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THE CANADIAN JOURNAL OF Optometry

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LA REVUE CANADIENNE d'OPTOMÉTRIE

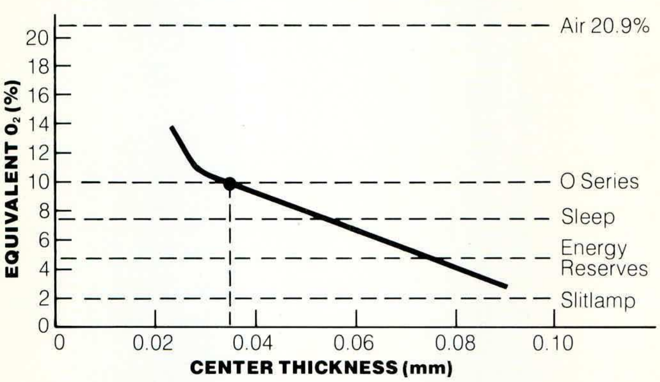
SEPT/1980 VOL. 42. No. 3

Introducing a lot less lens. And a lot more oxygen.

Bausch & Lomb brings more oxygen to the cornea with the new O Series SOFLENS (polymacon) Contact Lenses

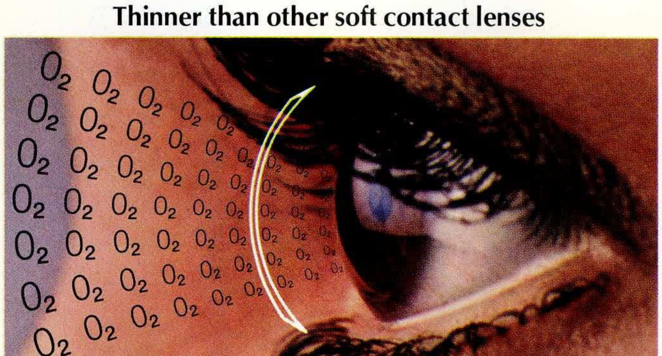
Greater oxygen transmissibility

The new O Series Soflens Contact Lens transmits more oxygen than our standard lens or even our Ultra Thin lens. In fact, during daily wear with O Series, the eye receives more oxygen than during sleep.[1]



"Equivalent oxygen" responses to a series of HEMA (Bausch & Lomb 38.6% water content) lenses having center thicknesses of less than 0.10 mm.[2]

Thinner than other soft contact lenses



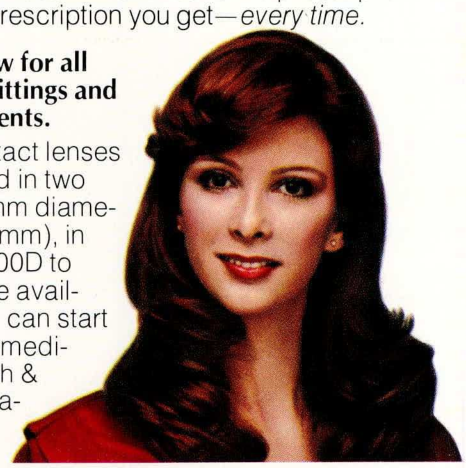
This high oxygen transmission is possible because the new O Series soft contact lenses are only .035 mm in center thickness—one third the thickness of standard soft contact lenses, 50% thinner than other "thin" lenses and consistently thinner than lenses from any other source.

Reduced likelihood of edema

The greater oxygen transmissibility of new O Series SOFLENS Contact Lenses should reduce the likelihood of corneal problems, such as edema.

Excellent reproducibility

As with other Bausch & Lomb SOFLENS Contact Lenses, the O Series is spincast which means the prescription you order is the prescription you get—*every time.*



Available now for all your new lens fittings and replacements.

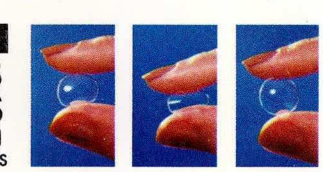
0 Series soft contact lenses are manufactured in two series, 03 (13.5 mm diameter) and 04 (14.5 mm), in powers from −1.00D to −9.00D. They are available *now,* so you can start fitting patients immediately. Your Bausch & Lomb Representative is ready with all the details—to help you order them *today.*

1. Hill, R.M. Hydrogel Lens Design: The Second National Research Symposium, The Thick and Thin of It, Aug. 16 & 17, 1975.
2. Ibid.

Fit the best first.

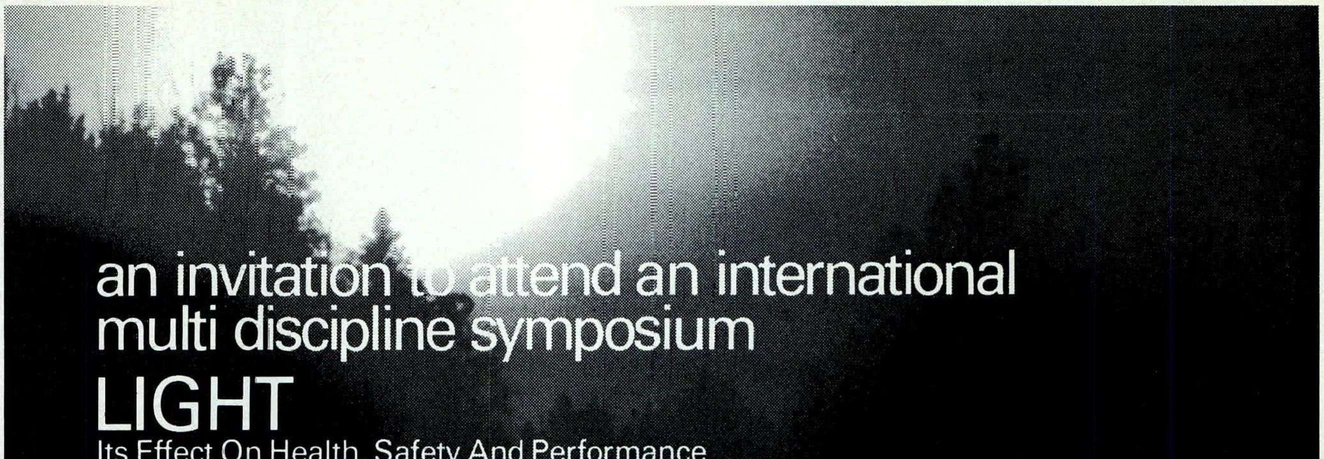
O Series SOFLENS (polymacon) Contact Lenses

BAUSCH & LOMB SOFLENS (polymacon) Contact Lenses



Prescribed more than any other soft contact lens.

BAUSCH & LOMB L213-80JA



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New Discoveries - Light in Health and Performance
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THE CANADIAN JOURNAL OF OPTOMETRY

LA REVUE CANADIENNE D'OPTOMETRIE

Vol. 42 | OTTAWA, ONTARIO, SEPTEMBER, 1980 | No. 3

Contents

SEPTEMBER IS TRUST FUND MONTH

Note: **Publication of advertising material in the Canadian Journal of Optometry in no way indicates endorsement of advertising content by the Journal or its publisher, the Canadian Association of Optometrists.**

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LETTERS

Ed. Note—The following comments were received in response to the Inns Contact Lens article Mar. C.J.O.

Dear Dr. Inns,

I was very pleased to accept your excellent article and will keep it for future reference.

Yours sincerely,
Montague Ruben, FRCS
Consultant Ophthalmologist.
Moorfields Eye Hospital
London, England

Dear Dr. Inns:

I just received a copy of your Journal, which you kindly sent with your paper on Soft Contact Lenses and Solutions in Canada.

This is an excellent contribution, and I would like to quote it in articles that I may write on this subject. The tables are a well organized method of referral, and you are to be congratulated.

In addition, the whole Journal is a wonderful contribution to contact lens care, and it is my first opportunity to see it.

With kind regards,

Yours sincerely,
Harold A. Stein, M.D., F.R.C.S.(C)

Dear Harry:

Thanks so much for the journal and allow me to compliment you on a superb job. It seemed like a major undertaking and was done extremely well. The six tables contain a wealth of information and I'm recommending to our sales organization that they use the article as a reference source.

One interesting aspect you touch upon is the water content variation with temperature. Some recent studies we did showed considerable temperature sensitivity for certain polymers. At higher temperatures base curves got steeper (obviously one reason why certain lenses "tighten" after 30 minutes to 60 minutes of adaption). We usually measure lenses at room temperature or 20°C. What other changes may be occuring at 35°C. or corneal temperature? It's an interesting aspect I hope to look at soon.

Sincerely,
Lester E. Janoff, O.D.
Director of Professional Services
American Optical Corporation

Ed. Note—Since the publication of Dr. Inns article, several minor errors have come to light. Dr. Inns is currently preparing corrections to these errors which will appear in the future. Refer to C.J.O. Vol 42 no. 1

Dear Dr. Inns:

Your timely article on soft contact lenses and solutions in Canada in the Journal of Optometry, March issue, is most informative. No doubt, it will clarify any confusion that the readers may have with the myriads of disinfection systems and solutions available in the market.

May I congratulate you on your attempt to embark on this very much needed project.

Yours truly,
(Mrs.) Peggy Sum
Product Manager
Bausch & Lomb
Soflens Division

Dear Dr. Bélanger:

I feel very much elated that you found to be important what I had to say. There is no occasion to comment further. To try to add something would spoil the effect for both of us.

I do intend to summarize my recent contributions to ophthalmic optics and an article along this line might be more helpful.

Sincerely yours,
Glenn A. Fry

Ed. Note—refer to Editorial - C.J.O. Vol 42 No. 1

cont'd on p. 136

C.A.O. BULLETIN

ANNOUNCING SINGLE BODY FOR U.K. OPTOMETRY

The ophthalmic optical profession has announced the advent of the British College of Ophthalmic Opticians which came into being on March 1st, 1980.

The most important immediate advantage of the College is the formation of a single examining body for ophthalmic opticians in place of the three which existed formerly, namely, The British Optical Association, the Scottish Association of Opticians and The Worshipful Company of Spectacle Makers. It is also anticipated that a single body speaking with one voice will have considerably more professional influence.

The objects of the College are to act as a professional and educational body for the furtherance of the interests of ophthalmic optics and the well-being and welfare of patients. The College already has an Academic Committee, an Executive Committee, a Finance Committee and a Professional Standards Committee.

The College now has powers to:

- establish and maintain libraries and museums and other facilities for study and research
- grant scholarships, bursaries and prizes
- organise, supervise and approve courses of instruction and training in ophthalmic optics and related subjects
- conduct examinations in these subjects and to issue certificates and diplomas to successful candidates
- co-operate with universities and colleges and other educational institutions and with other persons or bodies whether within or outside the United Kingdom, and international organisations with a view of promoting the objects of the College
- act as an authoritative body for the purpose of consultation in matters of public and professional interest concerning ophthalmic opticians
- maintain a register of members
- invite subscriptions and donations
- to print and publish any books, periodicals, newspapers, leaflets and other material the College may think desirable for the promotion of its objects.

Additionally, the British Optical Association Foundation Trust will be set up within the framework of the College in order to keep alive the memory of the British Optical Association. Its principal concerns will be the Library and Museum which the Association has given to the College, and the organisation, in association with the Academic Committee of higher qualification examinations.

Under the terms of the Agreement between the three sponsoring bodies the following conditions will prevail.

> All current holders of the qualifications of the three sponsoring bodies (F.B.O.A., F.S.A.O., F.S.M.C.) will be eligible for Fellowship of the College. Fellowship to the College will be indicated by the initials F.B.C.O. Thereafter candidates would have to complete the professional qualifying examination of the College and requirements as regards pre-registration experience, etc., and would then be granted D.Opt. and offered Membership of the College. These candidates would then be entitled to use the initials M.B.C.O. and should discontinue the initials D.Opt.

The College will seek to encourage Fellows to discontinue the use of other existing qualifications in favour of F.B.C.O. However, if they hold Honours qualifications or specialist qualifications, they can continue to use those in addition to F.B.C.O., i.e. F.B.C.O., F.S.M.C. (Hons.), F.B.O.A., H.D., D.C.L.P., D. Orth., would be allowable. Fellows can, if they wish, continue using the qualifications they currently hold, without F.B.C.O.

The College will also run 'specialist' examinations for contact lens practice and orthoptics and successful candidates will then use the initials D.C.L.P. and D. Orth respectively. There will also be a Fellowhip examination of a higher standard and successful candidates will be able to use the initials F.B.C.O.

In the interests of the profession generally, a Liaison Committee has been established with the political and protective body, the Association of Optical Practitioners, and close contact is being established with the new Faculty of Dispensing Opticians.

GOS SIGHT TEST – CHARGE PAYABLE BY PATIENT

In the British House of Commons on 26th March 1980, the Secretary of State for Social Services, Mr. Patrick Jenkin M.P., announced the introduction of a £2 statutory charge for an NHS sight test from 1st April, 1981.

