount of phoria was calculated and recorded.

6) *Near lateral and vertical phorias:* These were measured simultaneously. Students were seated 55 cm from the screen and wore cross polarized lenses with 10 dioptres vertical prism in each (opposite to each other). One eye saw a small flashing cross which could be moved with a joystick. The other eye saw a larger cross with the center missing. Each was seen monocularly but superimposed by the prism. The small cross could be aligned to fit into the "hole" in the large cross. The students lined them up themselves using the joystick and pressed a button on it when they were finished. Again the phorias were then calculated and recorded by the computer.

7) *Fusional Vergence:* Vergence testing was done with the same setup, but with concentric rectangles used as targets. These were fused by the students, providing a 3-D image. The targets were slowly separated using the joystick until fusion could not be maintained and diplopia resulted or the 3-D effect was lost. Both convergence and divergence were evaluated in this way.

8) *Saccadic Versions:* Saccadic version testing was done with three tests. Two are similar to the Pierce saccadic tests and evaluate gross saccades. The other is intended to evaluate fine saccades. With the first two tests, numbers were displayed in two columns, one on each side of the screen. On the first test a series of dots ran from the number on the left to the number on the right at the same level. On the second test no dots were provided. Students were asked to read the number on the left, then right, then to drop down a row and to repeat the procedure until finished. The third test consisted of a series of short vertical lines which the students were asked to count without pointing at them. All three tests were timed by the computer.

Results

To evaluate the effectiveness of the program it was necessary to assess how repeatable the results were, as well as assessing how accurately the program identified those students who do, and do not, have the conditions being screened for.

To assess the reliability or repeatability of the results, correlation coefficients were calculated using the results of both screening sessions. Ideally, there should be a perfectly linear relationship between the results of the two screening sessions. A pass or fail result on the first session should be repeated on the second session. Table 1 shows the reliability coefficients for the screening subtests. Visual acuity, stereoacuity, accommodative facility, near lateral phoria, and the positive fusional vergence limit tests all show very good repeatability. Distance lateral phoria, near vertical phoria, the accommodative test for hyperopia, and the negative fusional vergence limit tests show moderately good repeatability.

Table 1
Screening Test Reliability

	PHI Coefficient		
Test	**Age 7-16**	**Age 10-16**	**Age 7-9**
20/20 (6/6) VA	+0.6	+0.6	+0.6
20/30 (6/9) VA	+0.7	+0.7	+0.6
Stereoacuity	+0.5	+0.6	+0.3
Accommodation	+0.4	+0.4	+0.4
Accom. Facility	+0.5	+0.7	+0.4
Distance Phoria	+0.3	+0.5	-0.2
Near Phoria	+0.8	+0.9	+0.7
Vertical Phoria	+0.3	+0.4	+0.2
Pos. Fus. Vergence	+0.6	+0.5	+0.7
Neg. Fus. Vergence	+0.2	+0.3	+0.1
Saccadic Version	+0.7	+0.7	+0.6

To determine whether age had an effect on the reliability of the results, correlation coefficients were calculated for the students aged 7-9 and the students aged 10-16. These are also shown in Table 1. It can be seen that the reliability coefficient is

generally lower for the younger students. However, the visual acuity, near lateral phoria, saccadic version, and positive fusional vergence coefficients for the younger age group are still statistically significant at the .05 significance level. The accommodation and accommodative facility test reliability coefficients are significant at the .1 level. The remainder of the test results (distance lateral phoria, near vertical phoria, and negative fusional vergence limit) with lower coefficients are not statistically significant for this age group.

Table 2 represents the screening test validity coefficients. This was determined by correlating the results of the screening subtests with the results of the corresponding optometric tests performed under habitual conditions. The visual acuity screening test was evaluated against whether or not the student had any significant amounts of myopia or astigmatism. The accommodation test was evaluated against whether the student had any significant amounts of hyperopia. All other screening tests, except the saccadic version tests, were evaluated against the corresponding optometric test.

TABLE 2
Screening Test Validity

Test	PHI Coefficient Age 7-16
20/20 (6/6) VA	+0.5
20/30 (6/9) VA	+0.5
Stereoacuity	+0.5
Accommodation	+0.4
Acc. Facility	+0.7
Distance Phoria	-0.1
Near Phoria	+0.7
Vertical Phoria	-0.2
Pos. Fus. Vergence	+0.2
Neg. Fus. Vergence	+0.1

The visual acuity, stereoacuity, accommodative facility, and near lateral phoria tests all showed good correlation with the optometric tests. The test for hyperopia showed moderately good correlation. The tests for distance lateral phoria, vertical phoria, and positive and negative fusional vergence limits showed very poor correlation.

The saccadic version screening procedures were not evaluated against the optometric examination results because, short of having an eye movement monitoring device such as the Eye-Trac, a reliable objective assessment method does not exist. Instead, optometrists subjectively assess saccadic performance by watching for overshoots and undershoots while the patient alternately fixates targets. It was felt that comparing the screening results with non standardized subjective test results would not be satisfactory. Therefore age norms were developed for the screening test and students were failed if their results were greater than one standard deviation from the mean for their age.

Correlation coefficients give an indication of how accurately the screening test evaluated the population, but they do not indicate how many of those incorrectly screened were failed when they should have passed (false positives), or passed when they should have failed (false negatives). Table 3 provides this information, showing the sensitivity and specificity of those procedures which correlated well with the optometric examination. The pass/fail criteria used to determine the sensitivity and specificity of the screening results are shown in table 5. Sensitivity is the proportion of students who have the condition for which the test screened and who were correctly identified by the test. Specificity is the proportion of the students who do not have the condition and who were correctly identified by the test.[6,7,8] It can be seen that the sensitivity and specificity of all of these test procedures is good.

The predictive value of a positive test when all of the subtests are combined is 82%. This is the percentage of students who failed the screening and actually have a visual disorder. The predictive value of a negative test is 89%. This is the percentage of students who passed the whole screening program and do not have any visual disorder.[6, 8]

Table 3
Screening Test Sensitivity and Specificity

Test	Sensitivity (%)	Specificity (%)
20/20 (6/6) VA	94	74
20/30 (6/9) VA	84	86
Stereoacuity	95	82
Accommodation	80	90
Accom. Facility	93	95
Near Phoria	75	98

Positive Predictive Value for Complete Battery = 82%
Negative Predictive Value for Complete Battery = 89%

Discussion

This computer program is a prototype, developed to assess the effectiveness of using a computer for vision screening. As a result it was designed to test as many aspects of vision as possible. The intent was to determine which tests worked well and what criteria would be the most accurate at identifying visual conditions in the population. These could then be consolidated into a screening program which could be made available to schools, public health units, and other institutions which are presently using screening "systems" such as the Snellen Chart which are not comprehensive enough or accurate enough to provide a sound basis for referral or non-referral to optometrists.[2, 3, 5, 7, 11]

The results of this study show that the screening program accurately and reliably identified those children with significant amounts of myopia, astigmatism, hyperopia, poor stereoacuity, poor binocular fusion, poor accommodative facility, and near ocular alignment disorders. Table 4 shows the overall effectiveness of the program in these areas. When compared against the results of the optometric examination, only eight students were incorrectly failed and only four were incorrectly passed. The

other sixty-nine were correctly identified. It must be remembered that the screening results were compared against the results of the optometric tests done under habitual conditions.

Table 4
Overall Results of Screening Program Compared to Results of Optometric Examination for All 81 Students

		Optometric Evaluation	
		Fail	Pass
Screening Evaluation	Fail	36	8
	Pass	4	32

The screening procedures which did not work well were the distance lateral phoria, the near vertical phoria, and the positive and negative fusional vergence limits. The distance lateral phoria showed fairly good repeatability, but was not accurate when compared with the optometric results. For both screening sessions, the maximum phoria measured was one prism dioptre. Although 4 dioptres of vertical prism was used to attempt to dissociate the eyes, enough peripheral fusion was maintained to keep the eyes from actually doing so. The result was that most students were found to be orthophoric when measured this way, regardless of the phoria results obtained from the optometric examination.

The near vertical phoria was found to have no correlation with the results of the optometric examination. The problem appears to be due to poor control of fixation distance. Each child was initially placed the correct distance from the computer screen, however no device was used to ensure that this distance was maintained. The goggles the students wore contained 20 dioptres of vertical prism to fuse the two halves of the screen. With this much prism, a movement of just 2.5 cm would cause a 1 dioptre error in the phoria measurement. When dealing with vertical phorias this is a significant error. Better control of fixation distance should remedy this problem.

A good correlation was not found between the results of the fusional vergence limit screening tests and the optometric evaluation of fusional vergence limits. The reason seems to be in the administration of these tests. The animation was programmed so that the targets could only be separated at one speed, which turned out to be a little too fast for many of the students to maintain fusion. Therefore the operator separated the targets by an increment, asked the student if the targets were still fused and single, and continued in this process until diplopia resulted or the 3-D effect was lost. The increment of separation was controlled by the operator and may have varied from student to student. The fact that the near lateral phoria screening measurement correlated so closely with the optometric test indicates that variables such as peripheral fusion were not a significant factor in that test, and shouldn't be in this test either since conditions were exactly the same. In theory then, the fusional vergence tests should correlate just as well as the lateral phoria did if the animated separation were to be slowed down and made smoother to more closely simulate the Risley prism separation used in the optometric test.

The accommodation test to screen for hyperopia showed only moderately good correlation when the reliability and validity were evaluated, yet the sensitivity and specificity were very good. This seems contradictory at first glance, but is explained when it is realized that there were very few hyperopic children in the population. The screening accurately identified 8 of the 9 hyperopic eyes in the population. Twenty of the eyes which were not significantly hyperopic were incorrectly identified, indicating these students could read the acuity line when they shouldn't have been able to. These students were hyperopic and close to, but not over, the cut off point used to identify significant amounts of hyperopia, shown in table 5. These "errors" lowered the correlation coefficients, but because all but one were false positives and the population of true negatives was so large, the sensitivity and specificity remained high.

Table 5
Pass/Fail Criteria

Condition	Screening	Optometric Exam
Myopia/Astigmatism	≥ 20/20 (6/6) VA or ≥ 20/30 (6/9) VA	≥ -0.50D myopia or ≥ -1.00D astimagtism
Hyperopia	≤ 20/45 (6/13.5) VA through +1.50D	≥ +1.50D hyperopia
Accommodative Facility	< 6 cycles/minute	< 6 cycles/minute
Stereoacuity	> 63 sec. arc.	> 60 sec. arc
Distance Esophoria	> 5 prism dioptres	> 5 prism dioptres
Distance Exophoria	> 5 p.d.	> 5 p.d.
Near Esophoria	> 6 p.d.	> 6 p.d.
Near Exophoria	> 10 p.d.	> 10 p.d.
Vertical Phoria (N & D)	≥ 2 p.d.	≥ 2 p.d.
Saccadic Vergence	> 1 S.D. from age means	

The visual acuity test was used as an indication of the amount of myopia and astigmatism present. Two different letter sizes were used and each was evaluated separately to determine which size provided the best referral criterion. Both sizes had the same validity; however, the 20/30 (6/9) letters provided slightly higher repeatability and more equal sensitivity and specificity. Therefore it was deemed to be the most accurate and reliable referral criterion.

The screening program was designed to minimize the amount of knowledge an operator would require to carry out the screening accurately. The operator who carried out the screening was a unversity student in a non-health care field with no previous experience with computers. His preparation for the screening consisted of having the program demonstrated to him. When the program was run, instructions for the operator were automatically presented at appropriate times and the results of the testing were automatically recorded. The use of

cross polarized lenses in sports frames with elasticized head bands, and the cross polarized screen over the monitor eliminated the need to use an occluder or hand held lenses. All of this served to make the role of the operator simpler and easier. He did not have to watch the children closely to make sure they were not peeking around an occluder, did not have to worry about accurately recording and organizing results and did not have to worry about memorizing test protocol. The operator reported no difficulty in understanding how to carry out the tests, or in actually doing the screening, despite the difficulties encountered with the fusional vergence tests.

An unexpected bonus to using the computer as the presentation medium was that the students were interested in what was being done and anxious to participate and use the computer. It was common to have students poke their heads into the room between classes and ask when they could have their eyes tested. As a result, compliance with the operator's instructions was very good, although he did find it easier to work with the children over eight years old because he could communicate with them better.

A lot of tests were put into the program, but because all of the testing was done on one machine and was done automatically in orderly succession, the time taken on each student was relatively short. We averaged 15 minutes per student but that included the time taken to send each student back to class and have another sent to the examination room. The average testing time was closer to 10 minutes. Obviously, sending students in groups to the screening area would speed the process up. For large student populations several computers could be set up and run simultaneously, thereby permitting the screening of far more students per hour than with one station.

Conclusion

The purpose of a screening program is actually not to diagnose visual disorders, but rather to identify those persons in a population who have a high probability of having a visual disorder so that these individuals may be referred for a comprehensive diagnostic assessment and, if necessary, treatment. The screening procedures utilized in this study did this accurately and repeatably for the following conditions: myopia, astigmatism, hyperopia, anisometropia, binocular fusion, stereoacuity, accommodative facility, near ocular alignment, and saccadic version performance. A good screening program must not only be accurate and repeatable, it must also be fast, inexpensive, and easy to use for individual and mass screenings. This study shows that a computer-based vision screening program presently can fulfil all of these requirements.

Acknowledgement

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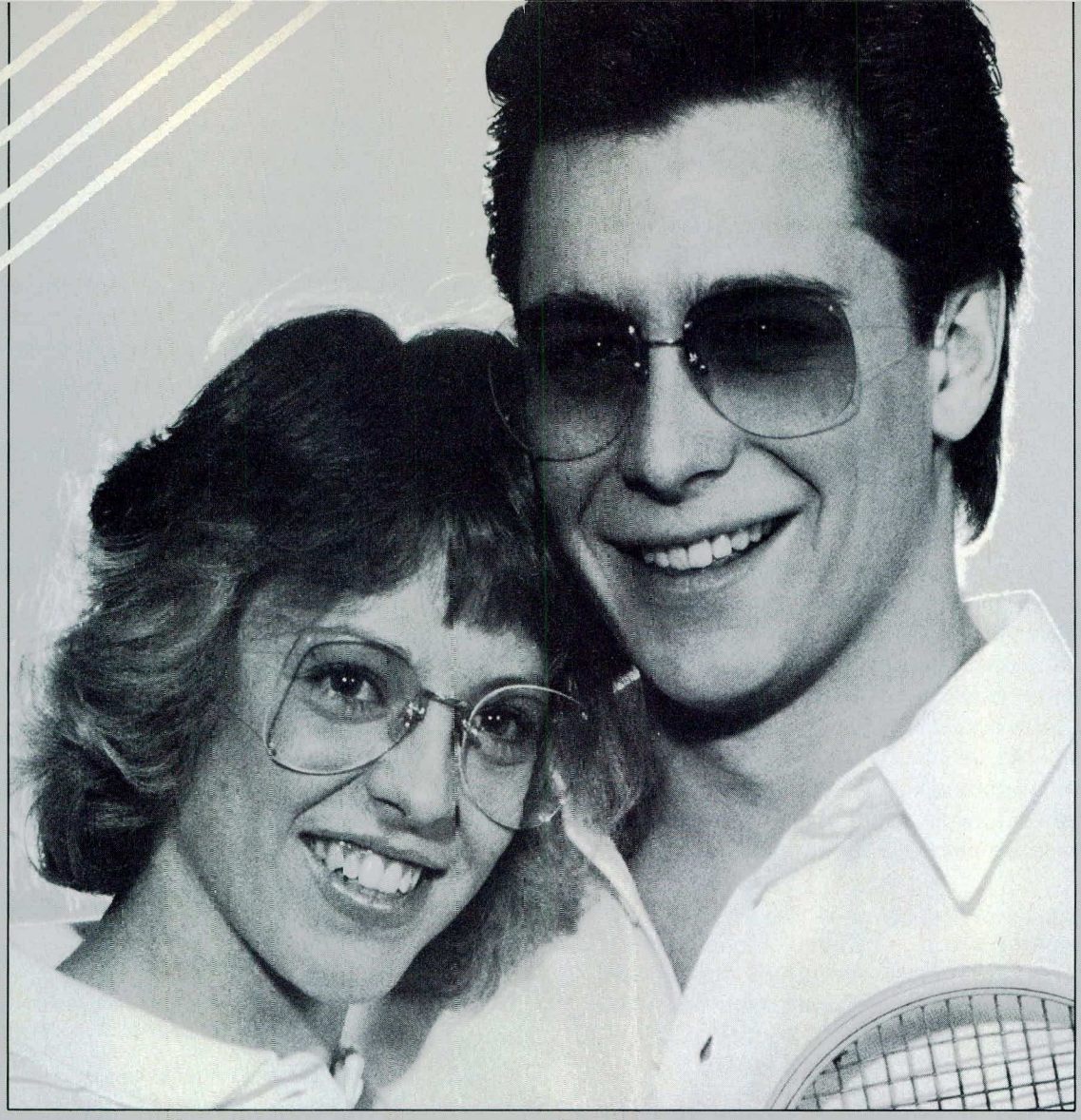

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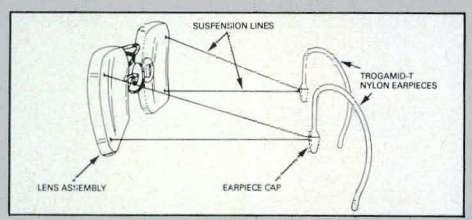

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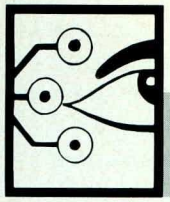

RESEARCH

Constituents of Ophthalmic Preparations

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M. Doughty***

Ophthalmic solutions and ointments

Eyedrops are sterile aqueous liquids, usually solutions or suspensions of electrolytes and polymers with additional ingredients. The ophthalmic preparations discussed here are designed for instillation into the conjunctival cul-de-sac and must be initially sterile. Preparations used to clean or disinfect contact lenses are not intended for direct application to the eye. Ophthalmic preparations usually contain pharmaceutical adjuvants such as antioxidants, buffers, complexing agents, excipients, preservatives, stabilizing agents, suspending agents, tonicity agents and viscosity enhancers that are designed to assist in the formulation or stability of the product rather than for their therapeutic effect. The properties of some adjuvants enable them to perform several functions even though the specific substance is incorporated mainly for one of its roles.

The following types of ingredients may be included in ophthalmic preparations or in products designed for use with contact lenses:

(1) Adjuvants enhance the action or help delay the deterioration of the principal ingredients and include agents such as polyethylene glycol and povidone (polyvinyl pyrrolidone).

(2) Chelating, complexing or sequestering agents such as disodium edetate help to remove divalent metal ions and aid the action of preservatives and antibacterials.

(3) Suspending agents[1] include: aluminum monostearate, aluminum tristearate, carboxymethylcellulose, gelatin, glyceryl monostearate, hydroxyethylcellulose, hydroxypropylcellulose, hydroxypropylmethylcellulose, liquid petrolatum, methylcellulose, polyvinyl alcohol, povidone, polyoxyl-40 stearate and propylene glycol. (See also drug vehicles).

(4) Antioxidants and stabilizers may be thought of as preservatives because they help to keep the preparations in its preferred state. The antioxidants inhibit the interaction between oxygen and the active ingredient.[1] Antioxidants include: ascorbic acid, isoascorbic acid (erythorbic acid), N-acetyl cysteine, sodium bisulfite, sodium metabisulfite, sodium thiosulfate and thiourea. Epinephrine, phenylephrine, ephedrine and physostigmine require the presence of antioxidants. Disodium edetate is a chelating agent which stabilizes the activity of antioxidants.[2]

(5) The purpose of a vehicle is to carry the drug. To do so effectively in ophthalmic preparations, the vehicle should be: non-toxic, compatible with the active ingredients, optically transparent and have a suitable refractive index, pH, tonicity, viscosity, wetting ability and emolliency. The solvent vehicle for ophthalmic solutions is usually aqueous or saline in nature but often contains some polyethlene glycol, cellulose derivatives, ethyl alcohol, glycerol, isopropyl alcohol, polyvinyl alcohol, and mixtures of these and other substances. (See also suspending agents).

(6) Excipients are inert substances which are added to modify the form or consistency of the preparation and to provide bulk. E.g. carboxymethylcellulose, hydroxypropyl methylcellulose, mannitol.