The Officers of the Joint Committee of Ophthalmic Opticians, who were not consulted in advance of the Parliamentary announcement, have asked for an early meeting with the Secretary of State.

The representatives of the ophthalmic optical profession are opposed to statutory charges on the grounds of their deterrent effect. Statutory charges for medical and para medical services discourage patients from seeking the service they need, and the introduction of a charge payable at the time of examination could be more damaging in "health care" terms than any other measure ever proposed since the inception of the NHS, they say.

To introduce a statutory charge of any kind payable by the patient for an examination, whether medical, dental or ophthalmic, as is now proposed for ophthalmic examination, would breach a fundamental principle of the NHS State spokesmen say, namely, "examination without charge". The profession's representatives hope to persuade the Secretary of State that this fundamental principle should be preserved.

The main purpose of an eye examination (NHS sight test) is concerned with the detection of any ocular abnormality or disease. This is of much greater importance than the secondary function, important though that is, of determining what corrective lenses (if any) are required.

On the 28th January, 1980, a letter was sent to the Government spokesman in the House of Lords on Health Service matters by Committee, Hon. Secretary R.T. Pine, pointing to the "growing concern among eye-care practitioners that not enough is being done to encourage regular eye examination which could facilitate the early detection of glaucoma and other diseases".

The letter held that a statutory charge, such as the Secretary of State has proposed, will act as a deterrent to many people, particularly the elderly. To deter a patient from seeking an eye examination is to prevent an early visual assessment of the patient when, if an abnormal condition of any kind is seen or suspected by the examining practitioner, immediate steps can be taken in the patient's interest - the letter states.

The fact is that a significat percentage (recent figures suggest 6.6%) of all patients examined under NHS General Ophthalmic Services are found to have an ocular abnormality of some kind. Patients usually attend an examination unaware of any ocular abnormality.

The representative body of ophthalmic opticians will raise vigorous objection to the British Secretary of State's proposal - CJ0 will update this situation as information becomes available.

Professional Press Changes Hands

Chicago - May 7, 1980 - The Professional Press, Inc., a major ophthalmic publishing company in the United States, has been acquired by Capital Cities Communications, Inc., headquartered in New York.

The Professional Press is the publisher of OPTOMETRIC MONTHLY, OPTICAL INDEX INTERNATIONAL CONTACT LENS CLINIC, N.O.R.E. (Modern Ophthalmic Retailing), JOURNAL OF LEARNING DISABILITIES, directories of optometrists and ophthalmologists, and a complete library of professional textbooks used by schools of optometry and opticianry and practitioners throughout the world.

Capital Cities Communications owns 6 television stations, 13 radio stations, 5 daily newspapers and Fairchild Publications, Inc. Fairchild publishes 23 special publications including the International Medical News Group.

LETTERS

Are We Too Afluent and Lazy

Dear Maurice:

Each issue of the JOURNAL seems to be better than the previous! It must be a great source of pride and satisfaction to see "your baby" maturing to such status.

The only weak section of the JOURNAL is the "Letters to the Editor". One would think that we practitioners would want to comment and argue our diverse opinions more often than we do. I guess we are too affluent and lazy in these dizzy and busy times.

I particularly enjoyed the Contact Lens Issue and found the Harry Inns "TABLES" most invaluable as a resource paper.

As well, I detected one small error in the table on lenses. It showed the FREFLEX lens compatible with enzymatic cleaners. But in practise I have found it disastrous to use the Hydrocare tablet with this lens. The mfgr tells me that the lens is so porous that the chlorine gets into the hema and is difficult to extract. I tried it on my own Freflex lenses and could not wear them an hour. The pain and distress lasted a full day. Now I just use surfacant cleaner and peroxide as recommended by the lab.

It occured to me that there might be other small errata and if readers reported these it might serve to update the article so that it could be used as an office reference.

All the best,
RW Macpherson OD FAAO

EDITORIAL

Furthering Trust Fund Objectives

The Main objective of the Optometric Trust Fund is the furthering of optometric education. This can be achieved in many ways of which the most important is financial contributions. This becomes seed money, so to speak, and is a manifestation of the profession's interest and good will.

Any educational institution at the professional level requires many facilities. Foremost must be a well informed faculty. Running a close second, one must list the library. It is a simple matter given adequate funding to keep a library current, but research requires access to the past and the past is for the most part consigned to journals rather than to text books.

Collections of professional journals are therefore both invaluable and frequently irreplaceable items for any institution hoping to develop research programs or to encourage students to investigate specific projects.

The editor is of the opinion - and he may be excused for his bias - that optometric journals and others pertinent to optometric education have accummulated in many optometric offices. These usually will be destroyed or disposed of for lack of adequate storage facilities. It is inconceivable that we allow these accummulations of old journals to be destroyed given the established need for them. They must be conserved and some way must be found to store them safely pending the founding of a new Western School of Optometry. Whether the storage is in the basement of some devoted practitioner, a local municipal library, a local community college or even a commercial storage company, a storage facility must be found and practitioners encouraged to forward these collections to a central point for classifying and boxing until the new school begins operation. Perhaps some arrangement could be made with the University of Calgary to accept these journals pending a final decision on the school, at which time it could relinquish the collections should Calgary not accept the option to institute a school of optometry.

Similarly, outdated text books have more than a historical value as they contain information and data not always found in more modern volumes. These too should find a place in the library of any new school of optometry. Even if duplicate collections were to result from the above activities they would have immense value in optometry schools in developing countries.

On page 81 of the June CJO issue a short news item indicated how initiative can provide unexpected sources of small contributions of moneys to the trust fund. Repeated country wide projects like these represent significant amounts. But there are other methods to provide funds and painless ones at that, the proceeds to be garnered from the melting down of old damaged or discarded metal frames for example. With the price of gold at the present level several thousands of dollars across the country are begging to be salvaged and made to serve a useful purpose.

And what more effective way of collection than an "old gold barrell" at our provincial meetings where registrants could drop their old metal frames. The refining of larger quantities would be more readily acceptable to a refinery than individual consignments.

Another way of contribution is rather than restore the gold leaf lettering in windows - very costly at today's price of gold - to remove it completely and donate the scrapings to the fund. This gold leaf although not pure gold has a high concentration of the metal and would represent a significant amount.

Pennies make dollars and dollars make millions - let each of us contribute his few pennies!

G.M.B.

NEW LENS COMBATS EYE DEFECT

Blue-tinted optical lenses, developed by an Australian optometrist, are being used to help treat an eye defect which causes night blindness and tunnel vision and often leads to blindness. The new lens was developed by professor Joseph Lederer, head of the School of Optometry at the University of New South Wales in Sydney. The defect is retinitis pigmentosa, an inherited, slowly progressive ailment caused by the formation of clumps of pigment on the retina. The lenses, originally ground from glass used by a British manufacturer for protecting eyes against laser beams, alleviate some of the effects of the defect, in particular extreme discomfort and temporary loss of vision from sunlight glare.

Professor Joseph Lederer with three of his patients with the new glasses.

Canadian Optometric Education Trust Fund[1]

Part V: The Need for the Creation of a New School of Optometry

This is the final part of our series outlining the practical and urgent needs your Trust Fund is attempting to meet.

We must consider the expansion of the Canadian university systems due to its current inability to graduate a sufficient supply of optometrists as the single greatest threat to our continued growth as a profession. But in promoting the objective of a new school of optometry our national and provincial associations have looked at the potential benefits in a broader and more politically sensitive manner. Within this section we will review the details associated with the broad based approach that has been taken in promoting recognition of the need for the creation of a new school of optometry.

1. Impact on the Profession

a) Scope of Practice

As stated in the previous article[2], until optometric manpower levels are stabilized to meet both attrition and population growth and can reach acceptable population ratios, the present rather limited scope of optometric services will, by necessity, continue. As a result the unmet vision care needs of the target population will persist and the optometrist will not be able to bring to bear the full scope of his training and skills. From this we can therefore conclude that the graduates from a new School of Optometry would naturally be recognized by existing optometric practitioners as the needed source of additional manpower. Their added numbers will allow the profession to expand our present limited range of services and to provide the full scope of primary vision care services.

b) Continuing Education

The profession through our efforts in continuing education has traditionally recognized the need for clinicians to keep abreast of the many new technological discoveries that become an integral part of the practice of optometry. We regard a School of Optometry as a regional resource that will help meet the continuing education needs of local practitioners, thereby allowing access to a central and easily accessible mechanism that is vital to the practicing optometrists continued growth and competence.

c) Research

The clinician's office serves as a productive site for ongoing studies of a wide variety of technical and practical optometric issues. The profession will gain a greater stability and scientific basis if the benefits of this type of clinical research are properly documented and presented in an acceptable scientific form. The School of Optometry through the research expertise of the faculty will therefore be able to assist the clinicians in the development of research models, the recording of data and the publishing of their research findings in a scientifically acceptable form.

d) Increased Involvement in Primary Care by Ophthalmologists

We have concluded that although both optometrists and ophthalmologists are increasing their available manpower, the medical profession since 1971 continues to enjoy a significant gain of manpower on an annual basis which will be assured for a sustained period of time. The implications of this trend are that if the required number of optometrists are not available across Canada, medical practitioners will increasingly become involved in primary vision care service delivery. In addition, provincial governments will not be able to approach acceptable ratio levels that are needed to maintain an appropriate cost and quality of service balance between optometric and ophthalmological manpower.

2. Impact on the Province and the Educational System

a) The creation of a school of optometry will have a beneficial impact on the province and the educational system from the following points of view:

i) It will make available a new discipline within the University that provides students with a broader selection of programs and graduate studies;

ii) It makes available to the Community the broad-based clinical programs associated with optometric education that will function in many of the present unmet needs areas as identified above;

iii) It will extend the practical bene-

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1. By Donald Schaefer
   Trust Fund General Manager
2. CJO Vol. 42 no. 2 p. 80

fits to optometric research into functional vision problems in areas such as vision restoration, and learning disabilities;

iv) As the only English language training facility in Canada, the School of Optometry at the University of Waterloo is designed in accordance with the Ontario government's estimates of their manpower requirements. The school's admission program is therefore very limited in the number of out-of-province students it can allow to enter. As a result, many qualified individuals from other provinces who are intent on pursuing optometry as a career find it virtually impossible to enter our profession. Their only alternative is to receive their formal education at a foreign insitution. This is a very costly and inappropriate means for your province to train its optometric manpower.

It should also be pointed out that if the University of Waterloo was in a position to admit more out of province students, the hardship imposed by out-of-province study would still persist.

Conclusion

We trust that as a result of reviewing this series of five articles you have developed a greater appreciation for the political and practical reasons for which the Trust Fund has been established. It does have a vital role to play in the continued development of the profession of optometry as a member of the health care delivery system of Canada.

We must not minimize to any extent the real threats that exist to our present and projected scope of practice role in providing vision and eye care services to the Canadian public.

Each of us must act now to contribute our fair share to the programs that will allow the profession's future goals and aspirations to become a reality. When contacted by your provincial Fund Raising Chairman during Trust Fund Month this September, please remember that your "tax free" contribution is needed immediately. Join with your national colleagues by making a pledge and giving as generously as possible on an annual basis for a five-year period. Only you can identify the actual dollar value of your pledge, but please make that pledge now. None of us can afford not to support the objectives and programs of the Canadian Optometric Education Trust Fund.

DONATIONS FOR SPECIAL OCCASIONS

In this mailing of the Journal you will find a special donation card to enable you to honour special occasions with a contribution to the Trust Fund.

Such occasions may be a birth, death, graduation, marriage, retirement or other moment that you wish to commemorate with a special pledge.

Check your Journal envelope for the special card and keep it on file for an appropriate occasion.

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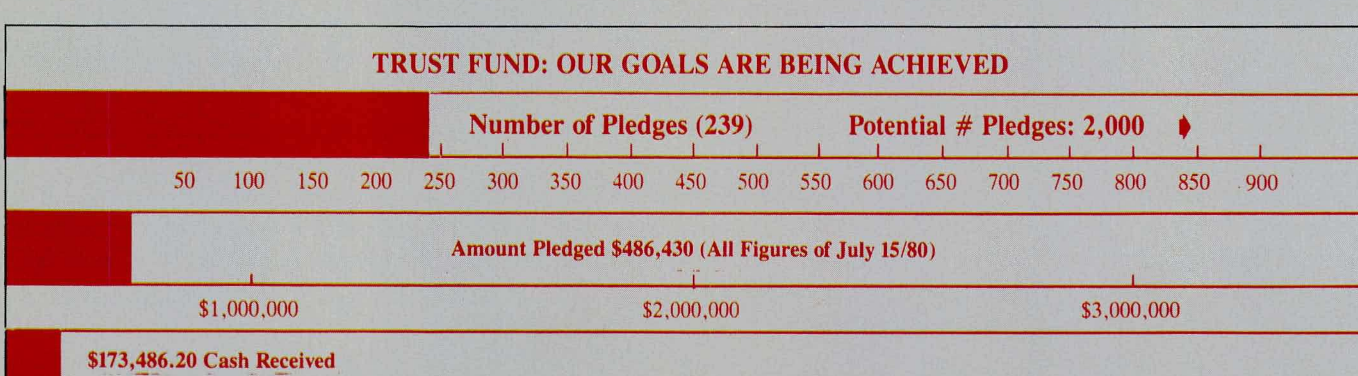

CANADIAN OPTOMETRIC EDUCATION TRUST FUND

Contributors — of July 1, 1980

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MacKenzie, H.D.
McCaw, C.H.
Menzies, L.
Potter, F.C.
Sask. Opt. Foun.
Seale, J.A.
Stadnyk, M.F.
Turriff, R.
Huber, J.F.
Huber, J.F. & A.
Kruse, C.W.
Stewart, H. (Mr.)