(7) Buffering agents stabilize solutions against pH changes which would otherwise be produced by the addition of acids or bases either from other drugs or from body secretions. Buffers by donating or accepting hydrogen ions enable a solution to resist change in pH when small quantities of acids or alkalis are added. As salts the alkaloids and other organic electrolytes have improved stability, better solubility and cause less irritation when in a slightly acid

* Optometrist, PhD, FAAO
Member of Faculty
School of Optometry, University of Waterloo

** BScPhm, Pharmacist

*** PhD, Biochemist
Member of Faculty
School of Optometry, University of Waterloo

solution.[3] Most alkaloid drugs (as the salt) are 100 times more stable at pH5 than at pH7. Making a solution more alkaline increases the amount of lipid-soluble, undissociated, alkaloidal free base. The more alkaline a drug is the less stable it is but the better it penetrates the cornea.[4] To adjust the pH of a solution, hydrochloric acid or sodium hydroxide may be added. The pK indicates the ionization constant of an acid. A buffer system has its greatest buffering power when its pK equals the pH.

$$pH = pK + \log \frac{\text{concentration of salt}}{\text{concentration of acid}}$$

Buffers decrease pain, promote drug stability and preserve the therapeutic action of the drug[5] but for ophthalmic solutions only low buffering capacity should be sought.[3] This allows the tears to make small adjustments in pH as required.[6] Tears are good buffers because they contain about 1% protein. Table 1 shows buffer pairs[1,7,8] which may be employed in the make-up of a buffering agent:

Table 1
Buffers

Acid or Base	Salt	Remarks
acetic acid CH_3COOH	sodium acetate $CH_3COONa.3H_2O$	Acetate buffers are most effective at a pH of 4 or 5. The pK of acetic acid is 4.8. The concentration of acetic acid used in buffers ranges from 0.2% to 1%. Acetate buffers are incompatible with some other components.
barbital $C_8H_{12}N_2O_3$	barbital sodium $NaC_8H_{11}N_2O_3$	Barbiturate buffers are used in a few ophthalmic products.
boric acid H_3BO_3	sodium borate $Na_2B_4O_7.10H_2O$ = borax	The concentration of boric acid ranges from 0.5% to 2.62% and that of borax from 0.05% to 0.41% The pH ranges from 7.4 to 9.0.
boric acid H_3BO_3	potassium tetraborate $K_2B_4O_7.4HO$	Borate buffers are used for solutions of alkaloidal salts and may be used for salts of benoxinate, cocaine, phenylephrine, proparacaine, tetracaine and zinc.[9] Borate buffers are not advised for use with pilocarpine intended for home application[4]; use instead a phosphate buffer with a pH of 6.8.
sodium hydroxide NaOh	borax $Na_2B_4O_7.10H_2O$	This combination gives a buffer with a pH range from 9.3 to 10.1. Borate buffers should not be used for sodium fluorescein, sulfonamides,[9] on other alkaline drugs; use distilled water instead. Borate buffers are incompatible with benzalkonium chloride and should not be used with alkaline products containing polyvinyl alcohol as gummy deposits will form on hard contact lenses. Borate buffers are preferred for the solutions used with soft contact lenses.[8]

citric acid $C_6H_8O_7$	sodium citrate $Na_3O_6H_5O_7.2H_2O$.	The citric acid concentration may range from 1% to 2% and the sodium citrate from 0.17% to 0.3%. Citrate buffers are volatile and can be incompatible with other components. The pH range is 3.0 to 6.6. Citrate buffers are incompatible with divalent cations.
citric acid $C_6H_8O_7$	potassium citrate $K_3O_6H_5O_7.H_2O$	
monobasic potassium phosphate KH_2PO_4	dibasic potassium phosphate K_2HPO_4	Phosphate buffers (pH range 5.8 to 8.0) are suitable for use with most alkaline ophthalmic drugs e.g. pilocarpine solutions. [5, 9]
sodium phosphate NaH_2PO_4	dibasic sodium phosphate $Na_2HPO_4.12H_2O$. (or anhydrous)	Phosphate buffers decrease the immediate pain response to pilocarpine.[4] Solutions of pilocarpine hydrochloride or epinephrine bitartrarte at a pH of about 6.8 should be buffered to improve comfort.[9] Phosphate buffers have also been advised for use with atropine, ephedrine, homatropine and scopolamine.

Buffers may also be made up with dextrose (glucose) or disodium edetate.

(8) Demulcents and viscosity enhancing agents serve several purposes.[1] Demulcents are hydrophilic colloids, they act as "substitutes" for mucin, they protect and lubricate the ocular surface which has a mucin layer and they help to alleviate dryness and irritation.[10] Because their molecules assume a particular orientation and attract water to a surface demulcents cause surfaces to become more hydrophilic. Viscosity enhancers help to put and to keep a coating on the surface of hydrophobic lenses. Demulcents, being water soluble polymers, also act as cushioning agents for contact lens wear and facilitate handling of contact lenses. Demulcents increase viscosity and are commonly present in preparations described as comfort, lubricating or rewetting solutions for use with contact lenses. Although viscosity enhancers are water soluable they decrease the fluidity of the tear film and can lengthen the contact time of a drug on the eye. However, the retention time of drugs on the eye is mostly determined by the rate of tear production. The viscosity enhancers include several cellulose derivatives, dextran 70, gelatin and the liquid polyols including: glycerol, polyethlene glycol 300 or 400, polysorbate 80 (= Tween 80), polyoxyl-40 stearate, propylene glycol, polyvinyl alcohol, polyvinyl glycol and povidone.[10]

(9) Wetting agents, like the demulcents, have some ability to change a hydrophobic surface (e.g., a contact lens or the cornea) into a hydrophilic one. A deficiency of either the aqueous or mucin layer of the tear film causes a dry eye. Wetting agents mimic the action of mucin, they interact with the surface, they orient their lipophilic end toward the corneal surface or toward a rigid contact lens and direct their hydrophilic end toward the aqueous portion of the tear film. Wetting solutions may be used with or without viscosity enhancers. A viscosity enhancer increases the thickness of the tear film and acting as a demulcent, helps to make a hydrophobic lens more tolerable on the eye. Hard lenses require a wetting agent when first placed on the eye each day. Tears contain sialomucin which functions as a natural wetting agent. Common wetting agents are: polyvinyl alcohol, povidone, polyethylene glycols, and polysorbate 80.

(10) Surface-active agents concentrate at surfaces, these surfactants lower interfacial tension, have a detergent-type cleaning action and facilitate corneal wetting but their effect is short lived (minutes). Surfactants lower the surface tension of a solution and some improve the comfort of ophthalmic solutions, they include:

(a) Anionic agents, e.g., soaps, are effective cleaners of hard and soft lenses and have some antibacterial action against gram-positive and acid-fast bacteria but little against gram-negative bacteria. The anionic agents are incompatible with many ingredients, e.g., benzalkonium chloride and they irritate the eyes,[9] but have been used with hard lenses because of the belief that particles attached to the lens surface are positively charged so a negatively charged

cleaner should be effective. The skin cleanser pHisoHex contains sodium octylphenoxyethoxyethyl ether sulfonate plus hexachlorophene. It must not contact the eye.

(b) Cationic surfactants e.g. benzalkonium chloride have their hydrophobic moiety in the cation. They can be effective antibacterials, but they do not inhibit viruses. Generally they should not be used with soft lenses.

(c) Nonionic surfactants are not incorporated for their antibacterial ability but are useful as cleaners. They facilitate the cleaning of contact lenses and do not interact with the lens material but some have an adverse effect on the antibacterial activity of preservatives. The poloxamers are nonionic surfactants.

(d) Amphoteric or ampholytic surfactants may be useful but their activity depends on the pH which can shift them toward becoming anionic or cationic.

Surfactants reduce the size of the drops which are produced when one squeezes a drop bottle.[9] Small drops of medication are more effective than large drops. Surfactants by lowering surface tension increase the penetration of drugs into the eye[11] and help to solubilize (in micelles) ingredients of poor water solubility.[12] They are useful because of their antibacterial activity and their detergent action. They include: alkyltriethanolammonium chloride, benzalkonium chloride, benzethonium chloride, chlorhexidine, myristyl-gamma-picolinium chloride,[1] oxyethylene octyphenol, oxyphenol, propanediol, poloxamer 188, poloxamer 407, polysorbate 80, polyoxyl-40 stearate and polyethylene glycols.

(11) Components whose purpose is to raise the osmotic pressure of lacrimal fluids need to be used at a fairly high concentration if they are to function as ocular hypertonicity agents.[1] By increasing the movement of water out of the cornea they decrease corneal edema.[10] For ophthalmic solutions the eye can tolerate a tonicity equivalent to that of sodium chloride solutions ranging from 0.5% to 1.5%. Suitable tonicity agents are: calcium chloride, dextrose, glycerol, mannitol, magnesium chloride, potassium chloride and sodium chloride.

(12) Astringents act locally to precipitate protein and thus help to clear mucus from the eye. Zinc sulfate and antipyrine are employed. Some preparations contain an infusion of rose petals but the usefulness of this infusion is questionable.

(13) Vasoconstrictors produce transient constriction of the conjunctival blood vessels. The commonly used vasoconstrictors are: ephedrine, epinephrine, hydrastine, naphazoline, oxymetazoline, phenylephrine, tetrahydrozoline, xylometazoline and possibly zinc sulfate. More than 350,000 liters of ophthalmic vasoconstrictors are dispensed each year in U.S.A.[13] Rebound hyperemia follows one to four hours after the application of a vasoconstrictor.

(14) Antihistamines are relatively ineffective histamine antagonists when applied topically. Most have a little local anesthetic activity. The following antihistamines are present in some ophthalmic preparations: antazoline hydrochloride (or the sulfate or the phosphate), chlorpheniramine maleate, pheniramine maleate and pyrilamine maleate.

(15) Ocular anesthetics are rarely present in over-the-counter preparations but are routinely applied by eyecare practitioners. Examples are: amylocaine, antipyrine, benoxinate, cocaine (rarely), menthol, phenacaine, piperocaine, proparacaine and tetracaine. Benzyl alcohol and chlorobutanol are principally used as preservatives but have some local anesthetic action and so do some beta blockers and some antihistamines, e.g., pyrilamine.

(16) Antimicrobial agents inhibit the multiplication of microorganisms. Whether an antibacterial agent is bactericidal or bacteriostatic depends not only on the local concentration of the agent but on the strain of bacteria, the temperature, and the presence of other materials as well as other less important factors. Some antibacterials are only questionably effective for example: boric acid, methylene blue, mild silver protein, sorbic acid, yellow mercuric oxide and zinc sulfate. Modern topical anti-infectives (mostly antibiotics) are more potent and these include bacitracin, chloramphenicol, erythromycin, gentamycin, neomycin and polymyxin B as well as sulfacetamide and vidarabine.

(17) Another role for antibacterial agents in these ophthalmic preparations is the preservation of solutions.[14] Here the concept of a preservative is understood to mean performing an antibacterial role. The purpose of the antibacterial agent in these ophthalmic preparations is to inhibit the multiplication of any microorganisms that gain entry into the opened container. F.D.A. guidelines in U.S.A. require that the antimicrobial preservative be capable of reducing an inoculum of 10^5 to 10^6 organisms/ml (*S.aureus, P. aeruginosa, A. niger, E. coli* and *Candida albicans*) to no more than 0.1% of the initial concentration of viable bacteria by the 14th day. The concentration of viable yeasts and molds must remain at or below the initial concentration during the first 14 days. The concentration of each test organism must remain at or below these levels during the

remainder of the 28 day test period.[15] Ophthalmic solutions must be sterile when packaged but become contaminated (2.5% to 44%) when the bottle is opened.[15] Antimicrobial preservatives in the preparation are responsible for restoring the sterility of the solution in spite of the entry of a small number of microorganisms. The viruses, spores and most of the fungi are not inhibited by these preservatives at the usual concentration. To sterilize ophthalmic solutions autoclaving is effective against all these organisms but some solutions cannot be autoclaved. In many cases the effectiveness of the antibacterial is enhanced by the addition of disodium edetate. Most single preservatives are slow acting and many have a narrow spectrum. The presence of a preservative in no way diminishes the need for correct technique to avoid contaminating ophthalmic solutions. Preservatives should have little tendency to induce sensitization, be compatible with the other components and be chemically stable.[3] Although increasing the preservative concentration in an ophthalmic solution increases its ability to inhibit microorganisms the concentration can not be increased to the point where the preservative harms the eye. Preservatives which bind to contact lenses may concentrate there and then be released on the eye and be harmful. Some preservatives can interact with plastic containers and with plastic lenses. Preservatives used to maintain sterility of ophthalmic solutions include: [1, 16-20]

(a) Quaternary ammonium compounds (present in about 40%) include: alkyltriethanol ammonium chloride, benzalkonium chloride, benzethonium chloride, cetrimide and cetylpyridinium chloride.

(b) Mercurials[19, 21, 22] (present in about 20%): nitromersol, phenylmercuric acetate, phenylmercuric nitrate and thimerosal.

(c) Alcohols[19] (present in about 25%): benzyl alcohol, chlorobutanol, isopropyl alcohol, phenoxyethanol and phenylethyl alcohol.

(d) Esters of parahydroxybenzoic acid[19]. These parabens include methyl, ethyl, propyl and butyl derivatives. They are rarely used alone and are not very effective against bacteria but better against fungi.

(e) Other antibacterial preservatives are: boric acid, camphor, chlorhexidine, chlorocresol, disodium edetate, methylene blue, parachlorometaxylenol, picolinium chloride, polymyxin B sulfate, salicylic acid, silver protein, sodium benzoate, sodium borate, sodium perborate, sorbic acid and zinc sulfanilate.

Some ophthalmic products are packaged in unit-dosage format. They are sterilized in the container and contain no preservatives. The absence of preservatives is an advantage if the patient is known (or thought to be) hypersensitive to preservatives. Of course such preparations must be used once only and on only one patient. Barkman et al. recommend not using preservatives and discarding opened bottles after two weeks.[14]

(18) Claims have been made that some agents promote wound healing. Examples are: allantoin, cod liver oil, eucalyptus oil and Vitamins A, C, D, and E.

(19) A few ophthalmic preparations include ingredients intended to enhance the appearance or odor of the product but these agents may have adverse effects on the eye and are very seldom appropriate for use on the eye.

(20) A collyrium is an eyewash, a sterile aqueous solution used to irrigate, flush or bathe the eye. Normally it contains no active ingredients but it can be effective for removing foreign material from the surface of the eye.[10] Collyria generally contain water, sodium chloride and/or other tonicity agents, buffers and an antibacterial preservative.

(21) Tear replacements, sometimes called artificial tears, are designed to provide relief of dry eye symptoms. They may also be employed to lubricate an artificial eye. Tear replacements supplement the available tears or substitute for insufficient tears or improve the quality of the tear fluid. Mucomimetic agents should be more helpful in a mucous-deficient eye and water retaining substances (cellulose derivatives) in aqueous deficiencies. Duration of action of commercial tear substitutes is from 45 to 90 minutes. Several commercial products are marketed, most contain sodium chloride, demulcents, emollients, cellulose derivatives, polyvinyl alcohol, povidone and other polymers.

(22) Some drugs are said to help increase tear production: riboflavin and thiamine and all those compounds[23] which aid the synthesis of prostaglandin E_1 namely, ascorbic acid, gamma linolenic acid, niacin, oil of the evening primrose, pyridoxine and zinc.

(23) Some drugs help to retain tears on the eye:
(a) Cellulose derivatives (carboxymethyl, hydroxyethyl, hydroxymethyl, hydroxypropyl, hydroxypropylmethyl and methyl derivatives).
(b) dextran
(c) glycerol, glyceryl monosterate
(d) polyvinyl alcohol

(24) Suspensions by definition consist of solid undissolved microparticles in a liquid or in a semi-solid such as an ointment. They have the advantage of prolonged action and the disadvantage of irritation produced by the

larger particles.[9] Particles should be less than 10 um in size to minimize irritation. Suspensions in liquids must be shaken before use.

(25) Cleaning solutions for hard and soft contact lenses.[24] All solutions to which contact lenses are exposed have some ability to alter lens parameters such as thickness, curvature, wettability, power and diameter. Cleaners tend to be more effective in alkaline solutions and in hypertonic solutions. Cleaning solutions should not be viscous. Cleaners are likely to cause discomfort if they contact the eye directly. Cleaning agents may contain any of the following:

(a) Surfactant molecules have a polar hydrophilic end which is attracted to hydrophilic material and a nonpolar, lipophilic portion which becomes attached to lipid material. Surfactants clean soft lenses more easily in a hypertonic solution. (See earlier section on surface active agents). Daily cleaners usually contain surfactants.

(b) Enzymatic cleaners (periodic cleaners) will remove protein and lipid deposits which surfactants will not and include:
pancreatic enzymes —
protein specific enzymes — papain. (See also lactose)
lipid specific enzymes — lipases. Lipids may also be removed by isopropyl alcohol. Residues of enzymatic cleaners have caused sensitivity reactions when allowed to contact the eye.

(c) Oxidizing agents are usually effective cleaners and disinfectants for hydrogel lenses but can damage some contact lenses and will irritate the eye if allowed to contact it. The available types are:
peroxides — hydrogen peroxide or sodium peroxide
peroxy salts — sodium perborate
chlorine releasing — sodium hypochlorite

(d) Chelating agents help to remove ionic materials.

(26) Soaking and storage solutions.
These solutions keep the lens in a hydrated state thereby allowing the lens to retain its specified curvature and thickness and they prevent tear film contents from drying on the lens surfaces. Storage solutions must contain an appropriate antibacterial agent or agents. Soaking solutions are used with hydrogel lenses and with hard lenses.

(27) Rinsing solutions are always used with hydrogel lenses. Some advise using a fresh application of the same solution that was used for soaking the lenses but others recommend use of a solution with less preservative, otherwise too much preservative may be transferred to the eye.

(28) Ophthalmic ointments are sterile preparations in a semi-solid dosage form. The ointment serves as a vehicle, lubricant and cushioning agent in which active medicinal substances may be suspended. The non-polar components of ointments facilitate the adsorption of the ointment to the cornea. Ointments are likely to contain complexing agents which aid in product formulation. Typical ointment adjuncts are lanolin and the polyethylene glycols. Lanolin absorbs water and thus helps to retain water-soluble drugs in the ointment. The ointment bases consist mostly of white petrolatum (about 60%) and mineral oil (about 40%) and these act as lubricants and emollilents. Emollients in ointments soften tissues and protect them by preventing drying and cracking. They either supply moisture to a tissue or act as a moisture barrier to inhibit evaporation. The emollients consist of fats, waxes or oils and include: oleaginous preparations, beeswax, oils, white ointment, white soft paraffin (i.e. bleached petrolatum), petrolatum, white wax and lanolin. Ointments blur vision transiently when applied to the eye. Contrary to earlier reports ophthalmic ointments in small doses do not inhibit corneal healing,[25] although they do reduce tear break-up time (BUT).[26] Ointments increase ocular contact time due to their viscous nature.[27-29] Ointments typically remain on the eye at least 3 times as long as saline solutions. One way to avoid some problems is to use aqueous solutions for daytime application and an ointment for nighttime application.

In the United States, the Food and Drug Administration (FDA) has compiled a list of hundreds of Inactive Ingredients for Approved Prescription Drug Products.[30] The length of this list emphasizes that it may not always be the "active" ingredient in a preparation that is responsible for an unwanted reaction.

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Evaluation de L'indice de Réfraction sur une Lentille Ophtalmique Mince

P. Simonet*

Abstract

The refraction index of a thin ophthalmic lens could be theoretically determined by power measurements with a focimeter and a lens measure. The lack of precision of the lens measure is the principal limit of this method. Nevertheless, the technique permits, in practice, the magnitude of the refraction index to be obtained.

Résumé

Il est démontré que l'indice de réfraction d'une lentille mince peut théoriquement être obtenu à partir de la mesure de la puissance au focomètre et au sphéromètre. Cette méthode est toutefois limitée par l'imprécision qui peut exister sur la puissance sphérométrique, néanmoins elle permet en pratique d'obtenir l'ordre de grandeur de cet indice de réfraction.

De nombreux matériaux ophtalmiques ont été mis sur le marché au cours des dernières années[1]. Les praticiens disposent maintenant, pour la fabrication de lentilles ophtalmiques, d'une certaine diversité dans les indices de réfraction, les constringences et les densités. Ceci est mis à profit particulièrement pour la correction des myopies modérées ou fortes. En effet, l'utilisation d'un matériel à fort indice, dont l'ordre de grandeur peut varier de 1,6 à 1,8 environ, permet de réduire sensiblement l'épaisseur au bord des lentilles concaves.

Toutefois, cette diversité n'est pas sans poser certains problèmes aux cliniciens. Il devient difficile de savoir si un laboratoire a bien fourni, parmi la gamme des indices, celui désiré. De plus, il est pratiquemment impossible de déterminer dans quel matériel sont fabriquées des lentilles que porte déjà un patient. Dans ce dernier cas, la connaissance de l'indice de réfraction est pourtant primordiale pour obtenir des résultats similaires au plan mécanique comme au plan optique[2].

Si l'indice de réfraction s'avère une information utile au clinicien, la détermination de l'ordre de grandeur de cet indice peut néanmoins être suffisante, en autant que la technique d'évaluation soit rapide, qu'elle ne fasse pas appel à une instrumentation sophistiquée, et qu'elle demeure réalisable dans le cadre de la pratique quotidienne.

*Optométriste, M.S., F.A.A.O.
Professeur adjoint
Ecole d'Optométrie
Université de Montréal

Dans ces conditions, il est possible pour un clinicien d'effectuer l'évaluation de l'indice de réfraction d'une lentille mince. Ces lentilles, utilisées chez le myope, sont d'ailleurs les plus susceptibles de présenter un fort indice.

Méthode

L'utilisation d'un focomètre et d'un sphéromètre permet, sur une lentille mince, de déterminer en pratique l'ordre de grandeur de l'indice de réfraction.

Cette méthode repose sur les bases théoriques suivantes:

La puissance frontale arrière (F'_f) d'une lentille, telle que mesurée au focomètre, s'exprime en fonction de son indice (η), de son épaisseur (e) et en fonction des puissances de ses faces (F_1, F_2) selon la formule suivante:

$$F'_f = \frac{F_1}{1 - \frac{e}{\eta} F_1} + F_2 \qquad (1)$$

Si la lentille est mince, on considère que la puissance frontale devient:

$$F'_f = F_1 + F_2 \qquad (2)$$

Si on exprime la puissance de chaque face en fonction du rayon de courbure (R) et de l'indice (n), on obtient à partir de l'équation (2):

$$F'_f = \frac{\eta - 1}{R_1} + \frac{1 - \eta}{R_2}$$

ou $$F'_f = (\eta - 1)\left(\frac{1}{R_1} - \frac{1}{R_2}\right) \quad (3)$$

En utilisant un sphéromètre étalonné pour un indice ηa, on obtient pour chaque face de la lentille, une puissance de surface apparente, soit:

$$F_{1a} = \frac{\eta a - 1}{R_1} \text{ et } F_{2a} = \frac{1 - \eta a}{R_2}$$

La puissance sphérométrique (F_S) de la lentille représente la somme des puissances de chaque face, soit:

$$F_S = F_{1a} + F_{2a}$$

$$F_S = (\eta a - 1)\left(\frac{1}{R_1} - \frac{1}{R_2}\right) \quad (4)$$

Si on transforme les équations (3) et (4), on obtient:

$$\frac{F'_f}{\eta - 1} = \frac{F_S}{\eta a - 1} \quad (5)$$

L'indice d'étalonnage du sphéromètre (ηa) est généralement égal à 1,530. On peut donc modifier l'équation (5) pour obtenir l'indice de réfraction (η) en fonction des deux puissances mesurées, ainsi:

$$\eta = \frac{F'_f \times 0{,}53}{F_S} + 1 \quad (6)$$

Résultats

Un clinicien peut donc aisément évaluer l'indice de réfraction d'une lentille mince à l'aide d'une calculatrice, après avoir mesuré au focomètre la puissance frontale, et après avoir calculé la puissance sphérométrique à partir des mesures au sphéromètre des puissances de surface. Il est possible d'éviter le calcul en utilisant les tables 1 et 2. Sur ces tables apparaissent les valeurs théoriques de la puissance sphérométrique calculées à partir de l'équation (5), pour des puissances frontales de -7 à -10 dioptries (table 1) et de -10,25 à -13,50 dioptries (table 2), variant par quart de dioptrie. Les différents indices de réfraction indiqués correspondent à ceux de matériaux actuellement disponibles sur le marché. Le CR39 et le Crown ont été rapportés pour référence.

Pour une valeur de puissance frontale mesurée au focomètre, le clinicien cherchera sur la ligne correspondante, la valeur théorique de la puissance sphérométrique la plus proche de celle qu'il a obtenue par ses mesures. La colonne où se trouve cette valeur permettra de déterminer l'ordre de grandeur de l'indice de réfraction.

Discussion

En dépit de la simplicité de la méthode, elle ne semble pas avoir été décrite antérieurement. L'équation (5) n'était appliquée que pour obtenir la puissance réelle d'une surface[3] ou pour trouver la vraie puissance sphérométrique[4], elle n'était pas utilisée pour obtenir l'indice de réfraction.

L'utilisation de l'équation (2) plutôt que l'équation (1) introduit une erreur $\triangle F'_f$ telle que:

$$\triangle F'_f = \frac{\frac{e}{\eta} \times (F_1)^2}{1 - \frac{e}{\eta} F_1}$$

Dans le cas d'une lentille concave dont l'épaisseur ne dépasse pas 2,2mm et dont la face avant est peu cambrée, cette erreur est minime. Sa valeur, en ne dépassant pas 0,06 dioptrie, demeure inférieure à l'erreur possible sur une mesure au focomètre.

Si l'évaluation de la puissance frontale (F'_f) s'effectue avec une bonne précision, la valeur de la puissance sphérométrique (F_S) est plus susceptible d'être entachée d'erreur. L'imprécision possible sur l'indice ($\triangle \eta$ et $\triangle' \eta$), attribuable respectivement aux erreurs $\triangle F'_f$ et $\triangle F_S$ sur les mesures de F'_f et F_S, s'obtient à partir de l'équation (5):

$$\triangle \eta = \frac{\triangle F_f \times 0{,}53}{F_S}$$

$$\triangle' \eta = \left(\frac{-\triangle F_S}{F_S + \triangle F_S}\right)(\eta - 1)$$

Les valeurs de $\triangle \eta$ et $\triangle' \eta$ ont été calculées pour chaque puissance frontale apparaissant aux tables 1 et 2, les valeurs choisies pour $\triangle F'_f$ et $\triangle F_S$ sont respectivement 0,12 et 0,25 dioptrie.

L'imprécision sur la puissance sphérométrique constitue la principale limite de la méthode, comme moyen de déterminer la valeur exacte d'un indice de réfraction, particulièrement pour les puissances les moins élevées. Néanmoins, la méthode reste valable pour évaluer l'ordre de grandeur de l'indice parmi la gamme qui existe. L'évaluation sera d'autant plus précise que la mesure de la puissance sphérométrique sera exacte. Or, cette information est suffisante pour le clinicien, d'autant qu'il peut l'utiliser en conjonction avec l'appréciation d'autres considérations techniques telle que la densité.

Table 1
Valeurs théoriques de la puissance sphérométrique (F_S)
Imprécision $\triangle \eta$ et $\triangle' \eta$ sur l'indice de réfraction

Puissance frontale	CR39 η=1,498	Crown η=1,523	Hoya LHI II η=1,60	Hoya LHI I η=1,702	Hoya THI η=1,806
F'_f =	F_S =				
-7,00	-7,45	-7,09	-6,18	-5,28	-4,60
	$\triangle \eta$=0,0085	0,0089	0,0102	0,0120	0,0138
	$\triangle \eta$=0,0161	0,0178	0,0233	0,0317	0,0415
-7,25	-7,72	-7,35	-6,40	-5,47	-4,77
	0,0082	0,0086	0,0099	0,0116	0,0133
	0,0156	0,0172	0,0225	0.0306	0,0401
-7,50	-7,98	-7,60	-6,625	-5,66	-4,99
	0,0079	0,0083	0,0096	0,0112	0,0128
	0,0151	0,0166	0,0218	0,0296	0,0388
-7,75	-8,25	-7,85	-6,85	-5,85	-5,10
	0,0077	0,0080	0,0092	0,0108	0,0124
	0,0146	0,0161	0,0211	0,0287	0,0376
-8,00	-8,51	-8,11	-7,07	-6,04	-5,26
	0,0074	0,0078	0,0090	0,0105	0,0120
	0,0142	0,0156	0,0205	0,0279	0,0365
-8,25	-8,78	-8,36	-7,29	-6,23	-5,42
	0,0072	0,0076	0,0087	0,0102	0,0117
	0,0137	0,0151	0,0199	0,027	0,0355
-8,50	-9,05	-8.61	-7,51	-6,42	-5,59
	0,007	0,0073	0,0084	0,0099	0,0113
	0,0133	0,0147	0,0193	0,0263	0,0345
-8,75	-9,31	-8,87	-7,73	-6,61	-5,75
	0,0068	0,0071	0,0082	0,0096	0,0110
	0,013	0,0143	0,0187	0,0255	0,0335
-9,00	-9,58	-9,12	-7,95	-6,79	-5,92
	0,0066	0,0069	0,0080	0,0093	0,0107
	0,0126	0,0139	0,0182	0,0249	0,0326
-9,25	-9,84	-9,37	-8,17	-6,98	-6,08
	0,0064	0,0067	0,0077	0,0091	0,0104
	0,0123	0,0135	0,0178	0,0242	0,0318
-9,50	-10,11	-9,63	-8,39	-7,17	-6,25
	0,0062	0,0066	0,0075	0,0088	0,0101
	0,012	0,0132	0,0173	0,0236	0,031
-9,75	-10,38	-9,88	-8.61	-7,36	-6,41
	0,0061	0,0064	0,0073	0,0086	0,0099
	0,0117	0,0129	0,0169	0,023	0,0302
-10,00	-10,64	-10,13	-8,83	-7,55	-6,58
	0,0059	0,0062	0,0070	0,0084	0,0096
	0,0114	0,0125	0,0165	0,0225	0,0295

Conclusion

A partir de mesures au focomètre et au sphéromètre, un clinicien peut théoriquement déterminer l'indice de réfraction d'une lentille mince. Cette méthode d'évaluation est limitée toutefois par l'imprécision qui peut exister sur la puissance sphérométrique. Cette imprécision amène plutôt, en particulier par les puissances les moins élevées, une évaluation de l'ordre de grandeur de cet indice. L'évaluation sera d'autant plus exacte que la puissance sphérométrique sera mesurée avec soin. En pratique, cette méthode reste valable, car elle constitue pour le clinicien, un moyen rapide sinon unique d'avoir une certaine idée de l'indice de réfraction d'une lentille mince.

Table 2
Valeurs théoriques de la puissance sphérométrique (F_S)
Impression $\triangle \eta$ et $\triangle' \eta$ sur l'indice de réfraction

Puissance frontale	CR39 η=1,498	Crown η=1,523	Hoya LHI II η=1,6	Hoya LHI I η=1,702	Hoya THI η=1,806
F'_f=	F_S=				
-10,25	-10,91	-10,39	-9,05	-7,74	-6,74
	$\triangle$n=0,0058	0,0061	0,0070	0,0082	0,0094
	$\triangle$n=0,0111	0,0122	0,0161	0,0219	0,0288
-10,50	-11,17	-10,64	-9,27	-7,93	-6,90
	0,0056	0,0059	0,0068	0,0080	0,0092
	0,0108	0,0120	0,0157	0,0214	0,0281
-10,75	-11,44	-10,89	-9,50	-8,12	-7,07
	0,0055	0,0058	0,0066	0,0078	0,0089
	0,0106	0,0117	0,0153	0,0209	0,0275
-11,00	-11,71	-11,15	-9,72	-8,30	-7,23
	0,0054	0,0057	0,0065	0,0076	0,0087
	0,0104	0,0114	0,015	0,0205	0,0269
-11,25	-11,97	-11,40	-9,94	-8,49	-7,40
	0,0053	0,0055	0,0064	0,0074	0,0085
	0,0101	0,0112	0,0147	0,0200	0,0263
-11,50	-12,24	-11,65	-10,16	-8,68	-7,56
	0,0051	0,0054	0,0062	0,0073	0,0084
	0,0099	0,0109	0,0144	0,0196	0,0257
-11,75	-12,50	-11,91	-10,38	-8,87	-7,73
	0,0050	0,0053	0,0061	0,0071	0,0082
	0,0097	0,0107	0,0141	0,0192	0,0252
-12,00	-12,77	-12,16	-10,60	-9,06	-7,89
	0,0049	0,0052	0,0060	0,0070	0,0080
	0,0095	0,0105	0,0138	0,0188	0,0247
-12,25	-13,04	-12,41	-10,82	-9.25	-8,06
	0,0048	0,0051	0,0058	0,0068	0,0078
	0,0093	0,0103	0,0135	0,0184	0,0242
-12,50	-13,30	-12,67	-11,04	-9,44	-8,22
	0,0047	0,0050	0,0057	0,0067	0,0077
	0,0091	0,0101	0,0132	0,0181	0,0237
-12,75	-13,57	-12,92	-11,26	-9,63	-8,38
	0,0046	0,0049	0,0056	0,0066	0,0075
	0,009	0,0099	0,0130	0,0177	0,0233
-13,00	-13,84	-13,17	-11,48	-9,81	-8,55
	0,0045	0,0048	0,0055	0,0064	0,0074
	0,0088	0,0097	0,0127	0,0174	0,0229
-13,25	-14,14	-13,43	-11,70	-10,00	-8,71
	0,0045	0,0047	0,0054	0,0063	0,0072
	0,0086	0,0095	0,0125	0,0171	0,0224
-13,50	-14,37	-13,68	-11,92	-10,19	-8,88
	0,0044	0,0046	0,0053	0,0062	0,0071
	0,0085	0,0093	0,0123	0,0168	0,0220

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CONTACT LENS

A Clinical Evaluation of the ALGES™ (hefilcon A) Bifocal Contact Lens

M.L. Gross*

Abstract

A new, soft bifocal contact lens design is described and its performance is assessed on the basis of sustained wearing time, refraction, acuity for near and far, k readings and pupil diameter. Recommendations are made to help improve success. Characteristics of successful and unsuccessful users are listed.

Résumé

Ce travail décrit un nouveau model de lentille contact souple double foyer. Sa performance est évalué en fonction de la durée du port, réfraction, acuité au loin et de près, courbes kératométriques et diametre de la pupille. Quelques recommandations pour rehausser le succès sont offerts. Les caractéristiques des porteurs qui ont réussi et ceux qui ont échoué sont énumérés.

Introduction

North American contact lens wearers' needs have changed gradually from their early requirements as adolescents to their current requirements as middle aged presbyopes. As a result of this change, it appears that a bifocal contact lens inventory has become mandatory in any up to date contact lens practice.

The theory that one contact lens design, or even one contact lens manufacturer, can meet all patient requirements is, of course, a fallacy. The contact lens practitioner, as a result, must be able to choose from an "arsenal" of bifocal type contact lenses.

The intent of this study was to evaluate the ALGES™ (hefilcon A) Bifocal Contact Lens from University Optical Products Company and determine its position and benefit in this "arsenal".

Material

The ALGES™ (hefilcon A) Bifocal Contact Lens is manufactured from PHP™ I, a random copolymer of 2-hydroxyethyl methacrylate and N-vinyl-2-pyrrolidone crosslinked with ethylene glycol dimethacrylate. When hydrated in normal isotonic saline, the lens has a water content of 45%.

Design

The ALGES™ Lens is a concentric bifocal design with a central near add zone of 2.12 and 2.35mm in diameter, surrounded by a distance annulus optic zone of typically 8.5mm diameter (figure 1).

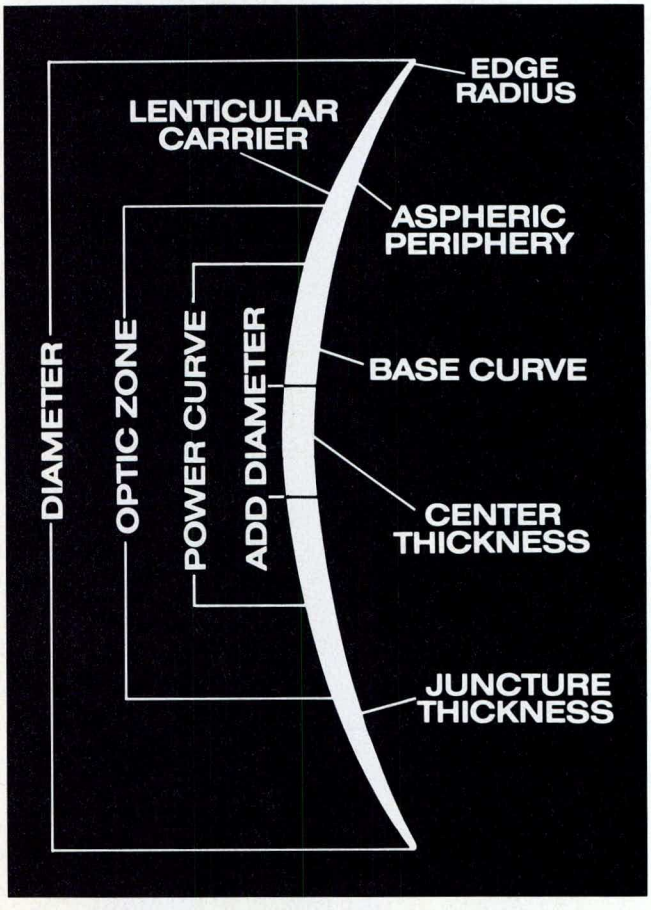

Fig. 1 ALGES™ Bifocal Contact Lens

*B.Sc., O.D.
Toronto, Ontario

Standard lens diameter is 14.0mm and the lens is available in 8.6 and 8.9mm base curves. (An 8.3mm lens was initially considered as well.) Powers are available from -6.00 to +6.00 diopters with add powers of 2.00, 2.50, 3.00 and 3.50 diopters.

This concentric design is based on the theory that the near add zone focuses rays from near objects on the retina (figure 2a), while rays from distance objects are focused on the retina through the distance annulus (figure 2b). By selecting a central add diameter to cover 50% of the pupil under illumination levels appropriate for reading, near and distance vision can theoretically be balanced.

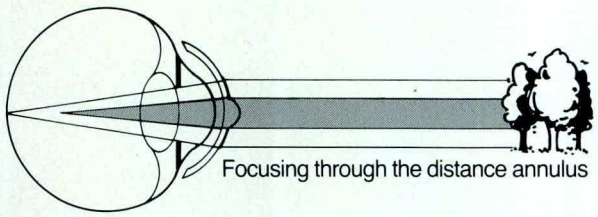

Fig. 2a
Focusing through the near add optic

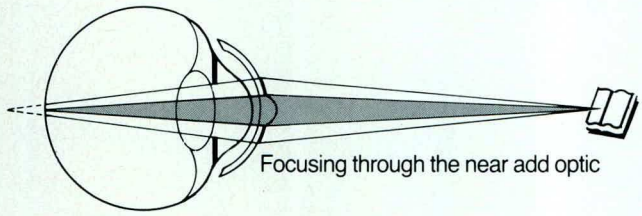

Fig. 2b
Focusing through the distance annulus

Methods

Twenty patients were selected for the study from a waiting list composed of successfully fitted non-astigmatic pre-presbyopes who have, over the last 12 to 15 months become presbyopic, and whose distance prescriptions were within the range of powers available from the manufacturer.

During the course of the study, there was no attempt to enhance the performance of these bifocal lenses by simulating monovision fitting techniques. The final contact lens prescription was the most plus or least minus that gave the best corrected monocular vision possible. The final base curve selected was the flattest one that centered well and did not restrict free movement over the bulbar conjunctiva.

Patients were deemed to be successful if:

1. They could maintain their existing wear times.
2. They achieved 20/25 binocularly or at least the same acuity for distance as they had with their existing lenses.
3. They were able to read 20/25 binocularly for near. (Jaeger 2)

Clinical Data

Pertinent clinical data on the 20 patients include:

1. Distance and near visual acuities uncorrected, with existing lenses and with the ALGES™ Bifocal Contact Lens.
2. Keratometric findings.
3. Refraction findings.
4. Horizontal visible iris diameter measurements.
5. Stimulated pupil diameter measurements: taken with a pen light held at a distance of about one inch from the eye and 20 to 30° temporally.
6. Pupil excursion ranges: the difference in pupil diameters going from those measured under the general illumination of the author's office, to those measured with penlight stimulation.
7. Patient age and sex.

Results:

Of the twenty patients selected for this study, fourteen (70%) were deemed successful according to the previously stated criteria. Of the six unsuccessful patients, two discontinued due to poor near acuities and four discontinued due to distance acuities.

It was found that the unaided binocular acuities of the successful study group were generally worse, both at distance and at near, than those of the unsuccessful group (Table 1).

Successful patients achieved almost the same quality of binocular distance acuities with their ALGES™ lenses as they did with their existing ones (20/25 versus 20/22 respectively).

As expected, however, their binocular near acuities improved from an average of 20/75 with existing lenses, to an average of 20/22.5 with the ALGES™ Lenses.