MANITOBA

Anonymous
Basman, H.
Brown, R.
Cram, W.D.
Eastwood, J.
Finkelman, E.M.
Garnett, W.B.
Hornbeck, H.L.
Jenkins, S.M.
Letts, G.K.
MacDonald, K.E.

McCaughey, N.R.
McQueen, J.D.
Moore, H.W.
North, C.A.L.
Oakley, D.R.
Porter, D.
Rosner, B.
Rosner, Bruce N.
Small, D.C.
Small, R.
Spearman, E.J.
Stanners, R.J.
West, B.P.
Rosner, B.& S.
Anonymous
Brown, R.
Brown, R.
Brown, R.
McQueen, J.D.
Anonymous

ONTARIO

Albright, S.
Arseneault, S.A.
Astles, J.C.
Attridge, E.F.
Beauchamp, K.A.
Belanger, G.M.
Benoit, R.A.
Beuglet, G.E.
Bock, R.R.
Brisson, J.A.
Brokenshire, A.
Bruce, D.A.
Buchner, E.L.
Chen, R.
Chhatwal, K.S.
Church, T.H.
Coates, P.H.
Conron, B.T.
Coward, L.A.
DesGroseilliers, R & M.
D'Hondt, R.
Dickie, W.I.
Dubuc, J.J.
Dutchak, J.A.
Fisher, E.J.
Forristal, D.L.
Fretz, B.
Gaulin, J.B.
Girard, M.J.
Goodwin, G.L.
Grant, G.A.
Hansford, R.R.
Henderson, J.R.
Hoffman, F.A.
Hohner, J.E.
Ivan, J.J.
Kniaziew, R.
Knight, M.I.
Kovacs, S.
Kronick, S.J.
Lafrenière, J.A.L.
Le Vasseur, P.E.
Lepienis, R.
Leake, R.B.
Lidkea, R.E.
Long, M.
Marsden, B.R.
Matthews, D.V.
McCann, J.J.
McDonald, G.W.B.
Millar, G.F.
Miller, R.E.
Mittelman, J.
Modesto, D.H.
Morrison, L.E.
Morrow, D.R.
Neff, D.
Newhouse, R.J.
Nisker, H.N.
Pace, R.
Patterson, R.W.
Penwarden, G.D.
Peppler, C.E.
Peta, S.
Petrachenko, W.
Price, D.R.
Rhynd, J.
Robinson, D.J.
Roche, W.M.
Rowe, W.M. Jr. & Sr.
Sassi, J.
Shanfield, H.
Scheid, R.J.
Springer, G.
Stephenson, N.G.
Stevenson, J.M.
Thompson, H.C.
Thompson, R.
Wasserman, H.
Waters, D.J.
Wigston, D.H.
Williams, G.A.
Wilcox, D.L.
Winter, B.
Wolf, M.
Wootten, P.
Young, R.A.

NEW BRUNSWICK

Bell, R.B.H.
Brown, A.I.
Cormier, J.
Daigle, J.
Desjardins, J.G.
Desjardins, L.
Duguay, R.
Fullarton, K.
Gagne, J.
Giasson, H.S.
Goldfeather, B.
Harding, J.R.
Hickey, T.F.
Landry, H.
Lenehan, T.W.
Ouellette, L.J.
Prince, W.M.
Ross, C.G.
Savaria, G.
Stewart, J.B.
Ouellette, L.J.
Aries Optical Ltd.
Prince, B.
Lenehan, T.W.
Leblanc, U.
Hickey, T.F.
N.B. Opt. Society
Ross, C.G.

NOVA SCOTIA

Campbell, P.D.
Comeau, R.
Comstock, P.
Haines, R.S.
Lawrence, &
Isabelle,
Lecker, G.
Livingston
Marney, C.
Ray, J.E.
Rosere, R.A.

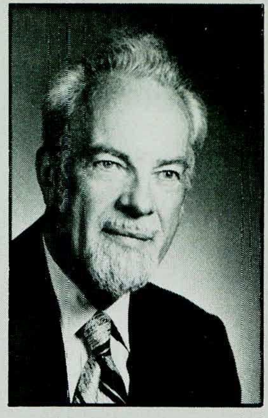
NEWFOUNDLAND

Buchanan, R.
Coté, D.J.
MacDuff, R.
Snow, J.A.
Richler, A.
(Superior Optical)

PRINCE EDWARD ISLAND

Hunter, B.F.

THE OPTOMETRIST'S BALANCE SHEET



by W.M. Lyle*

National Fund-raising Chairman-1980 Campaign

Optometry can be proud of the fact that since 1629, when the Worshipful Company of Spectacle Makers was chartered in England, optometrists have provided the best possible vision care for the majority of citizens.

The University Schools of Optometry are relatively new and must be viewed as developing structures. This demands more support than can be supplied by Government alone. Strengthening the existing institutions and creating additional educational resources must be a continuing concern of all optometrists.

Each optometrist must occasionally ask himself or herself certain questions. How does the service which I provide compare with that provided by others? Does my community recognize me as a concerned, responsible, caring practitioner? Am I receiving reasonable financial compensation for my training, the responsibility assumed and for my working hours? What of the future of vision care in Canada?

Still Obstacles Left

In Canada, until recently, the cost of acquiring the necessary knowledge was borne by the individual. Government grants were not available to support optometrical vision research and many obstacles were placed in the path of the profession. The work of dedicated individuals within our professional associations has reduced these obstacles to some extent. It is clear, however, that we as a profession still have substantial problems to eliminate if we are to continue to progress toward our goal of delivering optimum vision care to all Canadians.

Battling Tradition and Prejudice

We must battle certain traditions, established prejudices, an uninformed public and misinformed officials and certain groups who compete for our patients.

The Threat Posed by Ophthalmology's Excess

In Canada, ophthalmologists are three times as numerous per capita as they are in Britain. This excess plus the easier control of infections which has been brought about by antibiotics and antiviral agents has forced ophthalmology to expand into the field of optometry. By their own admission they are underemployed in surgery and undertrained in optics. The average ophthalmologist performs about 85 operations a year, this constitutes 35% of his workload, and therefore he must make 65% of his income by providing refractions.

Boutique Explosions

Across the country, there has been an explosion of boutique-type optician offices accompanied by extensive advertising of materials and prices. This is promoted by the optical manufacturers who establish and support these businesses. The manufacturers also advertise fashion frames and other products directly to the public. Traditionally opticians have also steered patients to ophthalmologists. The threat exists that these pressures could lead to control of optometrical practice by outside forces.

Those who fail to recognize the nature of a professional service are encouraging price advertising. They fail to understand that a professional practice is based on services rendered, not on the promise of advertisements.

Optometrists Well Respected

While many other problems could be placed on the debit side of the balance sheet, it is equally important to recognize that optometrists are well respected by the majority of Canadians, especially those who have tried other routes to obtain eye examinations and other vision care services. Optometrists who provide comprehensive vision care and accept full responsibility for the correcting lenses, if they are required, save the patient from being left in the middle between two practitioners, each of whom is willing to accept only some portion of the responsibility when problems arise.

Optometrists in most communities have an excellent working relationship with physicians who are responsible for the patient's general health problems.

Optometrists achieve reasonable incomes as soon as they have had sufficient time in practice to demonstrate the quality of care they provide.

Optometrists Must Continue Expansion

It is vital to quality vision care that optometrists continue to provide vision care to the majority of Canadians. Any part of the practice of optometry which we neglect is likely to be appropriated by others. Opti-

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cians wish to expand contact lens fitting, orthoptists want to provide vision training, manufacturers want to provide eye safety programs and prescriptions for protective spectacles and ophthalmologists want to enter the field of primary optical care. None of these will result in an increased quality of vision care for Canadians. The way to meet these challenges is to strengthen optometry and its practitioners both in quality and quantity.

Facing Facts

First, the average age of optometrists in practice is increasing, the large group who qualified right after the war are facing retirement. We need University spaces so that more of the bright young people who want to enter optometry can do so. Answer: Another School of Optometry, preferably sited in Western Canada.

Second, we need many more qualified teachers, researchers and exceptionally able clinicans to fill the faculty positions. Optometrists in the United States are meeting this challenge with the opening of new optometry schools in Oklahoma in 1979, and in Missouri in 1980. This drain on the teacher pool requires that Canadian optometry meet its challenges from Canadian resources.

It takes at least 10 years to develop a professor qualified to teach in an Optometry school. Answer: grants to support qualified students in graduate school now.

The rapid changes in the contact lens field, in electrodiagnostic methods and in sophisticated instrumentation have made continuing education an additional responsibility of all practitioners. This places a further load on our teaching universities.

Self-Sufficency Must Be Met

In order to maintain and advance optometry, we must plan for the future. We cannot rely on Governments or other societal components to solve optometry's problems or to bring about professional advancement. Each of us must be personally responsible by individual effort and fiscal support. We must give of ourselves and our resources, not until it hurts, but until it counts. Each optometrist can show his or her appreciation of what optometry has done for the patients and the practitioners by supporting the Canadian Optometric Education Trust Fund.

Optica '80 in Cologne - Optica's Report*

Good attendance of the WVAO Congress

The 32nd Annual Congress of the Wissenschaftliche Vereinigung für Augenoptik and Optometrie - WVAO (Scientific Association for Ophthalmic Optics and Optometry), the scientific part of OPTICA '80 held in Cologne May 13th, confirmed its reputation as one of the most important events of this kind world-wide. The number of delegates attending the Congress far exceeded the total expected by the organisers.

Optica reports that an emphasis at the Congress was placed on visual problems resulting from the growth in the use of viewdata equipment at the place of work.

Viewdata equipment does not have any disturbing influence on the eyes provided visual conditions are correctly arranged as for the ambient conditions. But to arrive at the best solution of all problems linked with vision in this sector the near focal range and ambient conditions should be examined at the actual place of work. The adaptability of the eyes to a workplace featuring viewdata equipment has to be very much greater than for a conventional office job or the eyes must be assisted, by suitable optical aids, to perform such work without any trouble.

Close-up spectacle corrections of the kind represented by reading glasses are not suitable as working glasses as the ranges differ too much from each other. In addition the changed physiological aspects compared with normal office work do not permit this.

Success in achieving complicated adaptation of contact lenses and in determining and adjusting spectacles can best be realised by the knowledge gained from the use of electronic mini computers. The use of these modern aids by opticians leads to even more precise results and therefore to a greater efficiency of the corrected eyesight.

For example, it is possible in future to determine the exact weight of spectacles before they are produced and make use of other glass materials - there are three - or other spectacle frames to arrange the overall weight in such a way that the new spectacles are very light and comfortable.

Regarding the subject of eyesight for road users, it was mentioned that spectacles should not restrict the field of view. The optical industry pays special attention to this point by offering thin-rimmed spectacle frames with high-set side arms. Moreover, spectacles worn by road users should all be of the anti-reflection type and if possible feature the maximum anti-reflex treatment.

Children who wear spectacles should be offered greater convenience and comfort. Many of the congress delegates were in favour of the development of special safety frames for children with soft supporting pads or bridges. The complaint was raised in this connection that very few children are allowed to choose their own spectacles. This frequently resulted in a disinclination to wear the necessary eyesight correction.

*reprinted from Optica 80 release

THE ARDEN GRATING TEST OF VISUAL FUNCTION

Helen Kalish Feeley*

Abstract

In the absence of detectable pathology, the optometrist must ascertain why a reading of 6/6 Snellen is not achieved. A new, inexpensive and simple test has been developed for this purpose, useful even with illiterates. An explanation of the test, some of its applicaitons and drawbacks, plus comparison with other, currently used tests is presented.

Abrégé

Dans l'absence de signes pathologiques evidents, il est du devoir de l'optométriste de déterminer pourquoi un patient n'atteint pas un niveau visuel adéquat. Un nouveau test, peu couteux, simple et utile même avec les illettrés est maintenant disponible. Ce travail explique l'opération du test, certaines applications et ses inconvénients. Aussi comparaison est faite de ce test avec d'autres semblables couramment en usage.