An interesting statistic was the fact that a ratio of 2.5 females to 1.0 male made up the unsuccessful group, while 6.0 females to 1.0 male made up the successful group (Table 2).

The average contact lens bifocal adds required were approximately one diopter higher than those required in spectacles (Table 2). The distribution of base curves (Figure 3 and 4) shows that the 8.9mm base curve was most often used. There was a statistically even split between the 2.12 and 2.35mm near add zone diameters (Table 2).

Discussion:

A previous study conducted with different concentric design lenses reported that the simultaneous imaging found with multifocal lenses created a "competition for the macula" which was accompanied by visual confusion."[1]. Practically speaking, this translated into patient complaints and discontinuation of lens use due to diplopia, glare, blurring and ghost images. The complaints resulted in 92.5% of the patients in the study to discontinue wear.


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Table 1
Comparison Table of Acuities

	Patients	
	Unsuccessful	Successful
Range of Binocular Unaided Distance Acuities	20/80 - 20/400	20/100 - 20/800
Average Binocular Unaided Distance Acuity	20/215	20/340
Range of Binocular Unaided Near Acuities	20/20 - 20/300	20/25 - 20/400
Average Binocular Unaided Near Acuities	20/122	20/188
Range of Binocular Distance Acuities with Existing Lenses	20/20 - 20/25	20/20 - 20/30
Average Binocular Distance Acuities with Existing Lenses	20/21	20/25
Range of Binocular Distance Acuities with ALGES™ Lenses	20/25 - 20/60	20/20 - 20/30
Average Binocular Distance Acuity with ALGES™ Lenses	20/34	20/25
Range of Binocular Near Acuities with Existing Lenses	20/40 - 20/200	20/30 - 20/100
Average Binocular Near Acuity with Existing Lenses	20/50	20/75
Range of Binocular Near Acuities with ALGES™ Lenses	20/30 - 20/80	20/20 - 20/25
Average Binocular Near Acuity with ALGES™ Lenses	20/44.3	20/22.5

Table 2
Comparison of Ocular Parameters

	Patients	
	Unsuccessful	Successful
Range of Flattest Keratometric Reading	42.00 - 45.00	41.50 - 47.50
Average of Flattest Keratometric Reading	43.25	43.58
Range of Horizontal V.I.D.	11.0 - 12.0mm	11.0 - 12.5mm
Average of Horizontal V.I.D.	11.54mm	11.64mm
Range of Stimulated Pupil Diameters	2.0 - 4.0mm	2.0 - 4.0mm
Average of S.P.D.	3.11mm	3.04mm
Average Pupil Excursion Range	1.54mm	2.34mm
Range of Ages in Study Group	44 - 60 yrs.	42 - 55 yrs.
Average Age of Study Group	49.57 yrs.	48.36 yrs.
Ratio of Females to Males	2.5 : 1	6 : 1
Range of Spectacle Rx Bifocal Adds	+1.25 D to +2.50 D	+1.25 D to +2.50 D
Average of Spectacle Rx Bifocal Adds	+2.00 D	+2.00 D
Range of Contact Lens Bifocal Adds	+2.50 D to +4.00 D	+2.00 D to +4.00 D
Average of Contact Lens Bifocal Adds	+3.00 D	+3.00 D
Ratio of 2.12 to 2.35 Add Diameters Used	1 : 2	4 : 3

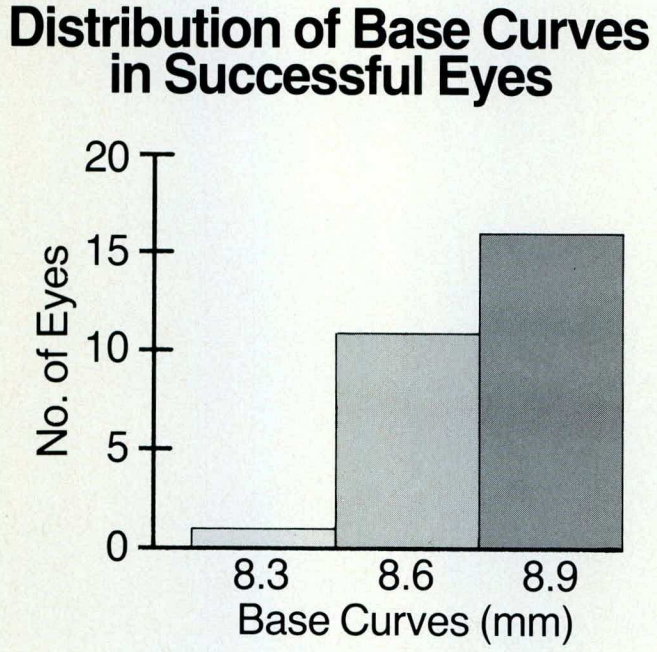

Fig. 3

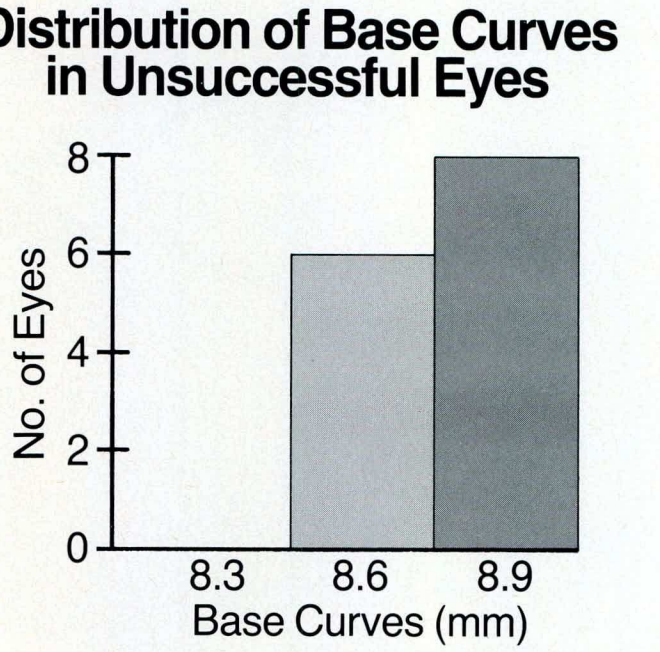

Fig. 4

The major difference in the ALGES™ (hefilcon A) Bifocal Contact Lens and the earlier designs studied is the placement of the near vision optic in the center of the lens surrounded by the distance annulus optic. This design configuration, which averages a seven micron transition between optics, plays to the synkinetic pupil response. This response, a result of pupil constriction during accommodative convergence, allows 60 to 70% of all available light to pass through the central near add zone optic, which greatly enhances near acuity when reading.

Conversely, during normal or low lighting conditions when the pupil is dilated, up to 80% of all available light passes through the distance optic

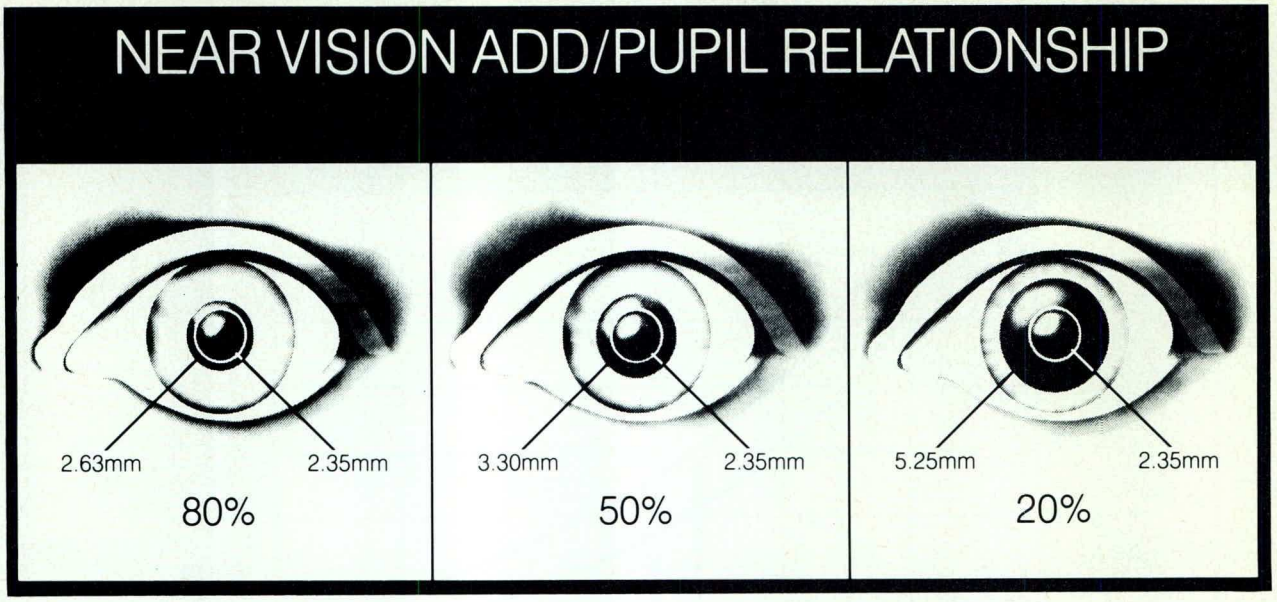

Fig. 5

zone. This is best demonstrated by use of the illustrations in Figure 5 and the graph in Figure 6 which show the relationship between pupil size and the central near add zone at varying light levels.

True to expected form, no complaints were found among the successful patient group, (those achieving 20/25 binocularly), concerning distance vision at night. However, some patients outside the successful patient group are motivated to accept 20/30 and J-3.

Almost all of the study patients found the ALGES™ lenses to be very comfortable. It was also noted that any lens which had to be replaced as a result of loss or damage, demonstrated excellent reproducibility by performing the same as the original lens.

The ALGES™ Bifocal Contact Lens comes in a large assortment of inventoried parameters which enable the practitioner to try various combinations in order to achieve the best possible fit. This is definitely not a "one size fits all" type lens. The ability to select between 2.12 and 2.35mm add diameters for instance, saved a number of potential failures.

There were a few drawbacks to the lens that are worth noting:

1. Satisfactory distance acuities sometimes could not be obtained under very bright lighting conditions (although, good quality sunglasses did help in this case).
2. Almost all of the study patients (both successful and unsuccessful) initially mentioned experiencing some shadows or even a "3D" effect while reading under lower than normal light levels. The successful patients adapted to these phenomena in little time, while the unsuccessful ones had greater difficulty. Careful patient counselling concerning this phenomenon was vital to adaptation. The patients were advised that with continued wear, the visual symptoms would automatically be ignored, much like spectacle frames or the lines of a bifocal spectacle which are no longer noticed after a few days' wear. It was found that if the patients were warned about the likelihood of shadowing or "3D" effects the ability to adapt to the situation increased significantly.

Suggestions for improving success rate include:

1. Increasing add power or size of near add zone if there are complaints of shadows or ghosting.
2. Remembering that the age group of patients that are going to be wearing this lens is 40 to 55 plus. As a result they may have drier eyes than those of younger patients. Fitting the flattest possible lens and using lots of ocular lubricants daily is then highly recommended.
3. Steepening the base curve and/or increasing the near add zone diameter if a lens decenters temporally resulting in reduced acuity at near.

Some of the problems that the test group encountered were as follows:

1. Difficulty in determining lens eversion, especially in low distance powers. The teaching of patience in these cases proved invaluable in determining a favourable outcome to the situation.
2. The study patients, in particular the older group, found the lenses to be somewhat more susceptible to tearing than previously experienced. However, this problem was significantly reduced with instructions to lubricate the eyes just prior to lens removal.

Conclusions

Based on this study, the ALGES™ Bifocal Contact Lens worked well with previous contact lens wearers who were highly motivated to continue wearing their

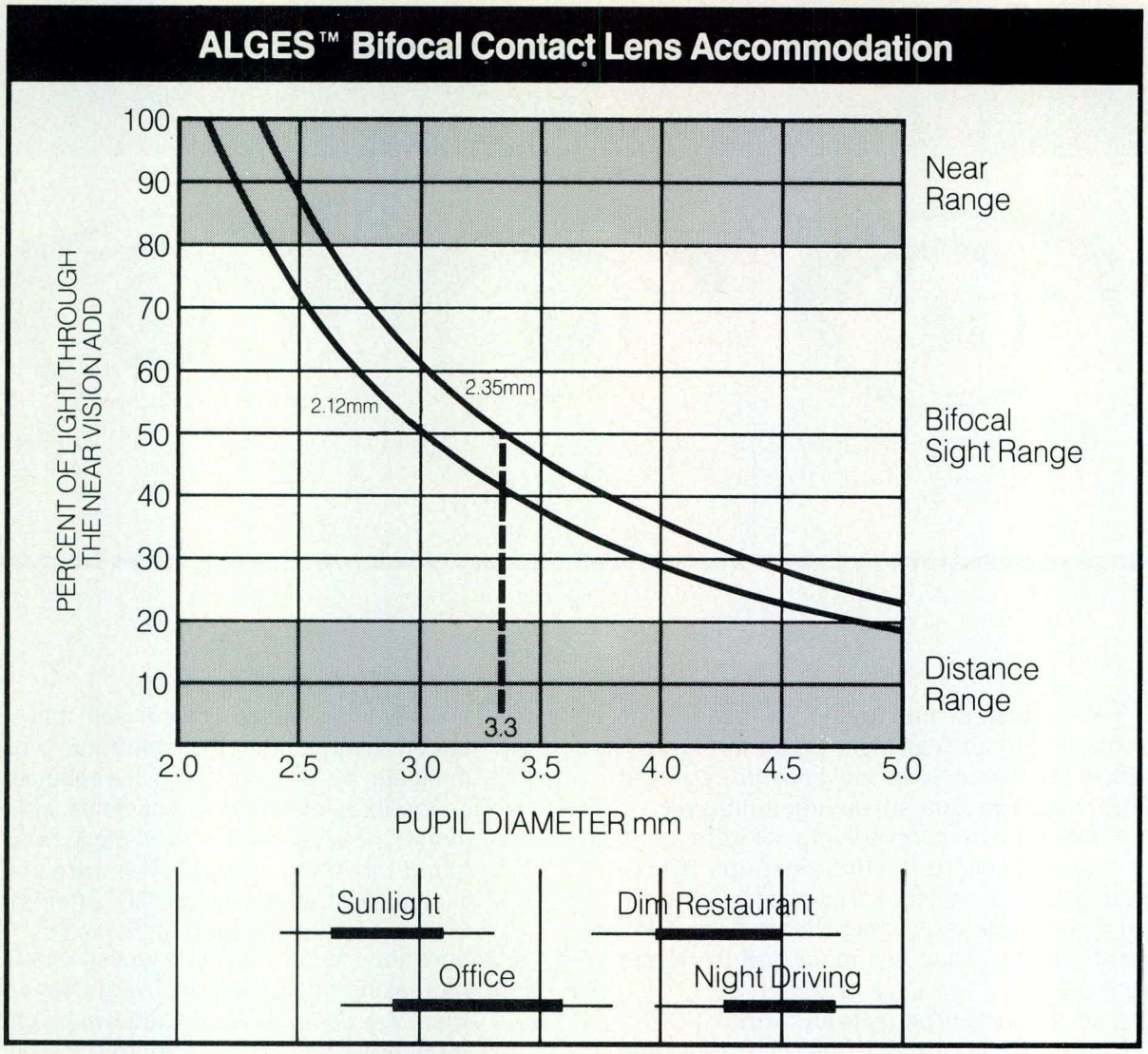

Fig. 6

contacts into their presbyopic years. The most successful patients were those who:

1. Had little or no astigmatism.
2. Had good ranges of pupillary excursions.
3. Were female.
4. Suffered relatively poor distance and near unaided acuities.

The ones who weren't successful were those who:

1. Had distance Rx's of 0.75D to 1.00D and lacked visual motivation.
2. Had professions involving excessive reading or other forms of near work.
3. Had very small or very large, sluggish pupils.
4. Had advanced well into their presbyopic years, and as a result, would not accept any acuity that was less than that achieved with their glasses.

As stated before, the ALGES™ Bifocal Contact Lens won't fit 100% of all presbyopes. However, the average contact lens practitioner can easily utilize the variety in parameter selection to figure out which patient will or won't work out. The fact that this can be done without spending an exorbitant amount of time on the case, makes this a prominent addition to one's bifocal contact lens fitting "arsenal".

Acknowledgement

This study was supported in part by University Optical Products Company. The author wishes to thank them for their technical expertise and cooperation.

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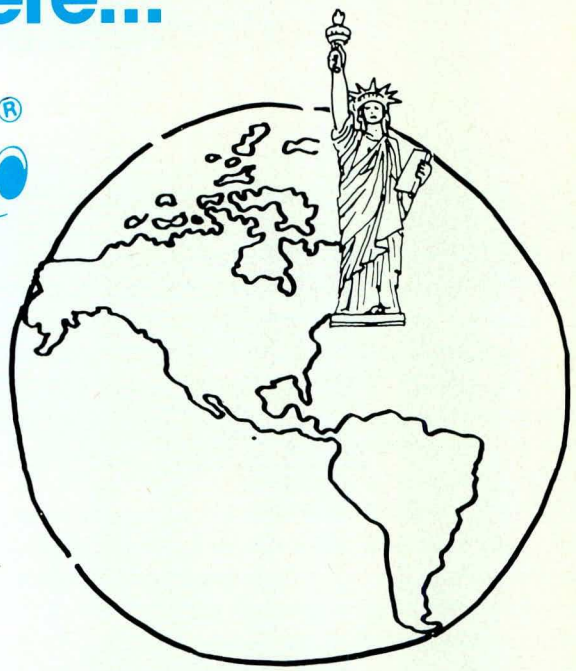

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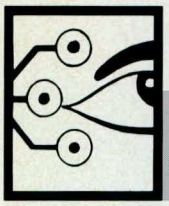

CLINICAL RESEARCH

Improved Stereoacuity Testing with the Judgement of Equal Distances

W.L. Larson*

Abstract

Stereoacuity tests do not usually require the judgement of equal distances. A stereoacuity test which included zero disparity and required equal distance judgements was used to investigate the effect of overall aniseikonia on depth perception thresholds and the disparity of subjective equidistance (DSE). The results of this investigation are reported. The same data were used to determine the effect that a forced choice without the judgement of equal distances would have on test results. Three different ways of responding to a forced choice were simulated by redistributing equal distance responses between left and right nearer responses. These simulations often produced apparently better stereoacuities. From this, it is concluded that equal distance judgements improve the quality of stereoacuity test results.

Résumé

Les tests d'acuité stéréoscopique n'exigent pas habituellement un jugement sur la distance qui sépare les cibles des yeux. L'auteur a utilisé un test d'acuité stéréoscopique comportant une disparité de zéro et nécessitant un jugement quant à des distances égales pour étudier les effets de l'aniséiconie globale sur les seuils de perception stéréoscopique et la disparité du jugement subjectif de l'équidistance. Les résultats de cette étude sont présentés. On a employé les mêmes données pour déterminer l'effet qu'aurait sur les résultats un choix forcé sans jugement de distance. Nous avons simulé trois façons de répondre à un choix forcé en redistribuant les réponses relatives à des cibles équidistantes entre les réponses relatives à des cibles plus rapprochées à gauche et à droite. Ces simulations ont souvent semblé produire de meilleures acuités stéréoscopiques. Nous avons donc conclu qu'un jugement quant à la distance entre les cibles et les yeux permet d'obtenir des résultats de meilleure qualité lors des tests d'acuité stéréoscopique.

This article aims to demonstrate that stereoacuity test results are enhanced by including test objects at an equal distance from the patient. The author's interest in the perception of equal distances was caught when some patients found it easier to perceive a difference in depth when the leftmost object was nearer and others when the rightmost object was nearer. Some perceived equally distant objects as left nearer and others as right nearer. Sometimes the nearer object was perceived to be farther away. These observations led to the conclusion that conventional stereoacuity test designs had overlooked an important element of depth perception. This is that small amounts of aniseikonia can make a more distant object appear to be nearer.

*O.D., Professor,
École d'Optométrie, Université de Montréal

In this project, the paradigm is 2 vertical rods separated laterally by a small distance. As is customary, rod separation in depth is expressed in terms of geometrical disparity.[1] There are 2 rod arrangements for each disparity, left nearer and right nearer. Before an understanding of the effect of aniseikonia was achieved, the author added together the patient's responses at a given disparity without taking into account the nearer rod. Thus, if aniseikonia caused one rod to appear to be nearer when it was not, at least half of the responses would be wrong. Stereoacuity calculated from such data could be over or underestimated. To avoid this, patient's identifications of left and right nearer disparities had to be tallied separately.