For patients with visual acuities slightly less than 6/6 Snellen, optometrists rely on a battery of tests to distinguish other causes from uncorrected refractive error. Included are a fuller case history of symptoms, dark adaptometry, macular photostress test, the pinhole, polaroid filters, automatic refractor readouts, Amsler grids and thorough colour vision testing. In monocular instances, microstrabismus is ruled out. Even if there is accurate but overly slow or halting reading of the 6/6 lines, tests are done for visual field defects. All patients with reduced vision and especially in the absence of other clinical signs of abnormal function have disc colour and pupil responses carefully evaluated. Medications that the patient is using should be listed and their effects ascertained. Is the reduced acuity possibly associated with chronic marijuana smoking? The optico-kinetic response may be used as an objective test of vision. If available, the electro-retinogram (ERG) is a useful objective test for investigation of possible functional impairment.

What if the results of testing are unsatisfactory or inconclusive, the patient verbally reticent or suspected of malingering, the optic disc and fundus apparently normal, there is no other evidence of physiological or pathological damage, no medications are being taken, and there is no history of past visual impairment? Or suppose, on the other hand, that the patient complains of various visual problems, yet seemingly has adequate acuity? Is there a reliable, rapid and sensitive auxiliary diagnostic test that will help rule out the presence of ocular disease and neurological defects, and allow the optometrist to resolve the visual impairment by more traditional methods?

Just such a prognostic clinical test has been recently developed by Prof. G.B. Arden of the University of London's Institute of Ophthalmology. He named it "a simple grating test for contrast sensitivity". It is known as the Arden Grating Test (AGT), but can be found in the literature under its various research developmental names such as "contrast sensitivity function" (CSF), "a sine-wave grating test", "a test of spatial contrast discrimination", or most simply as "bar gratings". It is based on the fact that there are two main factors limiting the perception of fine detail: (a) the refractive status of the eye forming an image on the retina and (b) the ability of the visual pathway to resolve these details. The test measures the quality of the final image.

A gross comparison of the bar gratings' spatial frequency can be made to the white gap between the two black arms of the Landolt C ring. At some distance from the observer, the gap is no longer visible to a particular person at a definite distance away from it.

Sine-wave gratings can be generated on oscilloscope screens in various sizes, but for office use, one form of the test consists of a book containing seven printed plastic-coated paper plates of grating patterns, approximately 30 cm. square, providing a range of stimuli. Each plate shows a series of light and dark grey bars with no definite borders, which appear sinusoidally fuzzy (see Fig. 1). Their contrast varies continuously from top to bottom. As one looks down the page, one sees, if one has an intact, but not necessarily perfectly focussed optical system, an apparently uniform grey colour at the top, not recognisable as gratings; as one looks further down the page the eye is able to resolve definite bars. These become more pronounced and darker toward the bottom of the page. There

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is a difference in the (a) space and (b) contrast between the bars. This sinusoidal pattern type is based on experimental findings which reveal that there is a "normal" human perceptual threshold regarding contrast between closely spaced narrow bars, and this depends on the width between them. It was discovered that if the edges were not sharply defined, calculations could be made to relate the slope of the varying width of the bar to the observer's perception of it.

History

Westheimer, in 1959, found that in the presence of an eye with intact optics, the neurological integrity of the visual pathways from retina to brain could be quantitatively assessed. In 1968, Campbell and Robson were publishing the results of their work in measuring what is essentially the resolving power of this visual pathway. They proved that the results of the sinusoidal profiles were influenced by neither the chromatic aberration of the eye nor fluctuations in accommodation. Furthermore, they showed that fixation on any part of the grating pattern is not necessary. Campbell discovered that the visual system does not function as a whole, but as a number of independent detector mechanisms, each tuned to a different and narrow band of frequencies of grating patterns. Retinal ganglion cells, for instance, have a different contrast sensitivity function than the overall human contrast sensitivity function. Other parts of the visual system are sensitive to different visual signals of this type. Each mechanism responds maximally to some particular frequency and not at all to others. It should be emphasized that the results are not a distribution comparable to a visual field plot.

In the visual cortex of mammals, it had earlier been found that there were single cells uniquely sensitive to the shape, position and movement of a stimulus. Maffei and Fiorentini studied the responses of neurons to grating bars, at various levels in the visual system. The information gathered along the visual pathway is synthesized, and as a result components can theoretically be identified. Tolhurst was the first to believe that edge detector units existed in the visual system, as distinct from line (bar) detectors, and that they interact by inhibiting each other. They consist of many channels, each responsive within a narrow limit. Moreover, there are two separate classes of channels in reference to both stationary and moving patterns, each with its own independent role in perception. There has been physical corroboration of his hypothesis.

Weisstein and Bisaha have demonstrated that the human visual system presented with a series of bars does not rely on a simple detection of form, but that different nerve populations react to various sizes and orientations of bars. Concurrent experiments with the visual evoked response (VER) showed that borders were of great importance in vision.

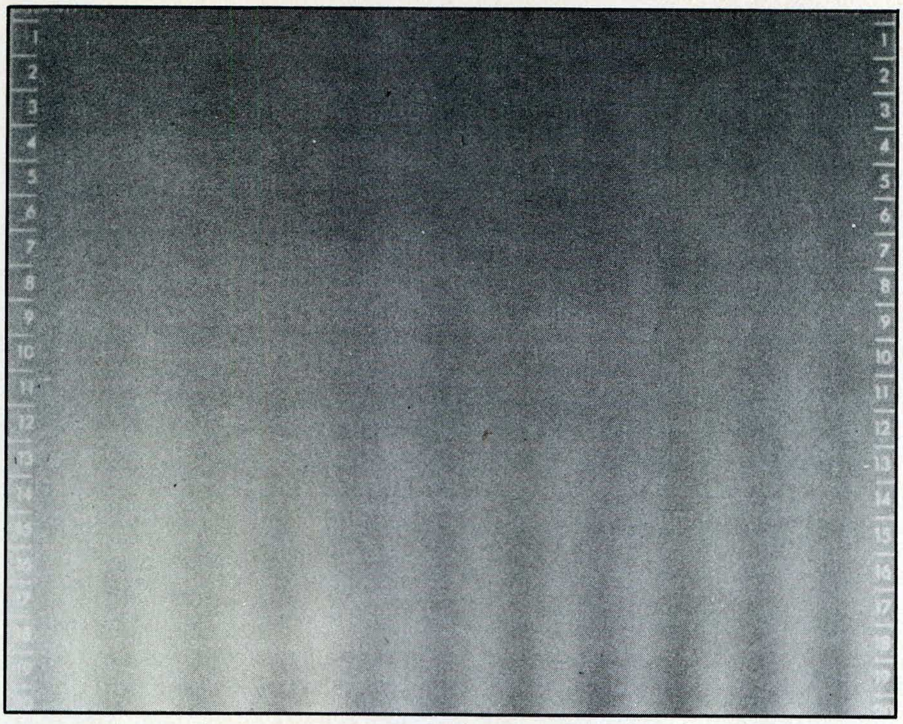

Fig. 1 Example of an Arden Grating Test Plate. (Supplied by Dr. G. Woo, U. of Waterloo.)

Method

When the test is being administered the patient should wear the prescribed distance correction and be monocularly occluded and seated at a table. The patient is assured to have clear ocular media and steady fixation. If accommodation is decreased to the point of influencing the sharpness of the retinal image, a near correction should be incorporated. Ask the patient to read some of the side numbers if in doubt. Plate #1, the screening plate, is employed as the first stimulus. It is used mainly to ascertain adequate acuity, as very large losses are precluded from testing. The AGT is relevant only insofar as the patterns can be imaged on the retina. If they are not, the patient sees no stripes on the plate. Attention is called to the top and bottom of the page. Can the patient identify an intermediate value bearing a specific relationship to them? Can he/she make an attempt? How does the page seem to look?

Plates # 2 to # 7 provide a quantitative estimation of visual performance. To maintain constant viewing distance, the patient should be instructed to sit with elbow on the table and with chin on fist; the low vision patient may have to move closer to the grating. The optometrist moves a covering card slowly from the top area downward, until the patient responds, indicating that the bars can be seen. The procedure then is to go to the next plate, where the "normal" threshold for bars to be distinguished is different (see FIG. 2).

The optometrist can either record the results from a limited duration of one presentation for each target or an average of two or more readings for each target. There should be no appreciable interval between presentation of targets. The score, or position where the grating first becomes visible, is read off the arbitrary side scale, marked 1 to 20 on each plate. The other eye is then tested. The end result is compared to a known normal score. A normal viewer sees gratings beginning somewhere in the mid-third of each page. The upper and lower limits are not clearly defined. There is a range through which patients are uncertain as to whether they actually see a grating. Scores of each page are added for a final score, but no page can exceed a normal score in itself. There are also limits as to allowable differences between the eyes.

In summary, there is a maximum score for each plate, a range indicating probable abnormality, another range indicating definite abnormality and an asymmetry of results between the eyes indicating abnormality.

Most eyes with pathological conditions see AGT patterns, but with a delayed response compared to normal eyes. The same delays are apparent if the patient's acuity is even slightly altered. Refractive errors depress sensitivity uniformly for all frequencies except the lowest, which are unaffected.

Standardized instructions to the patient should be employed in order to facilitate comparisons. Repeated testing makes the patient more sensitive to detail. Campbell and Green's research suggests that rather rapid observations are preferable to prolonged viewing of one target plate. Inter-stimulus intervals ought likewise to be controlled. The test can be done in daylight or any usual office light, as long as the illumination level is uniform and at least at the patient's perceptibility threshold without being excessively above it. The surrounding lighting or room luminance

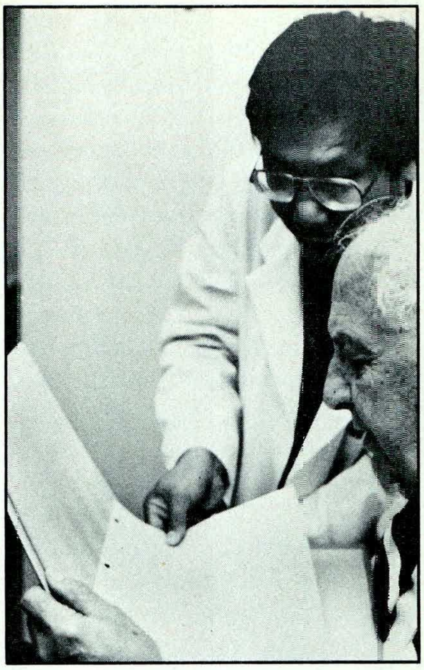

Fig. 2 One method of using the Arden Grating Test; monocular patient. (Supplied by Dr. G. Woo, U. of Waterloo)

should approximate the luminance on the target area, so as not to affect resolving power for the particular target at the standardized viewing distance. Any change in these parameters will affect the results.

Patients aged 8 to 70 have responded well to the AGT. Children and retardates have trouble with verbalization, so appropriate terminology and/or pointing can be utilized to elicit a response. In cases of complete communication breakdown, use only objective tests, as there definitely must be communication between the examiner and patient. Illiterates obviously do well in it.

Four to six minutes per patient are required to explain, complete and score the test. Repetitions can be made if necessary. As mentioned previously, a control ought to be used regarding the time allowed to perceive gratings. Research by Weisstein and Bisaha (23) suggests that observation time should be adequate because there is a reduction in contrast for a new grating stimulus presented after a previous grating has just been exposed to the eye. There is evidence that neurons sensitive to size and orientation lose sensitivity after prolonged stimulation.

There is no discomfort involved in the AGT. As can be seen, very little equipment is required, and that not expensive. However, much depends on the examiner maintaining a constant speed in moving the cover card. Results vary slightly, but consistently with the practitioner using the technique. In any case, results from normal eyes are very different from abnormal eyes. The result is reproducible for a given individual. When inattention is a problem, there is a uniform overall reduction in CSF. Real problem cases show greater losses selectively in high, middle or low ranges. This means, also, that individuals with high threshold criteria behave in a similar manner.

The AGT has an advantage over visual field plots (although it does not replace them) in that it does not require constantly maintained fixation, nor does it demand a relatively still patient. It is also not absolutely necessary to have fully aided acuity such as reading glasses, which can restrict measurements with visual field testing techniques.

Assessing Results

Not only do normal eyes respond differently from abnormal ones, but for some conditions, notably glaucoma, the degree of loss of sensitivity to the bars relates directly to the severity of the condition. In borderline cases, diminished tresholds in contrast can be compared to diminished tresholds in, for example, adaptometer results.

A small decrease in contrast sensitivity occurs with age, but not nearly as much as in abnormal eyes. Pupil size is almost a negligible factor unless there is very much dilation, as with drugs. The resulting spherical aberration gives a mild decrease in retinal resolving power.

Using the test, some patients with acuity of 6/6 will be found to exhibit some degree of abnormality as indicated by the departure from normal contrast sensitivity. In retrobulbar neuritis, there may be no trouble perceiving the outlines of letters on the visual acuity chart at the % level, but patients may say they look misty or flat. When the condition is more advanced, the decrement in contrast is more disturbing than the small loss of acuity. Once the condition has been diagnosed, recovery can be monitored by again employing the CSF. The extent of return to the normal condition becomes apparent when the results show stability.