When responses to left and right nearer are tallied separately, disparities are in a sequence from greatest left nearer to greatest right nearer. Zero disparity (equidistance) has its place in the middle of

this sequence. When test data are arranged in this way, there are 2 threshold disparities for stereopsis, left nearer and right nearer. These disparities are the same if there is no aniseikonia or other distortion. With aniseikonia, left and right threshold disparities will be different. The disparity perceived to be equidistant is midway between these thresholds. The term "disparity of subjective equidistance" was suggested by an anonymous referee to describe the disparity at which distances were perceived to be equal.

The disparity of subjective equidistance (DSE) is a valuable piece of information which can be extracted from test data. In a previous investigation, a group of 40 persons was tested with a procedure such that left, right and equal responses were tallied separately for each disparity.[2] Results showed a distribution of DSE from 12 arc sec left nearer to 6 arc sec right nearer. Only 10% of these subjects had a DSE of 0 arc sec. At the time, it was assumed that a non-zero DSE was due to aniseikonia but this was not proven.

In a recent investigation, an attempt was made to demonstrate a relationship between DSE and aniseikonia. To this end, aniseikonia was induced in a small number of subjects and their stereoacuity measured. Aniseikonia was produced by an afocal lens system of 2.4% magnification or by a mirror system with a variable magnification of up to 9%. The results of this investigation are reported here and are used to demonstrate the advantages to be gained by including equal distances when testing for stereoacuity.

Methods

A first surface mirror system (Fig. 1) provided known amounts of overall aniseikonia. The optical path length between the subject's right eye (R) and the rods (T) was increased by 39 mm by mirrors A to D. The path length between the left eye (L) and the rods was increased by a similar mirror arrangement (E to H) in which mirrors F and G were mounted on a slide. This slide moved at right angles to the line joining L and T as shown by the arrow. A scale and pointer attached to the slide was used to determine the path length from E to H. From this, the percent magnification of the right eye's retinal image with respect to that of the left was calculated. An increase

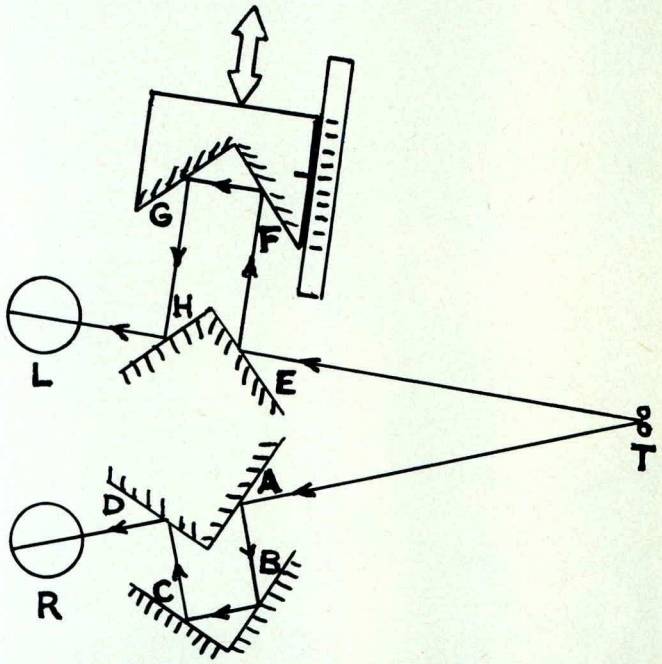

Fig. 1 Mirror arrangement for changing size of left eye's (LE) retinal image by means of a variable optical path length. First surface mirrors E and F were fixed. Mirrors F and G were moveable so as to increase or decrease the path length relative to that of the right eye. Path to right eye (RE) was by first surface mirrors A, B, C and D.

Table 1
Complete data for one subject showing number of left, right and equal responses for each disparity and for each of the 3 conditions of lens induced aniseikonia.

Magnification	Response	Number of responses Disparity (arc sec)											SA DSE[1]
		left nearer					right nearer						(arc sec)
		-24	-16	-12	-8	-4	0	4	8	12	16	24	
2.4% right eye	left	9	9	9	9	9	9	6	3	0	0	0	6 +10
	right	0	0	0	0	0	0	0	0	2	6	8	
	equal	0	0	0	0	0	0	3	6	7	3	1	
				(see note 2)				*	^	*			
none	left	9	9	9	9	8	2	1	0	0	0	0	8 +4
	right	0	0	0	0	0	0	1	5	9	9	9	
	equal	0	0	0	0	1	7	7	4	0	0	0	
						*		^		*			
2.4% left eye	left	9	7	7	1	0	0	0	0	0	0	0	6 -6
	right	0	0	0	0	4	7	9	9	9	9	9	
	equal	0	2	2	8	5	2	0	0	0	0	0	
				*	^	*							

1. SA = Stereoacuity, DSE = Disparity of Subjective Equidistance.
2. * = threshold, ^ = DSE

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Table 2
Equal response data of Table 1 redistributed so as to simulate a forced choice between left or right nearer.

Magnification	Redistribution of Equal Responses	SA	DSE
		(arc sec)	
2.4% right eye	not redistributed	6	+10
	shared equally between left and right	6	+10
	all given to left	4	+16
	all given to right	6	+6
none	not redistributed	8	+4
	shared equally between left and right	6	+2
	all given to left	4	+8
	all given to right	2	-2
2.4% left eye	not redistributed	6	-6
	shared equally between left and right	4	-8
	all given to left	4	-4
	all given to right	2	-10

in path length caused a decrease in retinal image size. The size of the left eye's retinal image could be varied from 1% larger to 9% smaller than that of the right eye. The binocular field of view was restricted to 5.2 deg horizontal by 7.6 deg vertical by the dimensions of the mirrors.

An afocal lens system provided a fixed overall magnification of 2.4% by combining 3 Tillyer trial lenses each of 0.0 diopters. For each lens, surface curvatures and center thickness were measured precisely. Trigonometrical ray tracing was then used to find the magnification and dioptric power of the combination when mounted in a trial frame.

The automated stereoacuity test has already been described in detail.[3] From the subject's point of view, 2 black vertical lines (the rods) were seen through a rectangular window in the center of a screen which lay in a frontal plane. By means of one of two switches, the subject reported which line (left or right) was nearer. If they seemed equidistant, both switches were actuated. When the perception of the lines had been reported, a shutter closed the window for 2.4 sec after which another pair of lines was presented.

Disparities used for this investigation were 24, 16, 12, 8, 4 and 0 arc sec. There were two arrangements at each disparity, one with the left rod nearer and the other with the right rod nearer.

Monocular cues to depth were eliminated by masking the rod's extremities and by backlighting which showed the rods in silhouette. At the test distance of 60 cm, the rods were both 4.5 min arc wide and were always separated laterally by a gap of 17 min arc. Each test consisted of 3 randomized presentations of the 11 rod arrangements for a total of 33 responses.

Subjects (4) were all in their early twenties. Each had a stereoacuity of 8 arc sec or better. Stereoacuity was tested with the lens before the left eye, the right eye and without the lens. The lens arrangements were in a random order and each was tested 3 times. One subject was tested with mirror settings of 8, 6, 4, 3, 2, 1, 0 and -1% right image bigger than left. These were presented in a random order.

The threshold of stereopsis was defined as the least disparity beyond which less than 66% of responses were correct. This was appropriate for 3 possible responses. There were 2 thresholds, left and right nearer. The disparity mid-way between these thresholds was calculated and was taken to be the DSE. Stereoacuity was the difference between the DSE and either threshold. The DSE was assumed to lie in the subject's apparent fronto-parallel plane. The angular relationship between the plane of the rods at the DSE and the frontoparallel plane was that for each 4 sec of disparity the plane of the rods was rotated by 1.77 deg.

Results

Stereoacuity results were similar for all subjects; the mean and standard deviation being 6.4 and 1.9 arc sec respectively. The change in DSE from 2.4% left image bigger to 2.4% right image bigger depended on the subject. For the 4 subjects tested, these were 4, 8, 8 and 16 arc sec respectively.

All data of the subject with the greatest change in DSE are given in Table 1. Thresholds are indicated by an asterisk (*) written under the threshold disparity. The DSE is indicated with a caret (ˆ). The change in DSE with induced aniseikonia is obvious.

An issue central to this investigation was whether or not equal distance judgements gave better data. If an equal response were not permitted, a choice would be forced between left and right nearer. To find out how such a forced choice would modify the results, data were stripped of equal distance responses by assigning them to left or right nearer responses.

This redistribution was made in 3 ways. In the first, equal responses were shared equally between left and right nearer responses. When the number of equal responses was odd, the extra one was given to the left or right response with the bigger total. In the second, all equal responses were given to left nearer. In the third, all were given to right nearer. The revised data were analysed for stereoacuity and DSE as before. As there were only 2 responses, threshold was 78% correct. These results are presented in Table 2.

The mirror system results of a different subject are presented in Fig. 2. This graph shows rod disparity versus % magnification. The upper and lower solid lines join thresholds of depth perception. DSE's are midway between thresholds and are joined by a dashed line. Because of the system's limitations, both thresholds could not be obtained beyond 4% magnification. However, the left nearer threshold was obtained with magnifications of 6 and 8%. An interesting discontinuity in the curves occurs between 2 and 3%.

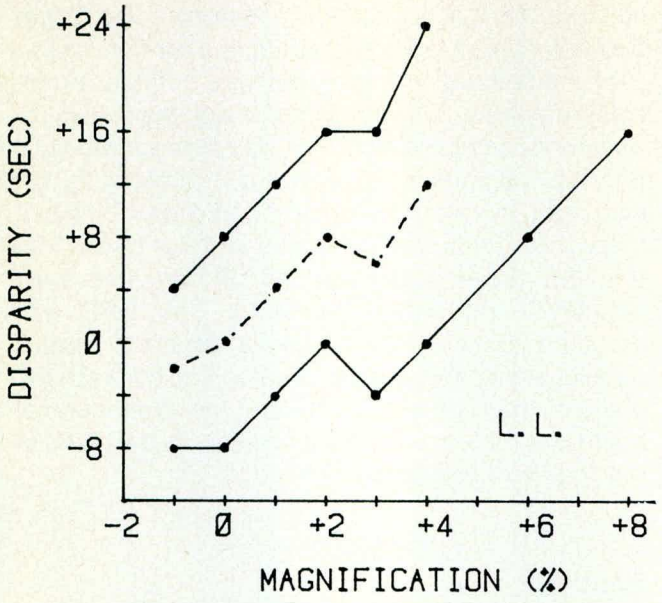

Fig. 2 Graph of disparity versus magnification found with the mirror system. Thresholds of stereopsis are continuous lines. Disparity of subjective equidistance is a broken line.

Discussion

Induced overall aniseikonia can cause a shift in DSE. This was demonstrated in each of the 4 subjects. However, the amount of this shift was found to vary from subject to subject. The least shift was 4 and the greatest 16 arc sec. This considerable difference precludes using a patient's DSE to estimate aniseikonia. Nevertheless, the amount of induced aniseikonia required to shift a patient's DSE to zero could be used to measure his or her aniseikonia.

Zero disparity is not superfluous to a test when the DSE is not zero. This can be seen in the data of Table 1. With 2.4% magnification before the right eye, zero disparity was always perceived as left nearer. With magnification before the left eye, zero disparity was identified as right nearer 7 times and as equidistant twice. In this instance, zero disparity was the right nearer threshold. If zero disparity had not been included in the test, 4 arc sec right nearer would have been taken as the threshold. This would have changed the calculated stereoacuity from 6 to 8 arc sec and the DSE from -6 to -4 arc sec.

A forced choice was not included in this investigation. However, it was simulated by distributing equal responses between left and right nearer. Stereoacuities and DSEs from the revised data are seen in Table 2. A forced choice usually resulted in an apparently better stereoacuity. In the results without induced aniseikonia, stereoacuity was 8 arc sec with equal responses included and 2 arc sec with all equal responses given to right nearer. This demonstrates that a forced choice can alter stereoacuity significantly. Therefore, a forced choice should be avoided if data quality is to be maximized.

From the author's experience, patients prefer a test with left, right and equal responses to one with a forced choice between left and right, probably because it is natural to say that distances are equal when neither rod seems nearer. A forced choice offends some patients because they object to a response which is not true to their perception.

Patients who want to improve their performance can do so by not making equal responses. This behaviour is very easy to detect by looking at the data. When only left and right responses have been made, a threshold of at least 75% correct must be used. In some instances, the absence of equal responses is due to very good stereoacuity. If the DSE lies between two disparities and the stereoacuity is 2 arc sec there may be no equal responses.

Equal distance responses are useful only if the test uses real objects. When anaglyphes (TNO) or vectographs (Randot) are used, the surface of the test plate is the reference surface against which other distances are judged. It is a common observation that patients rotate such tests about a vertical axis in order to improve performance. Even with aniseikonia, nearness judgements are unaltered because they are made with respect to the surface of the test and not the frontoparallel plane.

One might conclude that anaglyphes or vectographs are to be preferred because aniseikonia has no effect on stereoacuity measured with them. This is not true. These tests either do not include disparities of 8 arc sec or smaller or else cannot guarantee these disparities to be as marked. Howard demonstrated that good stereoacuity is of 8 arc sec or better.[4] Therefore, anaglyphes and vectographs are of limited use.

Acknowledgement

This investigation was supported by the Canadian Optometric Education Trust Fund.

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The Evolution of the Manitoba Optometry Act

S. Mintz*

Abstract

The history of optometric legislation in Manitoba is discussed. Beginning with the passage of the Optometry Act in 1909, the evolution of the Act is followed, culminating in landmark amendments in 1983.

Abrégé

L'auteur décrit l'histoire de la législation manitobaire en ce qui concerne l'optométrie. Cette histoire commence avec l'adoption de l'Acte d'Optométrie en 1909 et se déroule pour aboutir aux amendements marquants de 1983.

On 10 March, 1909, Sir D.H. McWilliam, K.C., M.G., Lieutenant-Governor of Manitoba, gave Royal Assent on behalf of HRH King Edward VII to An Act to regulate the practice of Optometry in Manitoba, thus creating, along with a similar Act in Quebec, the first Optometry Acts in Canada and only the second in North America. The Manitoba Optometry Act subsequently went through four major and seven minor revisions culminating in a landmark amendment in 1983. Last year commemorated the 75th anniversary of the passage of the Manitoba Optometry Act. This article will highlight some of the important and interesting phases in the evolution of the Act to its present form.

The preamble to the Optometry Act of 1909 recognized Optometry as a learned profession with the statement

> Whereas the profession of optometry is extensively practiced in the Province of Manitoba and it is expedient for the protection of the public that a certain standard of qualifications should be required of each practitioner of said profession and that certain privileges and protection should be afforded to said practitioners . . .

Thus, even at this early date, Optometry had received recognition of its professional status.

The second clause of the Act defined optometry as follows:

> The practice of optometry is hereby defined to be the employment of any means, other than drugs, medicine or surgery, for the measurement of the powers of vision and the adaptation of lenses for the aid thereof.

This definition was undoubtedly an accurate reflection of the state of optometric education at the time. However, the definition proved to be inadequate in the context of the level of training of Optometrists in the second half of the century, but was not changed until 1983.

The Act set up a Board of Examiners, consisting of "five reputable and practicing optometrists," appointed by the Lieutenant-Governor-in-Council, charged with the responsibility of examining the character, competency and qualifications of applicants for the practice of Optometry in Manitoba.

The requirements for practicing Optometry in Manitoba at the time were 1) being more than twenty-one years of age; 2) being of good moral character; 3) having completed the equivalent of two years of high school; and 4) having graduated from a school of Optometry maintaining a standard acceptable to the Board of Examiners or having practiced optometry under the supervision of a registered Optometrist for at least one year. Subsequently, an applicant was required to submit to an examination of his qualifications. Anyone who was able to prove that he or she had practiced Optometry for one year prior to the passage of the Act, was exempted from the requirement for an examination.

All optometrists with a certificate of registration, or of exemption, were required to display the certificate where he or she carried on the practice of Optometry. An interesting sidelight was that an optometrist practicing away from his or her place of business was then required to ". . . deliver to each *customer* (author's italics) or person fitted with glasses a bill of purchase, which shall contain his signature, his post office address and the number of his certificate of registration or exemption, together

* B.Sc., O.D.
Winnipeg, Manitoba

with a specification of the lenses and frames or mountings supplied, and the prices charged therefore."

The Act of 1909 allowed all registered Optometrists to use the word "Optometrist" and all those who were exempted from writing the examinations were allowed to use the title 'exempt'. However, there was a prohibition against anyone using the title 'Doctor' unless he or she was a graduate of a School of Medicine.

Those interested in how costs have accelerated over the decades would not be surprised at the fees legislated in 1909. The examination fee was set at $15, the registration fee was $10, and the annual renewal fee was $4. It is curious, though, that these fees did not change until 1957 when the examination fee was increased to the lofty level of $25. All other fees were removed from the Act and left instead to be specified by the Manitoba Optometric Society's bylaws.

The Act also provided for penalties in law for conviction of practising without registration or of fraudulently obtaining a certificate of registration. Anyone found guilty under this section was subject to a fine of between $25 and $100, or three months in prison.

Finally, the Act included a clause which exempted physicians or surgeons from the provisions of the Act. Furthermore, the Act did not apply to "persons who sell glasses as on prescription from an oculist or duly registered optometrist, nor to persons who sell complete, ready-to-wear glasses as merchandise from a permanent place of business."

The Act of 1913

In 1913, the Optometry Act went through a revision consisting mainly of grammatical or numerical changes. The only substantive change that was incorporated by this Act dealt with the penalty section of the Act. This change provided for payment of half the fine to the party procuring the conviction.

The Act of 1920

The Act (now known as the Manitoba Optometry Act) of 1920 resulted in the formation of the Manitoba Optometric Society. Prior to this, the professional Association for optometrists was the Manitoba Association of Optometrists and Opticians whose organization may predate the first Optometry Act of 1909. Along with the formation of the Society was a Council of five registered Optometrists (three from Winnipeg and two from outside Winnipeg) elected at the Annual Meeting of the Society. The Council was given the power to make rules and regulations for "the proper performance of its duties". All registered optometrists were required to become members of the Manitoba Optometric Society.

The power to appoint the Board of Examiners was taken away from the Lieutenant-Governor-in-Council and given instead to the elected Council of the Society. With this Act, many of the powers formerly assigned to the Board of Examiners were turned over to the Council, the Board itself being left simply with the duty of "conducting the examinations of the Society and passing upon the qualifications of applicants for admission to the Society." With small revisions, this relationship has remained up to the present time.

The requirements for practising in Manitoba were changed by requiring graduation from a School of Optometry *and* practising under the supervision of an optometrist for one year, instead of requiring one *or* the other as the previous Acts did.

The Act of 1927

This amendment gave the Society the powers to make by-laws for:

(a) the government and discipline of its members;
(b) the management of its property;
(c) all such purposes as may be necessary for the operation and management of the affairs of the said society.

Interestingly, these by-laws could not "prohibit the employment of a Member of the Society by a person, firm or corporation not a Member of the Society". This latter provision was to remain in effect for the next 30 years.

The Act of 1957

This Act was characterized mainly by some adjustments to the composition of the Council of the Society. Now nine registered optometrists, instead of five, were to be elected to Council. There was no longer any reference as to whether the optometrists were to be from Winnipeg or from rural locations. The Council was now to elect, from its own Members, the President of the Society. In the past, the Society elected a President, Vice-President, and Secretary-Treasurer separate from the Council which elected, from its own Members, a Chairman and Secretary. With the passage of this Act, the separate organizations ceased to exist and the President/Chairman became the Chief Executive Officer of the Society. The Council was also to elect, again from among its own Members, Vice-Presidents, a Secretary-Treasurer and, for the first time, a Registrar who was also to be the Chairman of the Board of Examiners.

Undoubtedly reflecting the changing educational standards of optometrists, the minimum requirement of two years of high school was removed from the legislation. Graduation from a college of Optometry was, of course, still required and, no doubt, Colleges of Optometry of the day required more than two years of high school for entry to their programmes. Also at this time, the term "preceptor-

ship' was used for the first time in reference to the one-year period spent under the supervision of a registered optometrist. (Less than one year later, an amendment to the Act changed the term from 'preceptorship' to 'apprenticeship'.

The Society was still allowed to make by-laws as first formulated in 1927. In addition, the by-laws could legislate

(d) the remuneration, if any, to be paid to the members of the board of examiners or the members of the council or both.

As well, the prohibition of bylaws that affect the employment of optometrists which, implemented in 1927, was now removed.

This Act brought in a new clause that applied to a situation where an optometrist had not been registered with the Society as an optometrist for a period of five years. In this case, the council was given the power to re-issue the certificate of registration "upon such conditions as it may deem fit and as are approved by the society at a general meeting . . .".

The Act also instituted procedures by which an optometrist could appeal a revocation of the optometrist's certificate of registration. The optometrist was no longer entitled to a public hearing but did obtain the right to be heard by council and to produce witnesses in his defense. If unsuccessful in his appearance before council, he could appeal to the Court of Queen's Bench within six months of the revocation. He was also given access, upon notice, to the evidence against him in the hands of the council.

One final change is worthy of note at this time. The legislation finally recognized that some optometrists were entitled to use the 'Doctor' title. Now, optometrists who had received the "degree of 'doctor' from a school of optometry approved or recognized by the Senate of The University of Manitoba . . ." would be allowed to use the title if ". . at the same time he displays or makes use of the word 'optometrist' immediately following his name."

The Act of 1966

This Act revised the entire section pertaining to charges which may be heard against a Member of the Society, which had recently been changed in 1957. The Council, at its discretion, was empowered to form a committee of three of its Members to hear the charges against the Member. Upon completion of a hearing, Council could

(a) reprimand the Member; or
(b) suspend or revoke the certificate of registration of such Member for such period of time as the Council considers appropriate.

The Member charged was given the right to be represented by Council at his or her hearing. Testimony of witnesses was to be under oath and full rights to cross-examination of all witnesses was granted to both sides. The Council was given the right to request, from the Court of Queen's Bench, subpoenas of witnesses and evidence. The Member, whose licence has been revoked or suspended, retained the right to appeal the decision to the Court of Queen's Bench within one month of the decision by Council. An important provision of these amendments was that "no action shall be brought against the Council or the committee or any Member thereof for anything done in good faith under this Act. . . ."

The Act of 1970

This Act changed the requirements for the right to practise so that no longer would a one-year apprenticeship be necessary. This change, no doubt, reflected the improvements in the educational programme which was now being provided for undergraduates in optometric programmes.

The only other significant change that came from this Act was the provision that the Council, if it felt that a charge against a Member was trivial or did not deserve a reprimand, was now given the power to dismiss the charges, a power that it did not have under law prior to this time.

The Act of 1971

The only change that occurred at this time was the lowering of the minimum age for an applicant for practise in Manitoba to the age of 18. This coincided with the age of majority being reduced to this level by provincial legislation.

The Act of 1972

Only one change occurred in 1972, but an important one it was. This allowed the use of the title 'Doctor' by all optometrists (regardless of whether or not they had had the doctorate conferred upon them by an educational institution) registered in Manitoba on 01 May, 1972. This 'grandfather' clause corrected the anomaly enacted in 1957 which created two classes of optometrists — those who were 'Doctors' and those who were not. The use of the 'Doctor' title, however, was allowed *only* if the word 'optometrist' was used immediately preceding or following his or her name.

The Act of 1983

This Act represents the most significant changes that have occurred in 75 years affecting Optometry in Manitoba. First and foremost, the definition of Optometry was revised from the historical definition to reflect the many advances that Optometry has made over the years. The 'Practice of Optometry' is now defined as

> the science related to the assessment of the health of the eye, its related structures and environment, and the diagnosis and treat-

ment of anomalies affecting the functional status and efficiency of the visual system including

(i) the qualitative and quantitative characteristics of the refractive, accommodative, and sensory ocular motor and perceptual components,
(ii) the employment of preventative, corrective, or rehabilitative procedures,
(iii) the detection of disease evident in the examination process, and
(iv) the offering of advice, consultation, and counselling.

Compare this with the very narrow (albeit reflective of contemporary Optometry) definition of the 1909 Act mentioned at the beginning of this article. In addition to these new clauses, persons were deemed to be practising Optometry if

(a) he engages in the examining, refracting . . . or improving the human visual system by the employment of any means including the use of any computerized or automated measuring devices, or the fitting and adaptation of lenses or frames for the aid thereof; or
(b) . . . he alleges . . . that he is . . . qualified, able, or willing to examine, diagnose, advise upon, prescribe for, prevent or treat with the intent to induce people to patronize him for the examination . . . of the human visual system, or
(c) he employs in the examination . . ., any means, including the use of topically applied diagnostic pharmaceutical agents, for the measurement, improvement, or development of any or all functions of human vision . . .; or
(d) he sells or offers for sale, otherwise than on prescription, spectacles or contact lenses containing any lens of spherical, prismatic, or cylindrical power, for the aid of human vision . . .; or
(e) he prescribes or alters the prescription for lenses . . . or prescribes the use of any optical device in connection with ocular exercises, orthoptics, vision therapy or other physical means to correct defects or adjust human vision.

Thus, in one step, Optometry made a quantum leap from a narrow, out-dated definition to a modern and, perhaps, futuristic view of the practice of Optometry.

The Council's composition was altered by the replacement of one of the elected optometric Members by a lay Member appointed by the Lieutenant-Governor-in-Council. This Member serves to represent the public's interest in the practice of Optometry in Manitoba. A lay Member was also appointed to the Board of Examiners to provide additional assurance that the public will receive optometric services from competent practitioners.

Of great significance to Canadian Optometry is the provision that optometrists who have satisfied the Board of Examiners that they are competent in ocular pharmacology as a result of the completion of a course in pharmacology in a School of Optometry, would be allowed to use certain diagnostic pharmaceutical agents. Additionally, the Council of the Society was given the authority to provide a course in ocular pharmacology to those optometrists who wish to use these agents. This course, as well as the designation of the agents and their dosages, are to be determined in consultation with the College of Physicians and Surgeons of Manitoba. The College, in fact, was instrumental in influencing the government in favour of optometric drug legislation.

Other significant, but less important, changes were included in this landmark legislation. For the first time, a 'discipline committee' (although previously included in the Society by-laws) was formulated in law, with lay representation to insure public access. The Council was now able to fine a Member for a breach of the Act, Regulations, or By-Laws in addition to its previously established rights to reprimand, suspend or revoke registration, or to dismiss the charge. The penalties for practising Optometry without a licence were increased for the first time in three-quarters of a century. Conviction on a first offence was liable for a fine of between $500-$1000, or 6 months in jail, while a second conviction made one liable for a fine of from $1000 to $2000, or 12 months in jail, or *both*. Finally, *prima facie* proof of practising Optometry, now included, in addition to the 1909 provision of 'the use of test lenses or trial frames', the use of

(b) instrumentation to measure or refract the human visual system; or
(c) instrumentation to detect or diagnose defects of the human visual system . . .

Like all things, some concessions often have to be given in order to make gains. In the case of this legislation, that which was given up was minor when compared to that which was gained. At the insistence of the government, the legislation included a clause which states

> . . . that every member of the Society shall observe the usual and customary procedures in consulting with or referring to a duly qualified medical practitioner a suspected medical problem where the consultation or referral is in the best interest of the patient.

Although some may say that this is understood in the practice of Optometry, this clause assured physicians that referrals would be made and was much preferred to the clause on mandatory referral that was first proposed. The other major concession made was to include a clause indicating that nothing in the Act would pertain "to ophthalmic dispensers to the extent that they are authorized to practise

under the provision of The Ophthalmic Dispensers Act." Since the Ophthalmic Dispensers Act does not allow opticians to do eye examinations, it was felt that, even with this clause, opticians could be prevented from practising Optometry without a licence.

Thus it can be seen that the Optometry Act in Manitoba has undergone substantial changes since its institution over 75 years ago. Many of the decisions have helped Optometry make the vast strides that it has over the years in Manitoba and in Canada. It is my hope that changes will come in the future that will further improve the practice of Optometry in the country.

Acknowledgement:

I would like to thank Drs. E.M. Finkleman, H. Moore, R. Brown, and K. Letts as well as Mr. V. Baird for their valued assistance in the preparation of this article.

Editorial (Concluded from p. 151)

optometrists and, therefore, no legal qualifications in optometry; anyone can call himself an optometrist. I hope that the EEC will make rules which will promote full optometric education and lead to adequate laws for the registration and control of optometry."

Fortunately, Italy is the only EEC nation which has not given legal status to Optometry. However, this does make the task of the IOOL more difficult in its attempts to establish a legal status for Optometry in Third World countries. Two developed countries in which Optometry has been legally banned are Israel and Greece, a very strange attitude because optometrists do practise in both countries. Stranger still because, in Israel, optometrists have access to the country's hospitals.

The IOOL has prepared a minimum course outline for the acceptance of optometric credentials in developing countries. Officials of the League act as consultants and lobbyists for local optometric groups who have approached their governments for statutory recognition. Model statutes, legal opinions and, in some cases, personnel to help establish these new schools are included in these discussions.

In some areas, success may be possible due to the lack of ophthalmologists, the cost of their training and the sheer numbers of people requiring vision and eye care. In fact, some ophthalmologists view favourably the development of these "Phase I" Optometry schools.

Canada is a member nation of the IOOL. We must do our share, individually and collectively, to promote Optometry through the League and by providing our services on screening projects sponsored by service clubs, Optometry schools or church groups in the Third World countries.

What better way to maintain our professional freedom than through a strong Optometry world-wide?

GMB

INTERNATIONAL

Facing Commercialism Within Optometry

F. Larsson*

Editor's Note:

This paper is actually the text of an address delivered by Professor Larsson to the 1985 Annual Meeting of the International Optometric and Optical League (IOOL). *The Canadian Journal of Optometry*'s Managing Editor, Dr. Roland des Groseilliers, attended the IOOL meeting as Canada's official delegate and requested a copy of Professor Larsson's presentation.

This convention of the IOOL may be considered a turning point in rather serious developments for independent optometry. Strong economic forces have changed the conditions of a highly qualified profession and now threaten its role as an important part of health care. I shall be glad if I can contribute to the efforts of this session to solve the problems of commercialism in optometry.

I shall start by confessing that I know very little about the technical and professional aspects of Optometry. Perhaps, however, this is not a disadvantage, since the problems we are going to discuss today, in fact, have a fairly general background. Even if your profession is based on a specific competence, it also involves things that are more or less common to *all* trades and crafts, such as managerial skills and financial planning. In addition to this, one may consider that the patient is also a consumer whose resources and attitudes determine the demand for goods and services according to a certain pattern.

Thus, the motives of the individual for selecting a certain place from which to buy spectacles and other optical products may be somewhat similar to the way he or she chooses among other specialised retail stores. Changes in consumer lifestyles and shopping behaviour are thus also likely to affect demand for optical products.

The international consumer

A Scottish professor by the name of John A. Dawson recently published a book on the distributive trades in Europe. Dawson has made a thorough study of the structural trends in retailing and other service industries within the Common Market countries. He tries to explain the development of the distribution sector as a function of various economic factors connected with population. In spite of existing national differences in population distribution and income levels, there is a tendency for consumer attitudes and shopping behaviour to converge towards what Dawson calls "the Euro-consumer". The effect of this is that the new business methods and distribution forms that appear in one country are also likely to occur in other countries as well. There are reasons for believing that what is happening within the trade in optical products at least partly reflects changes in general attitudes to modern distribution. This does not mean that a small independent is fighting a hopeless battle. He or she must, however, be aware of the changes in the environment and adapt products and services in order to cope with them.

The three "waves" in retailing

I should think that many of you have probably read Alvin Toffler's book *The Third Wave*, in which he describes the different phases of the development of industrial society. In a similar way, it is possible to distinguish three different periods with regard to the way in which goods and services are offered to the public. For most products, the first such wave lasted until the Fifties or the Sixties and was characterised by a rather static way of serving the consumers. The price of a certain article was often the same in all stores, in most cases set by the manufacturer. This meant that competition was weak, and the system gave protection to a large number of small dealers and craftsmen.

The second stage started some twenty years ago, when the abolition of price maintenance systems took place in most countries. Multiple chains with low price profiles appeared, and achieved considerable market shares in various segments. Distribution forms like variety stores and general merchandise discounters were successful in many countries and the traditional retail trade suffered considerably.

However, during recent years there have been obvious signs of a shift in attitude among

*Professor
Swedish Retail and Wholesale Research Institute
Stockholm, Sweden

consumers. Many of them have found that what they believed was a purchase at a favourable price — a real bargain — in fact turned out to be rather expensive because of poor quality or limited usefulness. Thus, in spite of declining real income in many countries, there has been a growing tendency among consumers to stick to quality and better service.

Now there is reason to believe that the same changes in consumer attitudes and behaviour will occur within the optical products market. Many independents today feel the threat of commercialism from powerful chain organisations. But even if the present competition creates serious problems for private practitioners, there should be no cause for defeatism. Because for the consumers, or patients, as we prefer to call them, good vision care is a *basic* need. However, they have been misled by the strong advertising campaigns of the chains. In order to keep and regain their market shares, independent practitioners need to find a strategy whereby they can focus the need for highly qualified information and treatment in optometry. But such a strategy must also include certain elements of management and marketing in order to be successful.

A competitive trade model

Now, in order to explain to some extent the nature of competition, I would like to show you a simple model (Fig. 1) that was in fact designed for the specialised retailer. Some of you may protest, saying that you are not retailers but professionals in optometry. Well, that is your basic profession, but you are also exercising various retail functions. In the latter capacity you are affected in ways similar to those affecting most retailers.

The outer ring of this chart shows the eight most important means of competition. They also represent different "values added" to the consumer. It is not possible for any retailer to be number one in all respects at one and the same time. Giving quality and rendering service always costs money and makes it impossible to offer low prices. On the other hand, companies wanting to show a marked low-price profile cannot afford to offer costly services.

Each company is characterised by a certain combination of these attributes which together constitutes its *market profile*. The large retail chains and especially the extreme low-price channels — we sometimes call them "pirates" because of their business methods — naturally stress the price factor. But people wouldn't know about these low prices if they were not informed by means of heavy advertising.

Companies like these are also dependent on impulse buyers, which means that they need a highly visible street location. With the help of noisy promotion campaigns they hope to distract the consumer's attention from the lack of qualified

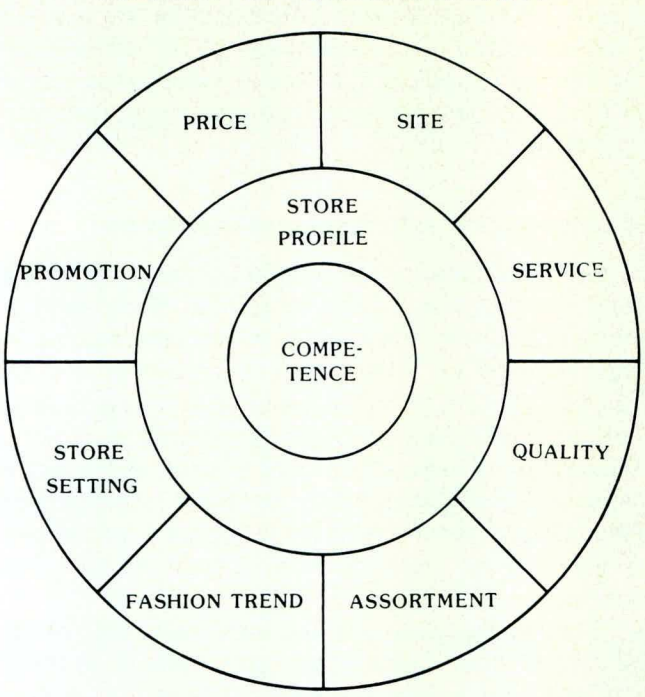


Fig. 1

service. Thus they get many customers who are not aware of the alternatives which exist.

On the other hand, the traditional specialised retailers — and I think this includes most optometrists as well — naturally lay most emphasis on attributes like quality and service. Many of these have a rather extensive assortment of products but not all are entirely up-to-date in terms of fashion trends. These dealers are generally regarded as rather expensive because they never give a discount or a special offer. And perhaps the most serious thing is they often do not communicate enough with the public through the media of information and advertising.

What I mean is not that the specialised retailer or the optometrist should engage himself in extensive marketing programmes, with wide use of discounts and special offers. But he or she is recommended to budget a reasonable sum each year for information to customers and patients, especially when something new and interesting has occurred in the practice. He or she should also carry some less expensive alternatives in his or her assortment. Remember the old saying "Poor people need low prices; rich people adore low prices".

This does not mean the application of a general price-cutting policy but the use of more flexible methods of price calculation and price setting. Thus the specialised retailer, including the independent optometrist, should take into consideration all of the factors shown on the chart, even if they may place most emphasis on some of these like quality, service and assortment. Together they form his or her market profile and distinguish him or her from other distribution forms. In the centre I have written

Competence because this is, of course, the basic factor in situations like yours. But in the present market situation you cannot survive on competence alone. It must be complemented with all these other values that are essential to meet the consumers' demands.

Conclusions and recommendations

Now it is time for me to sum up my conclusions and to try to give you some general recommendations concerning the strategy which we are going to discuss later on. I think it is necessary to start by trying to examine the causes of the new market situation for optical products. Is the expansion of the new chain organisations only a result of low price and heavy advertising? Or are there other factors that attract customers to these outlets, for example, better site locations or more convenient business hours?

Conversely, what are the weaknesses or drawbacks of the independent optometrist? Without trying to get a sincere answer on these questions, I think it is impossible to create a successful strategy for fighting these new forces.

I want to finish this presentation by offering you some general recommendations. Since I have not been able to make a special study of the problems of the optometry sector, these recommendations should be considered more as suggestions based on my earlier knowledge and experience from the retail area.

1. Don't compromise on the claims of adequate education and responsibility in your profession.
2. Find new ways to give information to the public about your profession and your service.
3. Improve management and efficiency. I have seen opticians with a rate of stock turnover on frames as low as point-five times a year. In the coming years small computers can be valuable tools for better stock control.
4. Try to be flexible in price setting. Be careful always to have some low-price alternatives which are competitive.
5. Encourage independent optometrists to join voluntary purchasing groups whereby they can achieve lower purchase prices and a stronger marketing impact.
6. Beware of changes in town planning and in consumer traffic flow in order to maintain a good practice location.

I don't claim that this will solve all your problems but I hope that my views can form a basis, at least, for discussion.

Radial Keratotomy Fact Sheet

Editor's Note

The controversial surgical procedure called Radial Keratotomy (or RK) is now being talked about widely, not only in professional publications, but also in the public media as well.

Coverage in the latter has ranged from a segment on ABC-TV's "20/20" program to local newspaper advertising by surgeons. It has prompted many patients to ask their optometrists for the facts about RK.

The Board of Trustees of the American Optometric Association recently developed and circulated to all AOA members the following fact sheet on RK. This surgical procedure to "cure" nearsightedness is still experimental and its long-term effects are not known.

To help you communicate effectively with your patients about Radial Keratotomy, the CJO is also publishing the information sheet, "What You Should Know About Radial Keratotomy".

"What You Should Know About Radial Keratotomy" can also be ordered in pads of 100 from the AOA's order department, 243 North Lindbergh Blvd., St. Louis, MO 63141, USA. The cost is $5.00 (US$) per pad, plus shipping.

What You Should Know About Radial Keratotomy

What is Radial Keratotomy?

Radial keratotomy is a relatively new surgical procedure used to reduce nearsightedness (myopia). The National Eye Institute considers it investigational and is conducting a five-year study of its effectiveness and safety. The surgery is available now on a limited basis but generally is not covered by medical insurance.

How does Radial Keratotomy Work?

To understand how radial keratotomy works, let's first look at how the eye works. In the normal eye with 20/20 (6/6) vision, the lens inside and the cornea (the clear outside surface of the eye covering the pupil and iris) work together to focus light rays on the retina located at the back of the eye. In the nearsighted eye, the light rays are focused in front of the retina, resulting in blurred vision when looking at far distances.

During radial keratotomy, the surgeon makes eight to sixteen freehand cuts in the cornea, like spokes in a wheel. These cuts cause the cornea to flatten and, as a result, the focusing of the light moves backward toward the retina. The operation is done under local anesthesia.

The length of healing time varies from several months to several years. Post-operative pain, sometimes requiring pain relievers, usually lasts only for a few days, however.

Does Radial Keratotomy Eliminate the Need to Wear Glasses or Contact Lenses?

Radial keratotomy usually reduces nearsightedness but the results are unpredictable for each individual.

Generally only those who are mildly nearsighted may be able to see clearly at far distances without glasses or contact lenses after radial keratotomy. Others still need to wear prescription lenses, although their lenses may not need to be as strong. Some people are overcorrected and end up wearing glasses or contact lenses for farsightedness.

Many radial keratotomy patients find their vision fluctuates, often being better in the morning than at night. They may need to wear prescription lenses at least part of the time.

Also, other vision problems requiring treatment with prescription lenses may exist along with nearsightedness. Two of the most common are astigmatism and presbyopia (a loss of focusing ability of the eye's lens that occurs after age 40 and affects reading vision). Even with radial keratotomy, most people eventually need glasses or contact lenses for other vision problems.