Scotomas may be absent on field studies, but abnormal responses on the AGT can provide an indication of patchy punctate retinal dysfunction. VER patterns can corroborate such losses.

In probable or possible multiple sclerosis patients with no apparent acuity loss (ie, % Snellen), evidence of pathology can be detected by the CSF. These people can see fine, high-contrast detail, like black letters on a white chart; coarse details without a contrasting background seem to them to be "washed out". They know they have a visual problem but the usual clinical procedures, such as ophthalmoscopy and colour vision analyses may not pick it up. It is a particularly disressing problem problem to the congenitally colour-blind, who are unable to rely on colour differences to distinguish objects. The AGT will often show surprising loss of visual contrast, although the type of results measured to date are not specific to multiple sclerosis.

As a rapid screening device the AGT is useful for detection of visual degradation in early lens changes, hypertensive arterial disease and intracranial lesions. With cataracts, CSF's are different with different patients and the clarity of the media limits use of the test. We know, however, that the acute cataract specific to diabetes gives deteriorating sight before any actual lens opacities are seen. The test can be used to monitor the progress of a cataract.

Subjects with occipito-parietal and occipital lesions can have symptoms out of proportion to their mild loss of visual acuity as tested on the maximum contrast Snellen chart. Larger targets of lower contrast however, cannot be detected. They can have difficulty reading or episodic blurring of vision. They complain of headaches. They may pass many tests for revealing retinal pathology; yet CSF testing may show marked departures from the norm. Some patients lose sensitivity in the high frequencies and some in the middle ranges. Tumors have been found in different parts of the brain for patients with different CSF data. Again, this suggest a possibility of future channelling of diagnoses.

The AGT detects abnormalities due to retinal damage like eclipse burns, but not retinitis pigmentosa, because only cones are involved in viewing the plates. When the macula and fovea do become involved in RP, then defects in contrast sensitivity will occur.

Some amblyopes do well on this test, and others do not. Hess and Howell have, on the basis of the CSF, postulated two types of amblyopia. One class of strabismic amblyopes cannot detect the high frequencies and another class has a depressed function for all frequencies, including the low. The normal fixing eye of these strabismics was found to correlate perfectly with non-strabismic "normal" eyes. The researchers examined both central and eccentric fixators in their study. They found they could detect the degree of amblyopia in all affected eyes, but consistently found two classes of amblyopes. Their explanation is, that there exists one form of a mild amblyopia (type I), over which is superimposed a more severe progressive loss (type II). The implications of this for visual training specialists is, that the AGT can (a) confirm the accuracy of the diagnosis, and (b) it will predict whether the visual function is amenable to restoration. For very young children, the VER recording is preferred, especially as it can also monitor acuity changes during occlusion therapy.

Where there is photophobia precluding prolonged ophthalmoscopic examination, the AGT can be used as an auxiliary procedure.

For some abnormalities uncovered by CSF, there may be a profile of typical responses, resulting from selective loss of sensitivity. This provides potential for future clinical applications. Not only could loss of function be ascertained, but an indication of type of abnormality involved. However, the main use of the test would be on selected, previously carefully refracted patients.

In addition to its uses in ocular abnormalities, this technique has been recently found to ascertain small or large changes in visual acuity. This suggests testing of various devices on both low vision and contact lens patients. The gratings used are not the coarse ones mentioned above, but those of a finer and more sophisticated variety. Changes in refractive power of the eye show up in the higher rather than lower spatial frequencies. Green and Campbell, in 1965, realized that by measuring the contrast at which a subject can just detect the presence of a sinusoidal grating pattern, it should be possible to assess the effects of focus on the visual system. They showed that increasing amounts of myopia reduce sensitivity to the higher spatial frequencies.

Rotating or tilting the gratings allows also for meridional refraction, and hence aid in correction of astigmatism. At defined distance, angular subtense, lighting conditions and the inclusion of the patient's limit of resolution in the targets, readings are possible through various optical appliances. As usual, the patient's task is to detect the presence of a grating. The best possible correction and the range through which there is no noticeable change are noted. Paralyzing the accommodation appears to have no effect on the results when compared to the normally functioning accommodation. Results are accurate to 0.50 D. Clinical applications of the method are currently being studied, but there are, as yet, unresolved drawbacks.

The test is extremely useful for patients who have had episodes of transient blurring of vision. It will detect abnormalities which the VER misses, besides doing it more simply and cheaply. If used along with the VER, it can indicate reasons for VER delay. However, if subjective testing is not possible, and there is access to the entirely objective VER testing equipment, this latter would then be the preferred tool of diagnosis and prognosis. Both instruments assess central acuity. In such cases, electro-retinograms should be obtained first, to ensure a normally functioning retina before looking for lesions higher in the visual pathway.

Summary

An aid is available for distinguishing some patients whose unexplained visual loss cannot be helped by glasses, from those who have the potential for improved vision. The AGT is superior to tests of acuity in cases of minimal reduction in acuity and early visual disturbances, because contrast sensitivity may be impaired even though acuity is normal. The VER has, up to now, been the most sensitive way to determine optic neuritis and detect abnormalities in glaucoma before any field loss has occurred. For brain and central nervous system conditions, especially inflammatory processes, the AGT is a more sensitive index of loss of function than any other test currently used. Even so, it is not a substitute for visual field screening. It is a valuable diagnostic tool for revealing clinically silent lesions in the optic pathways, albeit subjective and not objective like the VER. Both tests judge abnormality by delayed responses. The VER is a much more elaborate test, slower, not easily available and not as quantifiable as the AGT. It can, nevertheless, distinguish visual impairment due to refractive errors from those caused by retinal and optic nerve disease. In recent times, the VER has moved from bar gratings to the more sensitive checkerboard patterns to ascertain the degree of focus of the retinal image. It provides a definite,purely objective, quantitative analysis of blur within ±1.00 diopter, and improvements are constantly being made. However, as an in-office technique, it is, as yet, impractical, having many limitations. The AGT is not to be considered a replacement for it.

Furthermore, if in doubt, ultrasonographic scans and, where available, the new but extremely expensive hospital-based radiological technique of computerized tonography can be used, where the AGT or electrodiagnostic screening results are abnormal.

The AGT is a useful, easily understood test for young children and mentally disturbed patients.

When monitoring eyes during treatment of pathological conditions, the AGT can be used for intermittent follow-up testing to record the progress of changes in visual function. Also, it is a better test of visual competency and return to normality than visual acuity, because in everyday life, few objects are encountered at 100% contrast.

Finally, the AGT can be used as a simple, rapid screening tool on large populations such as in school surveys.

Even if the AGT has no direct impact on present modes of practise, the foregoing review indicates its potential.

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A VARIABLE MAGNIFICATION TRIAL LENS HOLDER

Arnulf Remole*

Abstract

A variable magnification trial lens holder is described. The unit is designed primarily for producing small order overall and meridional magnification for diagnosing and measuring aniseikonia. However, the unit can be used alternatively as a trial device in low vision.

Nearly all procedures for diagnosing and measuring aniseikonia utilize afocal magnification lenses (1). In the relatively sophisticated space eikonometer (2), they are part of the design; however, auxiliary size lenses are often required. In the simpler procedures for assessing aniseikonia used most often today, series of afocal magnifiers are usually needed. This paper describes a simple devise that will hold a pair of standard trial lenses so that an overall or meridional magnification is produced. The unit can be used as an auxiliary magnifier, or it can replace an entire series of size lenses.

A typical example of the simpler methods for assessing aniseikonia is the Maddox rod technique first introduced by Brecher (3). In principle, this method consists in dissociating a double target by means of a Maddox rod held before one eye. The distances between the two targets as perceived by each eye can then be compared. Afocal magnifiers are used to neutralize any difference between these distances and thus provide a measure of the aniseikonia along a particular meridian. Many of the present day techniques are variations of this method. Other methods depend on the stereoscopic observation of a tilting board (4) or a similar target. Again, size lenses are applied so that the tilt of the target is neutralized. Thus, afocal magnifiers are a common requirement of nearly all methods of measuring aniseikonia.

However, afocal magnification lenses are not always readily available. Whereas some prescription laboratories will manufacture size lenses to order, others appear rather reluctant to do so. Furthermore, the delivery period tends to be relatively long. It is therefore useful to have alternative methods of producing small order magnifications.

One alternative method is to place positive and negative trial lenses of equal denomination in the front and back cells of a trial frame. If the minus lens is placed in the cell closer to the eye, the combination will represent a Galilean telescope of low magnification power. However, this procedure is rather awkward if the trial frame must also hold the patient's correction lenses. Furthermore, since the distance between the cells cannot be controlled, the magnification can be changed only by varying the power of the pair of lenses.

A more flexible device for controlling the magnification trial lens holder can be made to order in most machine shops. A metal rod, milled flat on one side, is the carrier for two moveable lens holders, each of which is supplied with a spring clip. The dimensions of the holders are machined to fit standard trial lenses. The distance between the lenses can be varied from a minimum of about 5 mm, depending on the type of construction, to the full length of the rod. The lens holders can be fixed in position with thumb screws. The rings holding the spring clips are supplied with degree divisions so that cylindrical lenses can be rotated to the appropriate axis. The model shown is hand held, but it can be supplied with clamps for attachment to a trial frame.

If a minus lens and a plus lens are placed in the device with the minus lens closer to the eye, we have a system whose magnification power varies with the distance between the lenses. If the two lenses are of equal numerical denomination, the system will be nearly afocal if the lens interdistance is not too great. A rough estimate of the magnification in percent can then be obtained by multiplying the power of the plus lens by the interdistance measured in centimetres. Thus for a +4.00 D lens and a −4.00 D lens placed 1 cm apart, the magnification is approximately 4%.

An exact value for the magnification can be obtained by applying the well known exact formula,

$$M = \left(\frac{1}{1-kV}\right)\left(\frac{1}{1-cF_1}\right) \quad (5)$$

where k is the vertex distance, V is the vertex power, c is the reduced thickness, and F_1 is the front surface power, when a single lens is considered. In our example, c is simply the interdistance between the lenses, and F_1 is the power of the lens farthest from the eye. In our exam-

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ple, if it is assumed that the lens interdistance is 10 mm, the vertex power at the plane of the minus lens is

$$\frac{+4.00}{1-0.01(+4.00)} - 4.00$$

$$= +\ 0.16666\ \text{D}.$$

Assuming that the vertex distance measured from the minus lens is 15 mm, we have for the exact magnification:

$$M = \left(\frac{1}{1-0.015(0.16667)}\right)\left(\frac{1}{1-0.01(+4.00)}\right)$$

$$= (1.00250)\ (1.04166) = 1.04427, \text{ or } 4.43\%.$$

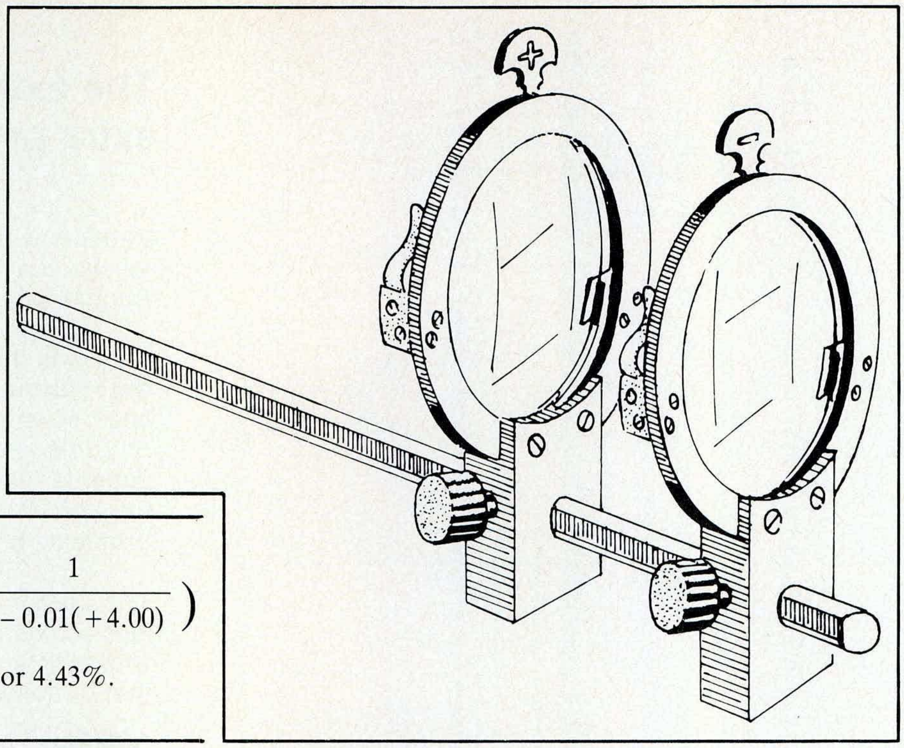

Fig. 1 Variable magnification unit for trial lenses.