Are There any Side Effects with Radial Keratotomy?

Yes. The most common are fluctuating vision; sensitivity to glare or light; difficulty seeing at night, and earlier onset of presbyopia. Also, surgical scars on the cornea sometimes make it impossible for some people to wear contact lenses.

Are There any Risks with Radial Keratotomy?

There are risks with any kind of surgery. Those involved with radial keratotomy include infection; accidental cutting of the optical zone, that is, the center part of the eye; and perforation of the cornea. All could result in a partial or total loss of vision.

Long-term risks of radial keratotomy will not be known for another decade or two. There is concern about the possible development of corneal diseases and the ability of the eyes to withstand cataract surgery, if that became necessary for the patient 20 or 25 years from now.

An older form of radial keratotomy, performed in Japan in the 1940s, resulted in the development of a degenerative corneal disease that did not appear until 10 to 20 years after surgery. The disease gradually blinded 70 percent of those participating in the follow-up study. Corneal transplant surgery was, for the most part, unsuccessful in treating these people.

What other Options are There for People with Nearsightedness who do not Want to be Bothered with Glasses or Contact Lenses Every Day?

Extended-wear contact lenses eliminate much of the bother of daily-wear contacts and may be a practical solution for many nearsighted people. Optometrists can provide up-to-date information on the newest types of extended-wear lenses.

When Should a Person Consider Having Radial Keratotomy?

As with all surgery, radial keratotomy should be considered only as a last resort. Anyone who can achieve satisfactory vision for everyday living with glasses or contact lenses would be wise, at this time, to continue with them.

CAO 1987 Biennial Congress

The 1987 "Merry-time Mingle" in Saint John, NB is fast approaching and the Education Committee is in the preliminary stages of lining up speakers.

We would like to ask all CAO members with a suggestion or recommendation for topics and/or speakers for the Committee to consider to forward these suggestions to:

Dr. Richard E. Lee
Education Committee
CAO 1987 Biennial Congress
c/o 512 George Street
Fredericton, NB
E3B 1K1

VISION CARE NEWS

CAO Sections Off and Running!

The Children's Vision Section of the Canadian Association of Optometrists was accorded official status at the October meeting of CAO Council, held in Montréal.

Reports from the co-ordinators for Sports Vision and Contact Lenses are that these two Sections are not far behind in finalizing the inaugural administration procedures required to secure Section status within the Association.

The CJO's first issue in 1986, our March issue, will feature a detailed report on each of the approved and proposed CAO Sections. In the meantime, members with an interest in any of the following practice areas are invited to write the CAO Councillor identified as liaison for that particular Section:

Children's Vision: Dr. Margaret Hansen des Groseilliers
2277 Riverside Drive
Ottawa, Ontario
K1H 7X6

Contact Lenses: Dr. Keith Letts
102 Fletcher Street
PO Box 250
Killarney, Manitoba
R0K 1G0

Sports Vision: Dr. Ralph Rosere
152 Ochterloney Street
Dartmouth, Nova Scotia
B2Y 1E1

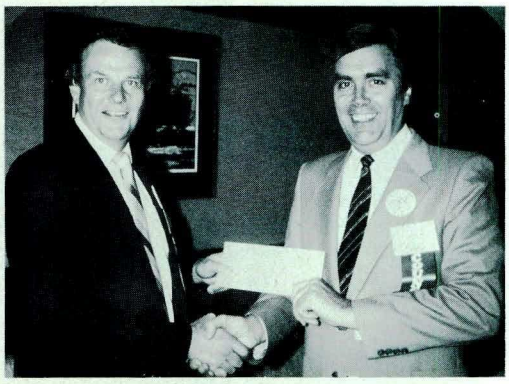
Volunteer Optometric Services: Dr. Les Clements
249 Rookwood Avenue
Fredericton, New Brunswick
E3B 2M5

Low Vision: Dr. Bruce Rosner
212A Regent Avenue W
Winnipeg, Manitoba
R2C 1R2

Aviation Vision: Dr. Tom Adamack
642 Second Avenue
PO Box 2500
Fernie, BC
V0B 1M0

COETF Industrial Fundraising Program Receives First Cheque

Having reached a milestone in its funding campaign — the pledging of $1,000,000.00 from the members of the Canadian Association of Optometrists, the Canadian Optometric Education Trust Fund (COETF) accepted with great pleasure a cheque from the purchasing group of l'Association des Optométristes du Québec, les Services Optométriques de l'AOQ, to inaugurate officially its industrial fundraising program across Canada. The presentation was made by AOQ President Dr. Jean-Marie Rodrigue (R) to COETF Chairperson Dr. Scott Brisbin at the 19th Biennial Congress of the Association, held this past July in Regina.



Michel Millodot Appointment

Professor Michel Millodot, Head of the Department of Optometry at the University of Wales Institute of Scientific Technology (UWIST) has been named patron of the Society of Experimental Optometry. The Society, which recently celebrated its 5th Anniversary, meets annually in a forum for presenting research in experimental optometry. Dr. Millodot is one of the Society founders. "Experimental optometry" is a term he has used to describe the research being conducted in his own laboratory since 1972.

SOA Act Proclaimed

On July 15 this year, the Saskatchewan legislature proclaimed as law the new Saskatchewan Optometry Act.

The Act permits the use of topical anaesthetics, as detailed in the provincial Association's bylaws, with further Diagnostic Pharmaceutical Agents to be added at a later date.

Canadian Participation at the AOA's International Optometric Forum in Las Vegas

In conjunction with the 1985 Congress of the American Optometric Association in Las Vegas this summer, an International Optometric Forum was held which featured several prominent individuals from CAO. Shown in the photo are Mr. Gérard Lambert, CAO Executive Director (5th from left); Dr. Ralph Rosere, (then) CAO President (extreme right) and Dr. Jean-Marie Rodrigue, President of l'Association des Optométristes du Québec and CAO Councillor for Québec (second from right).

Spring Into Europe in 1986!!

Back to back ophthalmic events this April in Europe offer an exciting opportunity for eye care practitioners to combine business and education with travel and a holiday.

From April 20-23, the 1986 Annual Meeting of the International Optometric and Optical League will be held in Madrid, Spain. The

IOOL traditionally offers a superb, European-flavoured social program with a widely diverse education and business schedule. Multi-lingual translation is standard for all IOOL educational sessions.

Three days later, April 26-29, Cologne, Germany will host Optica 1986, the International Trade Fair for Ophthalmic Optics, in conjunction with the 38th Annual Congress of the WVAO (an abbreviation of a lengthy German name — see the address below — which translates as the Scientific Association for Ophthalmic Optics and Optometry).

This year's WVAO Congress has as its theme "Good Vision and Good Looks — Function and Aesthetics of Vision Aids" and will include sessions on fashion, research results, new developments in correction aids and instruments, as well as future trends in ophthalmic optics and optometry.

Further information:
Re the I00L's Madrid Congress April 20-23: The International Optometric and Optical Leagues (IOOL), 10 Knaresborough Place, London, SW5 OTG, England.

Re Optica '86 and the 38th Annual Congress of the WVAO April 26-29: Wissenschaftliche Vereinigung fur Augenoptik und Optometrie (WVAO), Adam-Karillon-strasse 32, D-6500 Mainz, Germany.

CAO Inaugurates Annual Student Awards

The Canadian Association of Optometrists earlier this year presented its first ever CAO Award of Merit to a Student of Optometry at the School of Optometry, University of Waterloo. Dr. Ralph Rosere (L), then President of the national Association, is shown presenting the Award, which was accompanied by a cash prize, to (then) 4th year student Bertha Wolf.

The inscription on the plaque reads as follows: "The Canadian Association of Optometrists Award of Merit to Bertha Wolf, for outstanding contributions to the Optometric School community while maintaining a high standard of academic excellence."

The Award was presented at this year's Waterloo convocation ceremonies. CAO will also be inaugurating, at the coming convocation ceremonies for the School of Optometry, University of Montreal, an Award for an outstanding student contribution or performance in a category to be determined by the CAO Awards Committee in consultation with representatives at the Montreal School.

Holistic Optometry Awards Nominations Sought

The International Society for Holistic Optometry has announced that it is now accepting nominations for awards in two categories: The International Humanitarian Award, in recognition of outstanding service to humanity over and above the call of professional duty; and the Holistic Optometrist of the Year Award, in recognition of outstanding professionalism and service to patients.

Each nomination should include the name, address and a brief description of why the nominee should receive the award. Nominations should be sent to: Director, International Society for Holistic Optometry, PO Box 2172, Farmington Hills, MI, 48018, USA.

AO's Contact Lens Business Acquired by CIBA-GEIGY

CIBA-GEIGY Corporation and American Optical Corporation have announced that they have reached an agreement under which the contact lens and lens care product businesses of American Optical, AO's Contact Lens Division will become part of the Ciba Vision Care, a branch of CIBA-GEIGY's Pharmaceutical Division, headquartered in Summit, New Jersey.

Contact Lens Spectrum Joins Publishing Field

A new vision care publication has entered the field in North America.

Contact Lens Spectrum comes hot on the heels of a substantial personnel departure from the *Contact Lens Forum*. This past summer, a British owned publishing company, Gralla Corporation, moved to acquire Advisory Enterprises which publishes the *Contact Lens Forum*, three other publications, and organises the Optifair meetings held annually across the US.

In the wake of the acquisition, Dr. Neal Bailey and seven other Advisory Enterprises employees resigned and have put together their own publishing group — Viscom. Viscom will produce a tabloid journal, called *Eye Care Business*, and *Contact Lens Spectrum*, a journal in the more traditional academic format.

Further information is available from Viscom Publications Inc., 50 Washington Street, Norwalk, CT, 06854, USA. Telephone (203) 838-9100.

The Boston Lens IV Contact Lens Reconditioning Drops

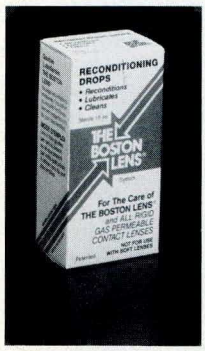
Last year, Polymer Technology introduced the Boston Lens IV Contact Lens, a new prolonged wear, rigid gas permeable lens which, according to Polymer, allowed as much oxygen to pass through as with extended wear hydrogel lenses.

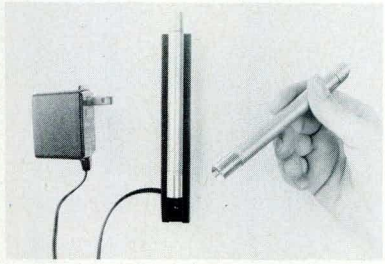
This year, Polymer has announced the development of a line of reconditioning drops specially formulated for rigid gas permeable lenses. The Boston Lens Reconditioning Drops, again according to Polymer, allow the wearer to "wet, clean and recondition rigid gas permeable lenses without the nuisance of lens removal."

To promote the product, "also helpful to patients who complain of dryness or irritation when living or working in dusty or over-heated environments or at high altitudes", Polymer is offering free samples of the drops to Canadian practitioners through its authorized manufacturers of the Boston Lens.

Further information is available from Polymer's PR firm: Lobsenz — Stevens Inc., 460 Park Avenue South, New York, NY. 10016, USA. Telephone (212) 684-6300.

▼





▲

Rechargeable Penlight Eliminates Disposables

Keta Corporation has introduced a new rechargeable pocket penlight that operates all day on a single charge.

With a brushed chrome finish and a clip actuated switch, the light comes complete with two nickel cadmium batteries, a charger and charger stand that can be affixed anywhere near a plug and sells for $31.95 (US$) complete. Information is available from: Keta Corporation, Richard D. Tracey, Jr., National Sales Manager, 9 Canal Street, Danvers, MA, 01923, USA. Telephone (617) 777-4660.

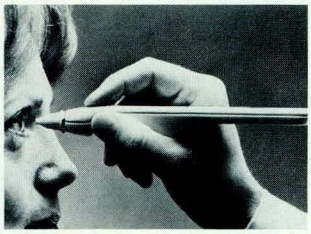
Hand-Held Computerized Tonometer Unveiled

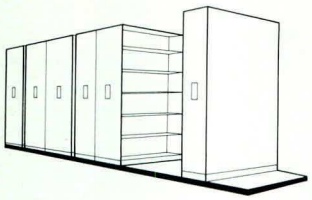
Oculab, Inc., a new company out of Glendale, California, recently unveiled its first product — a computerized, pen-sized, micro-electronic tonometer.

The TONO-PEN tonometer, according to Oculab's publicists, allows measurement of intraocular pressure (IOP) "much more easily".

The tonometer incorporates a microscopic, strain-gauge pressure transducer attached to a single-chip computer. IOP is converted into an electronic signal, analyzed and displayed as a measurement in seconds. TONO-PEN does not require a slit lamp or examining room.

The tonometer will be available in February, 1986 and will be distributed through Intermedics Intraocular, Inc., of Pasadena, California. Further information is available from: Baxter, Gurian and Mazzei, Inc., 8501 Wilshire Blvd., Suite 220, Beverly Hills, CA, 90211, USA. Telephone (213) 657-5050.





STOR — MOR Office Filing System

STOR — MOR Systems has introduced a new, compact, high density mobile storage system for office files.

Citing ease of installation as one of the systems main features, each unit includes a level and levelling tool and is "lockable, portable, and features an anti-tip mechanism".

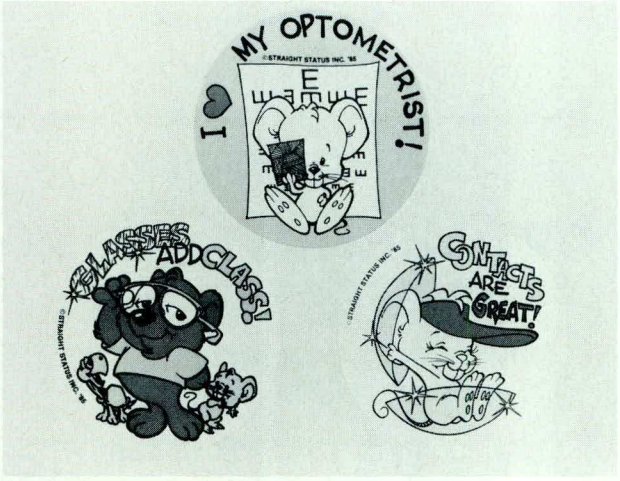
Further information: STOR — MOR Systems, Suite 474, 7305 Woodbine Avenue, Markham, Ontario, L3R 3V7. Telephone (416) 475-5958.

Optometric Stick-ups

Straight Status Inc. has produced a new line of self-adhesive stickers designed to reward and motivate young patients.

Each is 2½" (6.3cm) in diameter, brightly coloured and available in general designs, as well as in specific themes like Hallowe'en, Thanksgiving and Christmas.

For further information, prices and samples: Straight Status Inc., PO Box 445, New Castle, IN, 47362, USA. Telephone (317) 521-4040.



Allergan Introduce Lens Plus

Lens Plus, an aerosol, preservative-free saline which contains only sodium chloride and an inert nitrogen propellant, is now available in 90mL and 240mL sizes. With costs similar to Sorbisol, Lens Plus may be used as a rinsing agent, or to dissolve Hydrocare protein tablets.

Further information: Your Allergan representative.

PCL Holds Roundtable Discussion on the ALGES Bifocal

Toronto's Chelsea Inn was the setting earlier this year for an informal roundtable discussion on PCL's ALGES Bifocal contact lens. On the plus side — comfort, distance acuity and excellent reproducability. But on the negative side, problems were noted in the lens' handling of low powers.

A number of fitting recommendations were also aired, including using the 2.35mm diameter segment for better reading acuity, keeping lens lag minimal for stable vision and keeping the segment in the lower temporal pupil area.

Success was enhanced through careful screening of fits with young presbyopes and low astigmats (less than ¾D) showing the highest promise.

K & W Adds High Tech to Order Processing

K & W Optical Company Limited has begun processing orders through a new Optical Laboratory Management System developed by CMSI, of Portland, Oregon.

CMSI's PRISM II system includes a special tray tracking feature which follows each tray through every step in the laboratory. According to K & W, this will serve the double purpose of eliminating delays and providing immediate information for any job status enquiries.

K & W is located at 151 Weber Street South, Waterloo, Ontario, N2J 4C3. Telephone (519) 743-2601.

CALENDAR

1985

December

26-January 8
The Israeli Experience (Optometric Institute-sponsored)
CE Program and tour of Israel
Information: The Optometric Institute
Suite 301 — 815 Danforth Avenue
Toronto, Ontario
M4J 1L2
Telephone (416) 461-6222

1986

January

11-12 **Pan Pacific Contact Lens Conference**
Sheraton Royal Waikaloa Hotel: Hawaii
12 hours CE
Information: Dr. Stanley J. Yamane, Chairman
Pan Pacific Contact Lens Conference
94-748 Hikimoe Street, Suite C
Waipahu, Hawaii
96797
USA

Further information: STOR — MOR Systems, Suite 474, 7305

26-28 9e Congrès d'Optométrie et d'Optique de Contact
Paris, France
Information: Comité d'organisation du Congrès
d'Optométrie et d'Optique de Contact
38, Bd Raspail
75007 Paris
France

March

23-26 OptiFair International '86
Hilton and Sheraton Center Hotels
New York
Information: Program Director, OptiFair
17 Washington Street
Norwalk, CT
06854, USA
Telephone (203) 852-0500

24-26 Optical Society of America
Second Topical Meeting on Noninvasive
Assessment of the Visual System
Monterey Conference Centre
Monterey, California
Information: Optical Society of America
1816 Jefferson Place NW
Washington, DC
20036, USA

April

6-9 International Rehabilitation Week
Exhibition and Conference
Jacob K. Javits Convention Centre
New York
Information: EJJ Management Inc
225 West 34th Street, Suite 905
New York, NY
10122, USA
Telephone (212) 563-5461

18-24 International Optometric and Optical League
(IOOL) Annual Meeting
Madrid, Spain
Information: Jose L. Collado
Decano Colegio Nacional Opticos
Princesa, 25, 1
28008
Madrid, Spain

26-29 Optica '86
International Trade Fair for Ophthalmic Optics
and 38th Annual Congress of the WVAO
Cologne, Germany
Information: KoinMesse
Messe- und Ausstellungs-Ges.m.b.H.
Koln
D-5000, Koln 21 Messeplatz
Germany
Telephone: Willi Julich
221/821-2912
Telex: 8 873 426 mua d

June

22-27 89th Congress of the American Optometric Association
San Diego, California
Information: Meetings Department
American Optometric Association
243 N. Lindbergh Blvd.
St. Louis, MO
63141
USA

25-27 International Symposium on Low Vision
Centre for Sight Enhancement
School of Optometry, University of Waterloo
Information: Professor George Woo, Chairman
International Symposium on Low Vision
School of Optometry
University of Waterloo
Waterloo, Ontario
N2L 3G1
Telephone (519) 885-1211

BOOK REVIEWS

Ocular Photography by William F. Long, Ph.D. Professional Press Inc., Chicago, 1984, 138 pages, 102 black and white figures and illustrations, 3 tables, 132 references (65 for photoslitlamp), 2 appendices, glossary.

It has been said that a picture is worth a thousand words. One could add that nowhere is this statement more true than in ocular photography. Variations in the appearance of the normal eye and fundus, of congenital or developmental anomalies and of pathological conditions are such that written descriptions will vary with the experience, training and vocabulary of the observer despite efforts to standardize terminology. Ocular photography is the most concise and exact way of documenting ocular conditions.

Practitioners should be encouraged to incorporate the technique in their daily routine and apply it when indicated, particularly when monitoring pathological changes or to record the appearance of the anterior eye when fitting daily and extended wear contact lenses.

Dr. Long's book is as clear and to the point as were his lectures given many years ago during C.E. courses at Waterloo, which laid the foundation for this eminently practical text.

Chapter one deals with the basic photographic principles and how these are affected by the features of the camera such as focal lengths, field and apertures, not to mention quality of film and illumination. The very clear text is made even more comprehensible by a good selection of illustrations.

Chapter two describes external photography with a hand held camera. It is far more than a "cook book" procedure for portrait photography, uni-ocular or bi-ocular photography and close up photography. The author describes the equipment and the formulae required to select the proper working distances and lenses. Some few pages are devoted to pre-assembled systems which are less versatile but demand less experimentation. The chapter concludes with a discussion of framing methods and fluorescein photography.