It is seen that the contribution by the back vertex power of the system is relatively small. For routine clinical procedures it is seldom necessary to calculate the exact magnification; the approximation described above is sufficiently accurate in nearly all cases. For minification, the positions of the plus and minus lenses in the holder can be reversed.

In the above, we have demonstrated the small change in vertex power produced by the separation of the lenses. The blur generated by this slight change is insignificant and would not interfere with most tests for aniseikonia. A change in vertex power of up to 0.25 D would be acceptable in the majority of cases for this purpose. Since it is convenient to vary the lens separation without having to change lens powers, it is useful to know at which separation a back vertex power of 0.25 D is generated. Fig. 2 shows the change in vertex power with lens interdistance for pairs of lenses of numerically equal denominations, such as in the above example. Graphs for lens denominations of 1.00, 2.00, 3.00, 4.00, and 5.00 D have been plotted by applying the factor in the exact formula that describes the effect of the lens separation (i.e., the "shape factor")

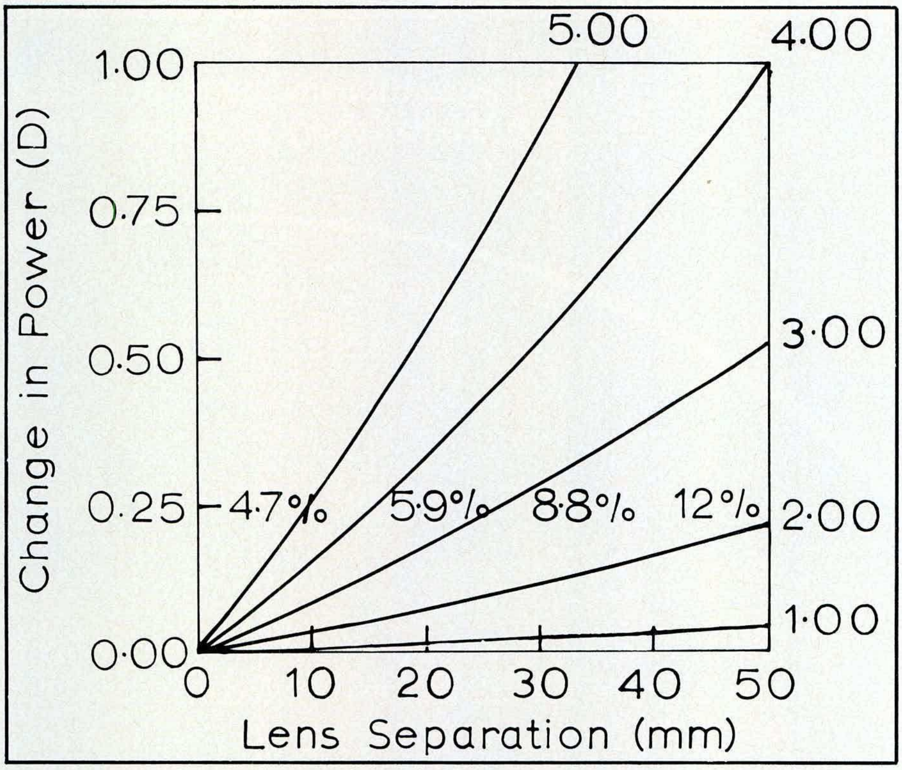

Fig. 2 Relationship between change in back vertex power of the magnification unit and the lens separation for lens powers of 1.00, 2.00, 3.00, 4.00, and 5.00 D. Percent magnifications associated with a back vertex power of + 0.25 D are shown for each power except 1.00 D.

(5). Because the back vertex distance is different in individual cases, the relatively small amount of magnification generated by the back vertex power (i.e., by the "power factor") has not been included. The percent magnification value shown next to each graph, except that representing 1.00 D, represents the effect of the lens separation that produces a back vertex power change of 0.25 D. Had the magnification produced by the back vertex power been included, the values would have been slightly higher.

From the family of curves presented, it is seen that the combinations consisting of the lowest powers yield the greatest amount of magnification before the 0.25 D limit is reached. On the other hand, the low power lenses need a relatively greater interdistance to produce the same amount of magnification, which is technically awkward. The ideal lens power for the present purpose would appear to lie between the extreme values shown; thus a combination of a +3.00 D lens and a −3.00 D lens would appear most suitable.

The device was originally designed for simple aniseikonia tests of the type referred to in the introduction, and for the demonstration of space distortions. However, it can obviously be turned into a variable loupe or telescope for subnormal vision testing. For these higher magnification powers, the negative trial lens would, of course, have to be of much higher denomination than the plus lens.

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Acknowledgement
The author wishes to thank Douglas Gregory for designing and constructing the variable magnification trial lens holder.

THE INTERNATIONAL SCENE

Aspects of Optometric Education in Australia

By G. Woo

Three schools of optometry in Australia were visited by the author during his sabbatical leave in 1977. This report presents some aspects of optometry in three states of Australia — Victoria, New South Wales and Queensland.

Optometric education in Australia as in North America is conducted in universities and comes under the jurisdiction of individual states. There are six states in Australia, and optometric institutions are located in three of the states. This paper deals with educational aspects of optometry in those three states.

Part I: Victoria

In order to qualify as an optometrist in the State of Victoria, a potential candidate usually goes through the Optometry program at the University of Melbourne. This course is four years in duration. The prerequisite to entering the program is completion of the Higher School Certificate (Form 6) in five subjects. Typically, these subjects are: 1) English, 2) Chemistry, 3) Physics, 4) General Mathematics, and 5) Biology. General Mathematics and Biology may be substituted by Pure Mathematics and Applied Mathematics. Generally, counseling of students begins before they enter the University.

The four-year program is described in the Faculty of Science handbook. The Department of Optometry of the University of Melbourne teaches optometry courses. The number of optometry courses makes up 25 percent of the curriculum in Year II, 50 percent in Year III and 100 percent in Year IV. The Victorian College of Optometry, however, provides clinical facilities for training optometry students. Examination of the didactic portion of the optometry curriculum in Years II, III and IV reveals that the courses given are similar to those given at British universities. As an example, a course in Physiological Optics will encompass all aspects of physiological optics normally given at a North American optometry school in four or five separate courses. Another example is the Public Health course. This includes not only public health optometry, but also illumination, occupational and environmental optometry. At North American universities, these are taken as separate subjects.

The first-year program is similar to the pre-optometry program at the University of Waterloo. However, only a limited number of students are admitted into Year I since there is a quota, and these students are usually pre-selected. Relatively few students, who are enrolled in other universities, would be able to join the program in Year II. Provided a student passes the prescribed subjects of Year I, a seat in the optometry program will be ensured. Between the third and the fourth years, optometry students are required to attend clinical sessions (approximately three weeks in duration) in addition to the regular university year, which ordinarily begins in March and ends in December. By the time a student graduates from the program, he would have seen approximately 120 patients in the clinic.

At the end of their fourth year, students are asked to write a set of comprehensive examinations in various subjects which they undertook in the previous three years. They are also required to pass oral examinations. Upon completion of the program, the degree Bachelor of Science in Optometry is conferred upon the candidate by the University of Melbourne. No additional examination is required for licensure in the State of Victoria.

General clinical training facilities in the department seem to be more than adequate. Insofar as specialty clinics are concerned, the department is known for its participation in a joint Low Vision program sponsored by the Association for the Blind at Kooyong Centre for the Blind. Its contact lens clinic is also well equipped. Many papers in both low vision and contact lens areas have been published in international optometric journals. Active research is being carried out in these areas.

There is a register kept by the Registrar of the licensing body. Its main function is to register and deregister optometrists in the State of Victoria, as well as maintain the Optometrists Registration Act of 1958. The Registration Board also recognizes registrations in the other states of Australia by reciprocity. It considers specific programs in optometry in Canada, the United States, and the United Kingdom as being equivalent. In its 1976 regulations, a University of Waterloo graduate is eligible to register in the State of Victoria without further examination. Optometry programs in South Africa are excluded from this list.

The Board of Education of the Victorian College of Optometry arranges continuing education courses throughout the year. There is also a professional program held monthly. Practicing optometrists from the State of Victoria and neighboring states attend these

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courses and meetings on evenings and weekends.

Although the undergraduate enrollment of optometry students is in the vicinity of 20 students per year, the department at present has five full-time graduate students working toward either the M.Sc. degree or the Ph.D. degree. There are a few research fellows from other agencies as well. Adjacent to the Victorian College of Optometry is the National Vision Research Institute of Australia founded by practicing optometrists throughout Australia and affiliated with the Victorian College of Optometry. It is still in its developmental stage and a director is yet to be announced.

The University of Melbourne offers programs in medicine and dentistry as well as optometry. Degrees conferred by the University in these other disciplines are M.B.B.S. (Bachelor of Medicine and Bachelor of Surgery) and B.D.S. (Bachelor of Dental Surgery). The duration of the medical program is six years and that of the dental program is five years.

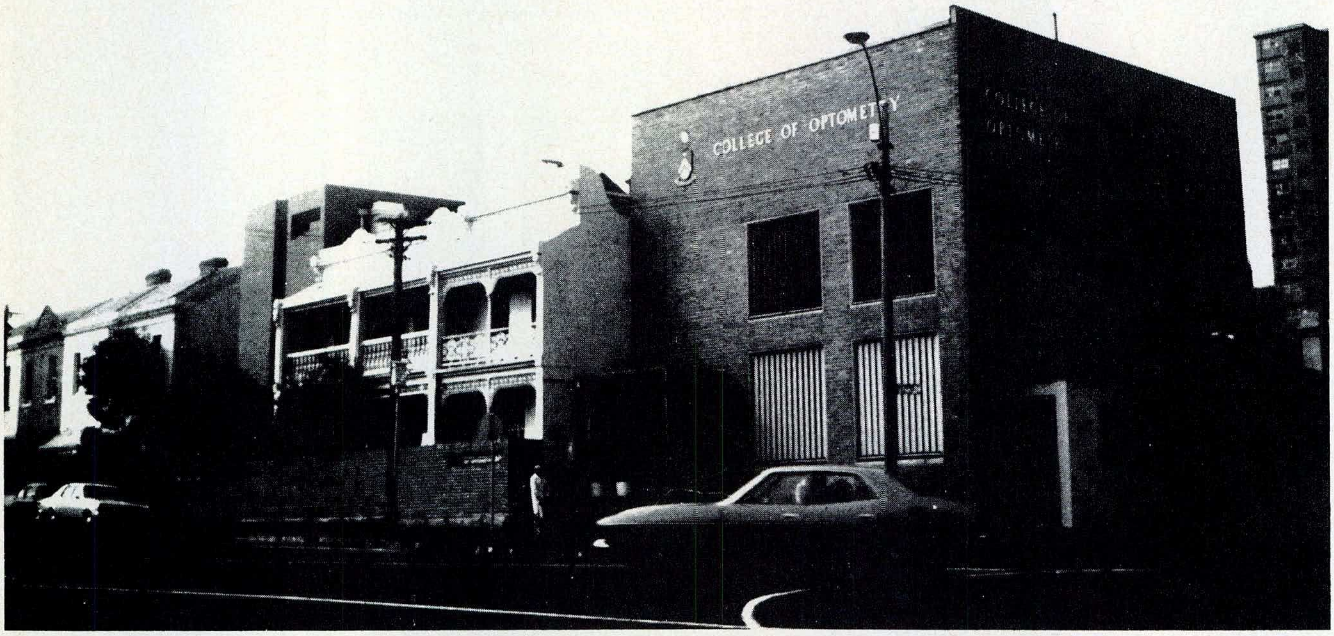
Part II: New South Wales

In the State of New South Wales, there is one School of Optometry within the University of New South Wales located in Kensington near Sydney. The "school" status was established in January, 1977. The head of the school is Professor J. Lederer who at present occupies the only professorial chair in optometry in Australia.

The program of optometry is four years in duration. University entrance requires completion of the Higher School Certificate. There is a quota on the number of students enrolled in the first-year optometry program. Failure or dropout rate is between 25 and 40 percent. Year II, or the first professional year, has a quota of an additional 20 students who transfer from other science programs either within the University of New South Wales or from any other Australian university. The first-year program includes Physics, Chemistry, Mathematics, and Biology. The second and third-year programs consist of three major subjects and an elective. The final year is made up of four subjects and one elective. A detailed description of these subjects is in the School of Optometry handbook. Each term or semester is 14 weeks in duration. Completion of the course normally takes eight terms. Students begin to see patients in their third year. A total number of 100 patients in general clinic and between 30 to 50 patients in specialized clinics are seen by a student before he graduates. There is also an externship program arranged by the department between students in optometry and private practitioners.