Slit-lamp photography is the topic of chapter 3. A brief description of the basic elements of the slit-lamp introduces the subject. Although some general principles apply to all aspects of ocular photography, the photo slit-lamp demands greater finesse than other forms. The author emphasizes "psychological clarity", that is, to capture the feature which the photographer wants to illustrate and to enhance it in somewhat of a 3D aspect in a two dimensional picture. Magnification, illumination intensity, film quality, exposure time, beam aperture size and shape; all must be considered to obtain the clarity desired. Even racial anatomical features, iris and fundus colours enter the picture. Adapting the conventional slit-lamp for photography, endothelial photography, use of auxiliary lenses, fluorescein photography takes up some 7 pages of text and illustrations. Recommendations on the choice of a photo slit-lamp close out this chapter.

Chapter four discusses photokeratoscopy. One would think that photographing the cornea would be a simple procedure. Photokeratoscopy is more than a mere photograph, however, as it aims to obtain a picture of the cornea's topography and demands more than just snapping a picture. Magnification of the apparatus and the topography can create difficulty in the interpretation of the keratogram which the author explains concisely. He describes some keratoscope commercial models as well as practitioner-designed ones and their uses for office documentation, research and contact lens design.

Chapter five is devoted to fundus photography, first tried some 100 years ago. High tech has made this aspect of ocular photography a very exacting science. The chapter covers a discussion of the optics of the camera, exposure time and film choice, the use of mydriatics and the alignment necessary to obtain the desired photos. The field of view is given considerable attention and the mounting of composites to compensate for restricted field of view. Non-mydriatic procedures and cameras are not overlooked, nor are stereo photography, spectral reflectance photography and fluorescien angiography. The chapter ends with a few notes on the choosing of a camera.

Chapter six is short, some 6 pages only. It concerns itself with administration routines related to the development of the film, its annotation, storage and mounting. The chapter could be summarized "You have a fundus picture. What do you do with it now?" One could, but only with difficulty, find a more concise answer than given in this final chapter.

The book is replete with excellent black and white pictures and all chapters have an adequate bibliography. A glossary of terms related to photography and an index complete the book.

This text should become a standard undergraduate text as well as a C.E. reference for those practitioners who were not favoured with such instruction in their undergraduate years.

G.M.B.

Colour Aids — Ophthalmology — by J.J. Kanski, F.R.C.S., published by Churchill Livingstone, Longman Group Ltd, 1984 distributed in Canada by Academic Press, Don Mills, Ont., 53 pages, 165 coloured illustrations, $12.75 Canadian.

This pocket-sized book is one of a series of ten texts dealing with different medical specialties. They are all compact desk references, something to be kept at hand during a patient visit for speedy consultation and to show the patient if necessary.

The format is similar in all books of the series — a list of common conditions explained in a very concise test on the left hand page facing full colour photographs of the conditions on the right hand page. There are 3 photographs per page. The colour photography is excellent and each photograph measures 2 x 3 inches.

This text, *Ophthalmology*, has 53 pages of text, 165 photographs of both external and internal ocular conditions. They are grouped under headings of: eyelids, orbit, uveitis, conjunctivitis of all types, corneal sclera, glaucoma, lens, retina, optic nerve, other cranial nerves, strabismus, phakomatoses and trauma. Simply thumbing through it is like attending an illustrated lecture. The text is short and restricted to the minimum essential information one would want during a patient examination. It is not a detailed book on anatomy, physiology or aetiology as would be found in more formal textbooks, but ones which are too unwieldy as desk references.

This book can be recommended to all practitioners whatever their years in practice. Students would benefit greatly from its use. A picture is worth a thousand words and this small book is many pictures' worth its weight in text.

G.M.B.

Contact Lenses: A Guide to Successful Wear and Care. Hikaru Hamano and Montague Ruben

This is a simple book for patients to read who wish to be better informed about their eyes and the use of contact lenses as corrective devices. Several weaknesses of the book, however, are in its presentation: one page, for example, is printed in reverse. An inexcusible error is revealed in a photograph which, although it may be more photogenic is not the way one holds a lid when inserting a contact lens. It is also regrettable that, at times, the ophthalmology/optometry conflicts surface.

For the general public, however, this is an acceptable book. Not only does it explain the different types of contact lenses available, but it also explains very clearly the anatomy and physiology of the eye.

R. des Groseilliers

The Canadian Optometric Education Trust Fund Invites Applications for Funding under the awards schedule for the 1986 Grant Program

Purpose of the COETF

Recognizing the need to support the continuing growth and development of the profession of Optometry, the COETF is prepared to financially assist the educational, research and manpower programs deemed by the Trustees to be more important to achieving these goals.

Suitably trained optometric personnel, and the profession's continued access to these professionals is vital to our academic evolution. *The COETF supports* faculty development in our schools of optometry, graduate students in specialized educational programs and investigative research by undergraduate students.

Ongoing research undertaken by the optometrist in private practice is just one type of professional development program which optometry must continue to initiate. *The COETF supports* projects established in a clinical environment to assist the visually handicapped and to assist other optometrists through preparation and publication of the details of these clinical research studies.

A third Canadian school of optometry is of vital concern to the profession. The ongoing activities of our two existing schools are just as important. *The COETF supports* needed alterations and renovations at both schools presently operating and stands ready to assist substantially in the operating cost support of a new school of optometry in Canada.

Continuing education in the 80s must be regular and structured as technology sweeps the profession forward into new methods and discoveries in the delivery of complete vision care. *The COETF supports* the development of an academic Chair of Physiological Optics and Continuing Education to meet these ongoing needs.

The Canadian Optometric Education Trust Fund invites your support in this "Vision of the Future". If you are (or know of) an optometric practitioner, student, educational institution, service organization or member of the general public who is presently involved in, or planning a program that meets any of the goals outlined above, then assistance might be available to achieve the project's objectives. Write to us, using the application in this issue of the CJO, by February 14, 1986. The Trustees assure that all projects meeting the purposes of the Fund will be given serious consideration.

Le Fonds de Fiducie pour les Études en Optométrie au Canada Offre du Financement en Vertu de son Programme de Subventions 1986

Objet du FFEOC

Reconnaissant la nécessité de soutenir la croissance et le développement de la profession d'optométriste, le FFEOC est disposé à accorder une aide financière pour les programmes d'étude, de recherche et de main-d'oeuvre que son Conseil de fiducie juge parmi les plus importants pour l'atteinte de ces objectifs.

Il est essentiel à l'évolution de notre science de nous assurer un personnel optométrique bien formé et de faire en sorte que la profession continue d'avoir accès à ces professionnels. *Le FFEOC appuie* le perfectionnement des enseignants dans nos écoles d'optométrie, la participation d'étudiants de deuxième cycle aux programmes d'enseignement spécialisé et le travail d'investigation de la part des étudiants de premier cycle.

La recherche permanente entreprise par l'optométriste en pratique privée n'est qu'un des types de programme de perfectionnement professionnel que l'optométrie doit continuer de lancer. *Le FFEOC appuie* les projets établis en milieu clinique pour aider les handicapés visuels et pour aider les autres optométristes par la préparation et la publication des détails de ces études de recherche clinique.

La profession souhaite vivement la création d'une troisième école canadienne d'optométrie. Les activités permanentes de nos deux écoles existantes sont tout aussi importantes. *Le FFEOC appuie* les modifications et les rénovations requises aux deux écoles actuelles et est disposé à assumer une part appréciable des frais de fonctionnement d'une nouvelle école d'optométrie au Canada.

L'éducation permanente dans les années 80 doit être constante et structurée au moment où la technologie propulse la profession vers de nouvelles méthodes et de nouvelles découvertes dans la prestation des soins complets de la vue. *La FFEOC appuie* la création d'une chaire universitaire d'optique physiologique et un programme d'éducation permanente pour répondre à ces besoins permanents.

Le Fonds de fiducie pour les études en optométrie au Canada vous demande votre appui pour cette "Vision de l'avenir". Que vous soyez praticien, étudiant, établissement d'enseignement, organisme de service ou membre du grand public qui participez présentement ou projetez de participer à un programme qui répond à l'un des objectifs décrits ci-dessus, vous pourriez obtenir une aide pour atteindre les objectifs du projet. Écrivez-nous, sur le formulaire de demande reproduit dans ce numéro de la RCO, avant le 14 février 1986. Le Conseil de fiducie accordera une attention minutieuse à tous les projets correspondant aux objectifs du Fonds.

Canadian Optometric Education Trust Fund
1986 Grant Program — Application for Funding

Complete and forward (we require 5 copies) no later than February 14, 1986, to:
COETF Grant Program,
Ste. 207-77 Metcalfe Street
OTTAWA, Ontario
K1P 5L6

FULL NAME _____ TEL. ( ) _____

MAILING ADDRESS _____

_____

_____

_____

FUNDING CATEGORY _____ ☐
Post Doctoral Study _____ ☐
Clinical Research _____ ☐
Undergraduate Research _____ ☐
Public Vision Care
(conducted by non-academic
or non-practitioner) _____ ☐

Title, nature and description of project* _____

_____

_____

_____

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_____

*(If this space is insufficient, please outline the project on a separate sheet of paper)

Expected date of completion _____

Expected benefit from project _____

_____

_____

_____

_____

_____

Estimated Budget (Please provide details on a separate sheet of paper)

Personal Services	Salaries	Equipment	Supply Mtl.	Travel	Tuition	Other (specify)
				Total Grant Requested $		

A formal written report is expected to be a part of this study. A copy must be submitted to the Trustees of the Fund, and will be considered for publication in the Canadian Journal of Optometry, within 60 days of the completion of the project.

_____ _____

SIGNED DATE

Fonds de Fiducie pour les Études en Optométrie au Canada
Programme de Subventions 1986 — Demande de Financement

Remplir et renvoyer (en 5 exemplaires) au plus tard le 14 février 1986 à:
Programme de subventions du FFEOC
Bureau 207, 77 rue Metcalfe
OTTAWA (Ontario)
K1P 5L6

NOM DU COMPLET _____

ADRESSE POSTALE _____

_____

_____

_____

TÉL. ( ) _____ ☐

CATÉGORIE DE FINANCEMENT ☐

Études post doctorales _____ ☐

Recherche clinique _____ ☐

Recherche (premier cycle) _____ ☐

Vision publique
(par un non-universitaire
ou un non-praticien) _____ ☐

Titre, nature et description du projet* _____

_____

_____

_____

_____

*(Si l'espace est insuffisant, exposer le projet sur une feuille détachée.)

Date prévue d'achèvement _____

Avantages attendus du projet _____

_____

_____

_____

_____

_____

Budget estimatif (Fournir détails sur une feuille détachée)

Serv. pers.	Salaires	Matériel	Fournitures	Déplacements	Scolarité	Autres (préc.)
				Subvention totale demandée $		

Cette étude devrait donner lieu à un rapport écrit officiel. Il faut en soumettre un exemplaire au Conseil de fiducie du Fonds, qui envisagera la possibilité de le publier dans la Revue canadienne d'optométrie dans les 60 jours de l'achèvement du projet.

_____ _____

SIGNATURE DATE

Canadian Journal of Optometry — Annual Index Volume 47 — 1985

The Canadian Journal of Optometry gratefully acknowledges the continuing support of all our contributors and our advertisers.

EDITORIALS

BOOK REVIEWS

FEATURES / ANNOUNCEMENTS

ARTICLES

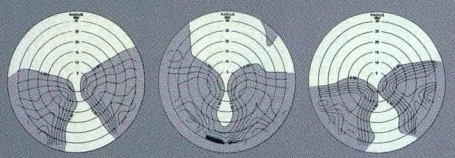
Just one of these lenses lets you earn $30,000 more profit every year...without more work and worry.

Which one? The Sola VIP.

Why? Because only the VIP can satisfy the biggest untapped market for progressives: your current flat top customers. And each time a patient makes the switch, you make $50 extra profit. Less than 3 pairs a day earns you $30,000 in just a year.

Flat top wearers want big viewing zones. Sola VIP delivers in a big way.

Multifocal wearers are used to ample viewing zones (especially at near). Only the VIP is big enough to please them.

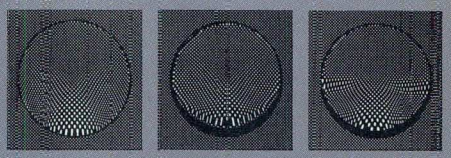


Sola VIP™ Varilux 2® Super NoLine®

Compare us to the competition. You'll discover our near zone is up to 50% larger, our intermediate up to 36% larger than other progressives.

Flat top wearers want peripheral clarity. Sola VIP is clearly the best.

It's hard to match a flat top for peripheral clarity. Except with a VIP.



Sola VIP™ Varilux 2® Super NoLine®

Look above. The VIP has smoother transitions from zone to zone with less concentrated distortion.

VIP keeps you happy, too.

Because patients adapt almost instantly, the VIP is easy to fit and easy to sell. Our free anti-scratch Perma-Gard® coating is another bonus. And our fully usable 78mm diameter fits all Rx's perfectly.

Just 14 pairs per week of VIPs will build your profits by $30,000 a year.

The Sola VIP is the first progressive designed to satisfy your current flat top customers. So it's the only one that lets you double your profits—without doubling your patient load.

All of which should make your choice of progressives very, very easy.

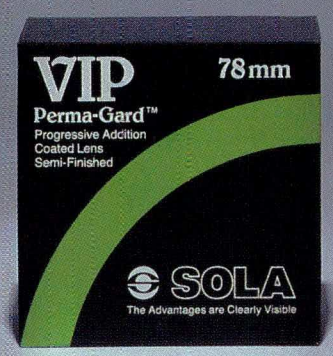
SOLA

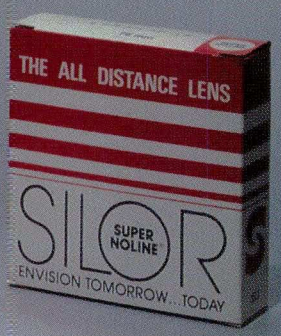
The advantages are clearly visible.

Sola Optical USA, Inc., (800) 358-8258 (Continental U.S.), (800) 862-4934 (California), or (707) 763-9911.

Ad refers to U.S.D. $30,000.

Varilux 2 is a registered trademark of Essilor International.
Super NoLine is a registered trademark of Silor Optical Inc.



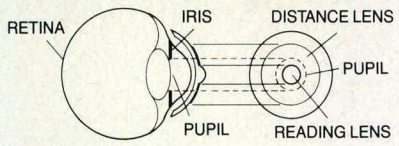


THE $30,000 DECISION

THE BIFOCAL CONTACT LENS THAT WORKS.

Introducing ALGES™, the new soft bifocal contact lens from University Optical Products, Co. It's the ideal solution for your presbyopic patients. With qualified patients, successful fitting rates of 70% and better have been achieved.

The ALGES™ Soft Contact Lens is based on a unique approach to the bifocal function, which represents an unprecedented advancement in design and manufacture. The near vision add is placed in the center of the lens and covers 50% of the pupil area at reading light levels. Concentric around the reading lens is the distance lens.



SUCCESS IS REPRODUCIBLE!

To assure that you have the exact prescription necessary,

BASE CURVES	8.6 and 8.9mm
DISTANCE POWERS	− 4.00 to + 4.00 in 0.25D steps + 4.00 to + 6.00 in 0.50D steps − 4.00 to − 6.00 in 0.50D steps
NEAR ADD POWERS	2.00, 2.50, 3.00, 3.50
ADD DIAMETERS	2.12 and 2.35mm

Standard lens diameter is 14.0mm. Lenses outside this range are available on a custom basis.

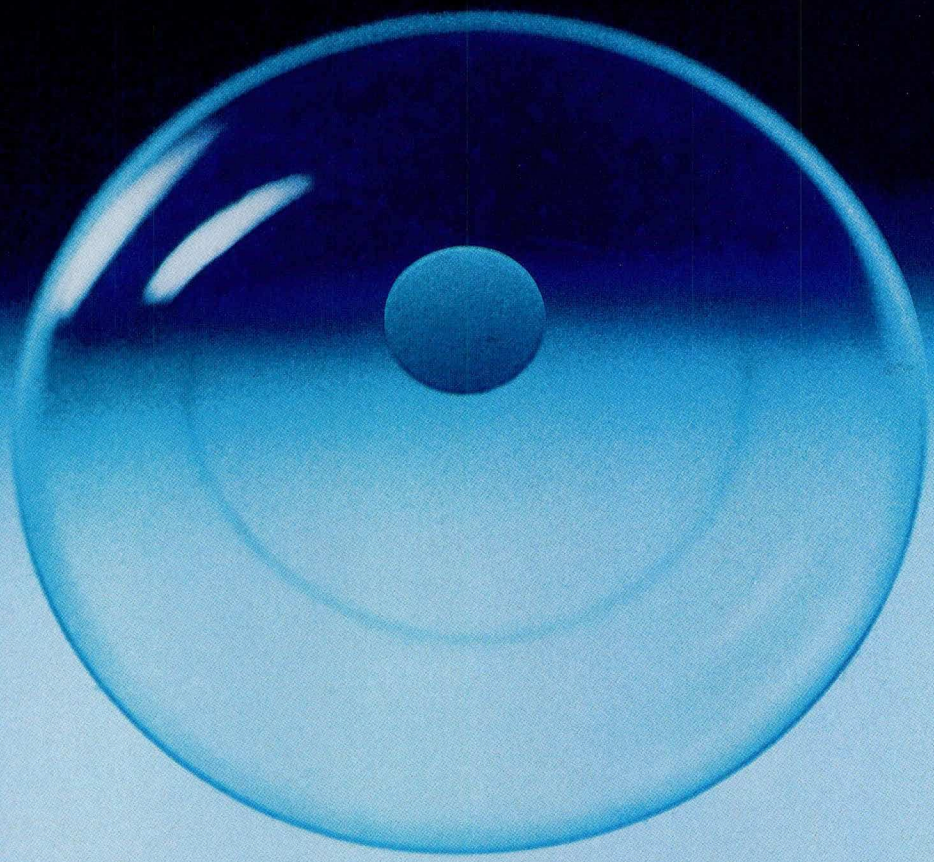
there are 656 different combinations of inventoried lens parameters available. Any lens can be replaced at anytime.

The new ALGES™ lens is tested, proven and available now. Ask your sales representative for a demonstration.

EXCLUSIVELY DISTRIBUTED IN CANADA BY PCL

TORONTO	862-8585	800-268-8548
DARTMOUTH	463-5800	800-565-7183
MONTREAL	878-9887	800-361-8443
WINNIPEG	947-0621	800-665-8603
SASKATOON	653-3711	800-667-8718
CALGARY	259-3878	800-352-8211
BURNABY	437-5568	800-663-9206
EDMONTON	423-2854	800-272-8867

THE SUCCESS LENS



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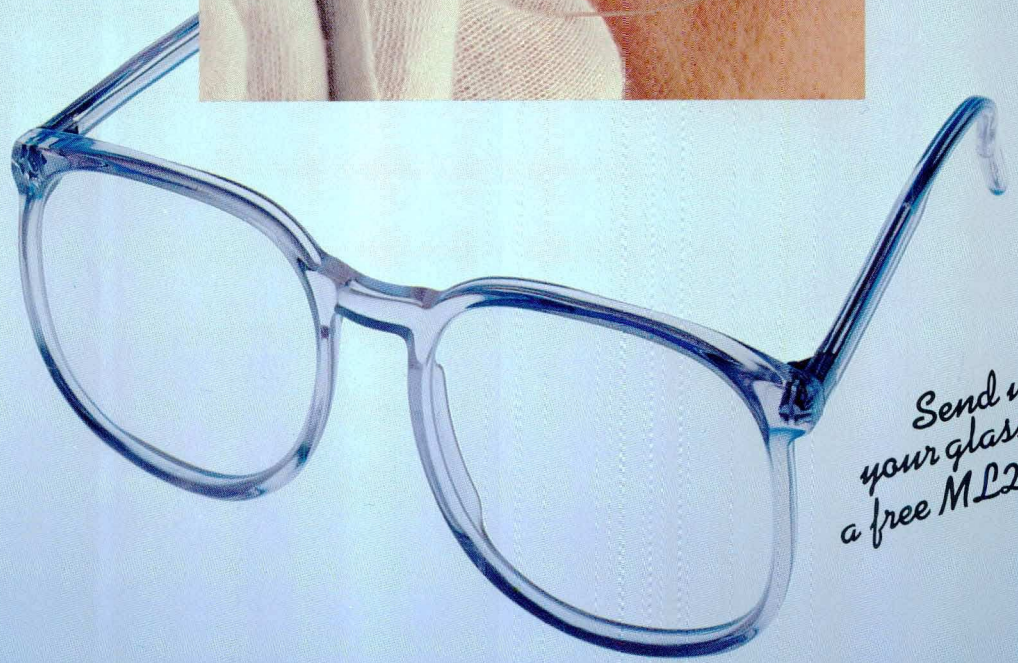

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