A socialized health care program (Medibank), equivalent to Ontario's OHIP, does not reimburse the University for services rendered by students although private optometrists are eligible for payment. Consequently, there is no actual fee for eye examinations at the optometry clinic. There are two groups of patients attending the clinic. The first group receives examinations only and necessary prescriptions are given to them to be filled elsewhere. The second group of patients receives examinations and spectacles without charge. These latter patients are either registered with various welfare agencies or with the Repatriation Department (veteran's affairs). Thus dispensing is not routinely performed, although students do get their experience in externship programs with practicing optometrists and with a limited number of patients from the second group of patients described earlier.

A number of well-equipped consulting rooms are in the general clinic. In addition, there is a pleorthoptic (pleoptics and orthoptics) clinic, a contact lens clinic and a low vision clinic. Each of these specialty clinics is headed by



The Department of Optometry, University of Melbourne, Melbourne

one of the faculty members. There is also an external clinic of pediatric optometry. An external low vision clinic is being developed jointly by the school and the Royal Society for the Blind in Sydney.

Upon completion of the optometry program, a student receives the degree B. Optom. (Bachelor of Optometry) from the University. With this degree, he may register with the New South Wales Board of Optometrical Registration where the register is kept without further examination. The New South Wales Board also considers specific programs in Canada, the United States and the United Kingdom as being equivalent. It works closely with the Committee on Overseas Professional Qualifications which is associated with the Immigration Department of the federal government of Australia in Canberra. It appears at the moment that both University of Montreal and University of Waterloo graduates may register in New South Wales without further examinations.

Although the New South Wales Optometry Act allows optometrists to use drugs, only those who have completed a course, "The use of drugs in refraction and examination of the eyes," may do so. The registrar keeps a list of optometrists who are eligible to use drugs. They need to show documentary evidence of their training and know-

ledge in ocular pharmacology. The University of New South Wales gives a course on pharmacology to optometrists from time to time and an examination is compulsory at the end of the course. A British graduate is generally considered proficient in the use of drugs by the Board, and he is exempted from the pharmacology course and the examination.

In 1977, there were 347 undergraduates enrolled in the program, and a total of ten part-time and full-time graduate students are enrolled either in the M. Optom. program or the M.Sc. or Ph.D. programs. The latter two degrees are research oriented degrees awarded by the Faculty of Science. The M. Optom. degree is a clinically oriented program. it consists of course work and a research project. The University of New South Wales has a medical program of five years duration, and the degree conferred by the University is M.B.B.S. (Bachelor of Medicine and Bachelor of Surgery).

The Optometric Vision Research Foundation is loosely affiliated with the University of New South Wales. It generates funds primarily from optical industries and private practitioners and supports various research projects in the Schools of Optometry at New South Wales and Queensland.

Part III: Queensland

A three-year diploma course in optometry has been available at the Queensland Institute of Technology since 1966. It is given in the Department of Paramedical Studies. Since August, 1977, a Section of Optometry has been created. Prerequisites for entry into the course are similar to the University of Melbourne and the University of New South Wales. The number of students in the three-year program is 64. Recently there were some discussions on the possibility of changing the curriculum of the course to a four-year degree program. A tour of the facilities in the optometry clinic revealed that all clinical rooms are well equipped. Research activities, however, are much less apparent than at other schools in Australia.

It is interesting to note that in the state of Queensland, there are no opticians. Optometrists not only fill their own prescriptions but also those generated by ophthalmologists. Some optical firms hire optometrists to serve specifically as dispensing opticians. ●

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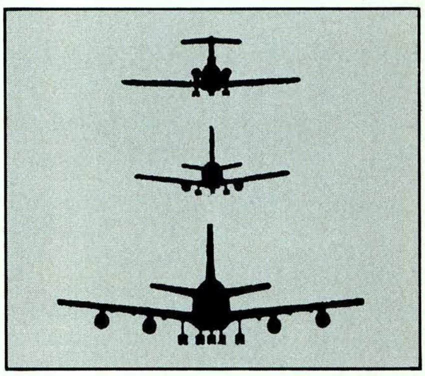
Accident Experience of Civilian Pilots* With Static Physical Defects

J. Robert Dille and Charles F. Booze
FFA Civil Aeromedical Institute

US study indicates that pilots with certain visual deficiencies had significantly more accidents than were expected on the basis of the observed-to expected ratio . . .

The 1974 and 1975 aircraft accident experiences of civilian pilots with eight selected static physical defects were examined and reported on earlier. These conditions were blindness or absence of either eye, use of contact lenses, deficient color vision with a statement of demonstrated ability (waiver) and no operational limitations, deficient color vision with a restriction "not valid for night flight or color signal control," deficient distant vision, paraplegia, deafness, and amputations. For each category, we determined the number in the active airman population, the rate per 1,000 airmen, the expected number of accident airmen on a ratio basis to total airmen and total accidents, the observed accident airmen, the observed-to-expected accident airman ratio, and the statistical significance by the chi-square test. Three groups – blindness or absence of either eye, deficient color vision with a waiver, and deficient distant vision – had significantly more accidents than were expected on the basis of observed-to-expected ratios. In 1974, pilots with these three conditions reported considerably higher (4- to 8-fold) median 6-month flight times in the 6 months preceding their most recent physical examinations before their accidents than did an active airman population sample, but the study was not designed to determine the role of exposure by calculation of accident rates.

In 1975, the same three categories plus the contact lens group had more accidents than were expected as demonstrated by the observed-to-expected ratio. For this year, the self-reported 6-month and total flying times for all airmen and all airmen with these three defects significant in 1974 were determined and accident rates were calculated. The rates for airmen with blindness or absence of an eye were found to be significantly higher than the total active airman population. The rates for airmen with deficient distant vision and deficient color vision and a waiver were not significant when the 6-month flying times were used; the rate for the color vision group using total time was significantly higher



but was felt to be of marginal importance considering the 6-month rate.

Individual accident records were reviewed to determine any possible relationship between visual defects of the pilot and accident cause, phase of light, type of flying, time of day, and weather, but no usual associations were determined.

The contact lens group was selected to receive special attention in a study of the 1976 data because a marginal significance was found in the analysis of the 1975 accidents and, after 1976, this group will not carry a pathology code or require a waiver, and thus will be very difficult to study.

Materials and Methods

For the 1976 active airman population of 780,408, the numbers were determined who had blindness or absence of either eye (includes uncorrectable distant visual acuity of 20/200 or worse in one eye); contact lenses; deficient color vision but who had taken and passed a signal light gun test and had no operational limitation; and deficient distant vision (uncorrected distant vision poorer than 20/100 for first and second class, or does not correct to standards for any class). The deficient distant vision category ordinarily includes many who also have absence of an eye and some who wear contact lenses, but these were subtracted for this study.

For each of these four categories, their representation per 1,000 active airmen, expected frequencies for 4,355 total accidents, actual accident experience, ratio of observed to expected accidents, and significance by the chi-square test were calculated.

Total and last-6-months civilian flight hours, reported at the time of the most recent physical examinations, were obtained for all active airmen, those with blindness or absence of either eye, those with deficient distant vision, those with deficient color vision, and those who wear contact lenses. From these flight time data, accident rates per 100,000 h of flying experience, both total and in the last 6 months, were calculated and statistically compared.

Finally, the records of all accidents involving pilots in one of these four defect categories were reviewed by the authors to determine if medical conditions had been considered by

TABLE I. AIRMEN AND ACCIDENT FREQUENCIES FOR SELECTED PATHOLOGY CATEGORIES.

Pathology Category		Freq. Active Airmen Pop.	Rate/ 1,000	Expected Accident Airmen	Observed Accident Airmen	No. Observed / No. Expected	Chi-Square Test
Contact Lenses	(1976)	17,657	22.62	98.5	126.0	1.28	7.8****
	(1975)	15,737	20.60	86.1	104.0	1.21	3.80**
	(1974)	14,421	18.91	87.0	99.0	1.14	1.70*
Blindness or Absence of Either Eye	(1976)	4.855	6.22	27.1	37.0	1.37	3.67**
	(1975)	4,781	6.26	26.2	35.0	1.34	3.01**
	(1974)	4,704	6.17	28.4	45.0	1.58	9.86***
Deficient Distant Vision	(1976)	21.909	28.10	122.3	198.0	1.62	16.50****
	(1975)	21.464	28.10	117.5	145.0	1.23	6.66***
	(1974)	20,247	26.55	122.1	165.0	1.35	15.55****
Deficient Color Vision—No Restriction	(1976)	6,861	8.79	38.3	73.0	1.91	31.93****
	(1975)	5.690	7.45	31.1	61.0	1.96	28.99****
	(1974)	5.157	6.76	31.1	52.0	1.67	14.21****

*Not significant at 0.10
**Significant at 0.10
***Significant at 0.01
****Significant at 0.001

the accident investigators or if time of day, phase of flight, nature of accident, or other findings offered any plausible explanation for the accident experience of these groups.

Results

The numbers of active airmen in each of the four categories and their accident experience in 1976 are shown in Table I. The 1974 and 1975 data are included for comparison. Again, the same four categories had more than their expected numbers of accidents—deficient color vision with no restriction, deficient distant vision, blindness or absence of either eye, and contact lens use.

When the accident experiences of airmen with each of the four static defects of major concern were compared with the total active airman population accident experience per unit of total (cumulative) and recent (6 months) exposure (Table II), both rates for airmen with blindness or absence of an eye were again found to be significantly higher as were those for the contact lens group; the rates for those with deficient color vision were again insignificant when total experience was used but not significant when calculated for recent exposure. Similar findings to those for color vision were observed for the deficient distant vision category.

TABLE II. ACCIDENT RATES PER 100,000 h OF CIVILIAN FLIGHT TIME FOR SELECTED STATIC DEFECT GROUPS.

Defect	Civilian Flight Hours: Last 6 Months	Civilian Flight Hours: Cumulative to Date
Contact Lenses	15.3**	0.9**
Blindness or Absence of Either Eye	20.0**	0.7**
Deficient Distant Vision	12.1*	0.5**
Deficient Color Vision	13.9*	0.7**
Total Active Airman Population	11.2	0.4

*Not Significant
**Significant at 0.05

Review of each of the accidents and extraction of factors of interest and concern did not reveal any unusual associations of these accidents with weather, time of day, mid-air collisions, or agricultural flying. Physical findings had not been ascribed causal roles. Landing accidents, which usually account for about 40% of the total, were listed in our preliminary tabulation as the phase for 8% of the monocular pilot accidents. However, after review of the reports for the correct phase and adjustment for emergency landings reportedly caused by mechanical problems, the final figure was 41% (15 of 27). Of these, two struck objects (power line, trees) on approach, one misjudged snow depth,

two landed left or right of the runway (one on a downwind landing), two lost directional control, and one accident was blamed on a downdraft. Most of the 15 were pilot factor accidents but not definitely associated with their visual problems. Binocular pilots have similar accidents. Some of the accidents with "loss of power" and other cited mechanical problems could also have been due to human errors and loss of power is an easy excuse for landing short.

When the medical records of 36 "monocular" pilots with the 37 accidents were reviewed, we were surprised to learn that 3 had been miscoded and 5 who were originally correctly coded were subsequently reported as having better than 20/200 corrected visual acuity in their "bad" eye.

No corrections to the tables and calculations have been made as a result of this finding. We assume that the errors and variations apply equally to the 37 accident airmen and to the 4,855 total "monocular" airmen groups. The ratios and rates which we have calculated here are, by definition, estimates and we feel that they are still best estimates. We do not have sufficient resources or priority to review all 4,885 medical records at this time.

Of the 36 monocular airmen who had acccidents, 18 had no useful vision in one eye, 9 had best corrected vision of 20/200 or worse in one eye, 5 had previous visual recordings which caused correct assignment of a monocular code but do not presently meet the criteria, the record cannot be located for 1, and 3 never should have been coded as monocular. One of the non-monocular pilots had two accidents in 1976.

Six of the 37 accidents were fatal; 2 of these 6 pilots did not meet the monocular criteria at the time of their accidents.

No unusual associations were found with phase of flight, accident cause, weather, time of day, or recency of experience for the contact lens, deficient distant vision, or deficient color vision groups, either.

Conclusions

Despite the recent discovery of errors and variations in the assignment of the code for monocularity, the increased accident ratios and rates for monocular pilots, which have been observed for 3 consecutive years, are felt to be real. However, there is no clear indication at this point of the exact nature of the problem or how to avoid it. No changes in medical standards or policies are proposed at this time. Studies have shown normal performances by binocular pilots suddenly rendered monocular so no further research is recommended, either, for now.

We do suggest greater awareness of these findings and of our concern, increased knowledge about depth perception, and recognition of the disadvantages of monocularity by flight instructors, physicians, affected airmen, and accident investigators.

At a recent staff seminar, 15 visual cues for depth perception were identified. Only two (steropsis and convergence) are binocular; the other 13 are monocular including retinal size, which is better than steropsis, and motion parallax, which is also very effective. However, with monocularity there is 1) no spare, 2) possible incapacitation by a foreign body, 3) a reduced field of vision, 4) an uncompensated blind spot, 5) increased awareness of floaters, and, perhaps most important, 6) frequent denial by the individual.

The variable classification of many pilots as monocular, which has complicated the analysis herein, can probably be attributed to the frequent imprecise measurement of acuities of 20/100 or worse. A case which varied from 20/400 to 20/13 uncorrected probably involved undetected contact lenses. Improved accuracy will be stressed for Aviation Medical Examiners. There is some regret that administrative monocularity is combined with actual monocularity in our data base and that refractive error information is not obtained.

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LIMITATION OF GAZE

Dr. Howard A. Backman*

Abstract

Limitations of gaze may be congenital or acquired. The Optometrist should differentiate the two and look for associated anomalies. Some neurologic and congenital oculomotor anomalies are discussed.

Limitations of gaze may be encountered by the Optometrists in practice either as an isolated problem or in association with other anomalies. These anomalies may be neural, muscular or traumatic in nature and the Optometrist should be able to either reassure his patients or refer them to the appropriate health professional.

Eye movements may broadly be categorized as outlined in Table 1. Table 2 is a summary of disorders of eye movement mechanisms (1). These disorders may be either congenital or acquired. Often torticollis is associated with these anomalies. It should also be noted that with horizontal anomalies of gaze there is a face turn; vertical anomalies which produce a rise or fall in chin position; and torsional disturbances cause a head tilt. A patient with a right superior oblique paresis will often have the head turned to the left, face to the right and chin down, (Figure 1).

Acquired Limitations of Gaze

Acquired limitations of gaze are primarly due to trauma such as motor vehicle accidents and often involve orbital fractures. Greenwald, Kenney and Shannon (2) did a retropective study of 128 patients with orbital fractures. Table 3 summarizes the signs and symptoms of orbital fracture. Table 4 lists complications of surgery to repair orbital fracture which may be encountered by the optometrist (2).

Other causes of acquired limitations of gaze may include internal carotid artery aneurysms affecting oculomotor nuclei in the midbrain region, aberrant third nerve regeneration, viral infections, hydrocephalus, tumors, orbital congestion, ophthalmoplegic migraine, multiple scelerosis, and Myasthenia gravis. These conditions are often associated with other signs and symptoms but are acquired. A development or congenital anomaly can often be differentiated from the acquired type by obtaining early childhood photographs and noting consistent abnormal head positions.

Congenital Limitations of Gaze

Congenital ocular motor paralyses may be due to developmental abnormalities of ocular motor nerves and extraocular muscles (which is to be discussed in this article), developmental abnormalities of the brain, and generally other conditions such as developmental ophthalmoplegias myasthenia congenita and cyclic occulomotor paralysis.

Developmental abnormalities of ocular motor nerves and extrocular muscles are outlined in table 5 (3) and special examples include Möbius syndrome, Duane's retraction syndrome, Brown's tendon sheath syndrome and strabismus fixus.

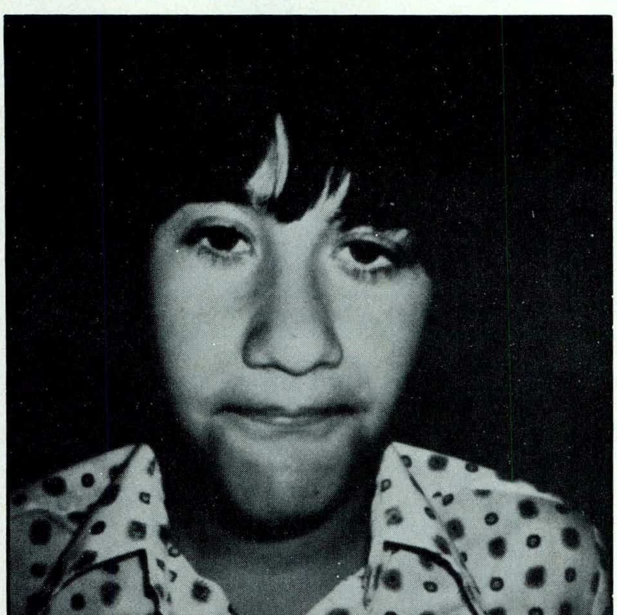

Fig. 1 Right Superior Oblique Paresis

Fig. 2A Brown's Syndrome

gion, aberrant third nerve regeneration, viral infections, hydrocephalus, tumors, orbital congestion, ophthalmoplegic migraine, multiple

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syndrome, the Klippel-Feil anomaly (Congenital strabismus, bilateral DRS, congenital fusion of cervical vertebrae producing a short immobile neck, often with torticollis; spastic paraplegia, deafness and mental deficiency), and perceptive deafness is inherited as a dominant condition with variable penetrance and expression. (7) (Figure 3).

Wildervanck (1952, 1960) described a syndrome with Cervico-Oculo-Acoustic manifestations. The triad consists of a bilateral DRS, and congenital ipsilateral aplasia of the auditory (VIII) and facial (VII) nerve. This syndrome is often associated with the Klippel-Feil Syndrome and may be x-linked dominant. (Figure 4).

Goldenhar's Syndrome (Oculo-auriculo-vertebral dysplasia) consists of: an epibulbar limbal dermoid and coloboma of the lid; Low set ears or ear deformity (which may be associated with deafness) Pewwriauricular cutaneous appendages (skin tags); mandibular hypoplasia and occipitalization of atlas hemivertebrae may also be present (Figure 5). The optometrist should note limitation of head motion, short neck, other facial deformities, hearing problems and anomalies of the external ear, as they may be associated with DRS.

Isenberg and Urist, in their study of 101 patients with DRS found a higher incidence in females 58 to males 43 (8). Fifty-six patients presented with a left DRS and 29 a right DRS. Fifteen per cent had a bilateral DRS usually associated with an A-pattern; 36 patients were orthophoric patients, three had head turn, and 2 had hyperphorias. All strabismus patients displayed a head turn with the eyes deviated toward the field of action of the underacting muscle; 52% demonstrated changes in both eyelids; 18% dropped the upper lid; 21% elevated the lower lid and 7% showed no change. Sixty-seven per cent were hypoeropic, 18% myopic and 16% emmetropic; 10% had amblyopia and 50% anisometropia. Kirkham, in a study of 110 patients with DRS, re-

Table 1. Control mechanism (1)

	Position maintenance	Pursuit
Function	Maintain eye position vis-a-vis target	Maintain object of regard near fovea, match eye and target
Stimulus	Visual interest and attention	Moving object near fovea
Latency (From stimulus to onset of eye movement)		125 msec
Velocity	Both rapid (flick, microsaccades) and slow (drifts)	To 100 deg/sec with central scotoma (accurately to 30 deg/sec)
Feedback	—	Continuous

Table 2. Summary of disorders of the eye movement mechanism (1)

Area of lesion	Mechanism involved	Defect
Frontal (a) Unilateral	Saccadic	Absence of contralateral rapid eye movements (refixation saccades, fast phase of vestibular nystagmus, fast phase of OKN); temporary tonic deviation to side of lesion; gaze paretic nystagmus on gaze to side opposite lesion.
(b) Bilateral		Bilateral defects same as above, and absence of vertical saccades
Parietal	Disconnection of occipito-frontal fibers	Defective fast phase of OKN; spasticity of conjugate gaze; cogwheeling, saccadic pursuit
Occipitoparietal (a) Unilateral	Pursuit, vengence position maintenance	Inability to fixate, inability to follow to contralateral side
(b) Bilateral	Pursuit, vergence position maitenance	Cortical blindness, defective vertical following, bilateral horizontal deficits, impersistence of gaze
Capsule/subthalamus Pretectum	Saccadic or following Vertical saccadic, pursuit	Defective saccades or following or both Limitation of vertical gaze, retraction nystagmus, pupillary abnormalities, Parinaud's syndrome
Paramedian pontine reticular formation (PPRF)	Saccadic	Absence of ipsilateral saccades, fast phase of vestibular nystagmus, fast phase of OKN
Internuclear ophthalmoplegia (INO)	Saccadic, Pursuit	Abducting nystagmus; supranuclear paresis of ipsilateral medial rectus, sparing convergence
Pontine gaze center	Saccadic, pursuit vestibular	Loss of ipsilateral eye movements
Diffuse supranuclear degeneration (progressive supranuclear palsy. Huntington's chorea)	Saccadic	Loss of saccades, which are replaced by slow eye movements (following?)
Nuclear lesions	All	Loss of all movements in field of muscles controlled by involved subnuclei
Cerebellum	Saccadic, pursuit	Dysmetria, flutter, opsoclonus; saccadic pursuit (cogwheeling)

Table 3
Signs and Symptoms of Orbital Fracture

	No. of Patients (%)
Limitation of extraocular movements	98 (77)
In up-and downgaze	36 (28)
In upgaze	46 (36)
In downgaze	9 (7)
Diplopia	89 (70)
In central upgaze	48 (38)
In central downgaze	29 (23)
Entrapment of the extraocular tissues	68 (53)
Inferior rectus muscle	23 (18)
Inferior Oblique muscle	2 (2)
Orbital tissues (not specified)	48 (38)
Clouding of the maxillary antrum	45 (35)
One side	44 (34)
Both sides	1 (1)
Preoperative hypesthesia of the skin in the distribution of the infraorbital nerve	38 (30)
Forced duction test	
Positive	36 (28)
Negative	7 (5)
Enophthalmos	29 (23)
One side	28 (22)
Both sides	1 (1)
Orbital Emphysema	15 (12)
Retrobulbar hemorrhage	2 (2)

ported that 44 had anisometropia of more than 1 diopter and 23 of these patients were amblyopic. (9)

Surgery is not usally recommended for DRS. The Optometrist should reassure the patient and their family and advise the patient with a unilateral DRS to sit on the side of a classroom where the field of gaze is normal and no diplopia or extreme head turn will disturb them.

TABLE 4
Postoperative Complications or Persistence of Signs and Symptoms

No. of	Patients (%)
Persistent diplopia	21 (20)
Not specified	10
In upgaze	8
In downgaze	5
In abduction	3
In primary gaze	1
In adduction	1
Persistent enophthalmos	11 (11)
Persistent blepharoptosis	2 (2)
Epiphora	1 (1)
Reoperation for diplopia	5 (5)
Vertical muscle surgery	4
Horizontal muscle surgery	1
Reoperation to remove an implant	2 (2)
Extrusion	1
Diplopia	1
Reoperation for epiphora-dacryo-cystorhinostomy, débridement of scar, and medial canthoplasty	1 (1)
Persistent anesthesia of the infra-orbital nerve	1 (1)

The purpose of this article is to alert the optometrist to the problems and anomalies associated with oculomotor limitations of gaze and to discuss some limitations of treatment. The author wishes to thank Drs. T. Kirkham, J. Little, D. Anderson and J. Wise for the opportunity of seeing their patients at McGill University department of Ophthalmology, Montreal Childrens Hospital, Montreal General Hospital, the Royal Victoria Hospital and Montreal Neurologic Institute over the past five years.

TABLE 5

Congenital Ocular Motor Paralyses (3)

Developmental abnormalities of ocular motor nerves and extraocular muscle:
Absence or hypoplasia of cranial nerve nuclei or nerve fibers.
Aberrant innervation
Dysgenesis (absence or hypoplasia) of extraocular muscle
Abnormal muscle insertion.
Fibrous substitution of extraocular muscle.
Fascial defects (sheath and check ligament abnormalities).

Special examples:
Möbius syndrome.
Duane's retraction syndrome
Brown's tendon sheath syndrome
Strabismus fixus.

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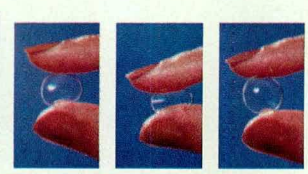

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DIRECT OPHTHALMOSCOPY TOWARD THE RETINAL PERIPHERY: LENS POWERS REQUIRED

T. David Williams* and Dennis A. Bader**

Introduction

Direct ophthalmoscopic examination toward the retinal periphery requires the use of increasing amounts of plus lens power in the instrument. The purpose of this clinical study was to determine the amount of additional plus power required to focus on peripheral fundus details.

Method

A series of retinal photographs was taken of a patient's right eye. The patient is a healthy university student, aged 24. The photographs followed the four major divisions of the retinal blood vessels until the vortex veins were reached. A composite photograph was prepared, and three markers were placed at readily identifiable points in each of the four quadrants (see Fig. 1). Direct ophthalmoscopy was performed through natural pupils and each of the selected landmarks was located. The observer then determined the maximum amount of plus power which permitted a clear view of the selected fundus detail. This measurement was repeated 5 times for each landmark.

Results

The results are shown in Figs. 2, 3, and 4. The data points give the average ophthalmoscope lens power (relative to that used to view the optic nerve head) required to view the landmarks. Each number is the mean of 5 determinations. For example, an actual power of −2.5 D was required to view the nerve head and an actual power of +1 D was required to view the superior temporal vortex vein. The **change** in power required to view the superior temporal vortex vein, relative to the power required to view the nerve head, is +3.5 D, as shown in Fig. 2.

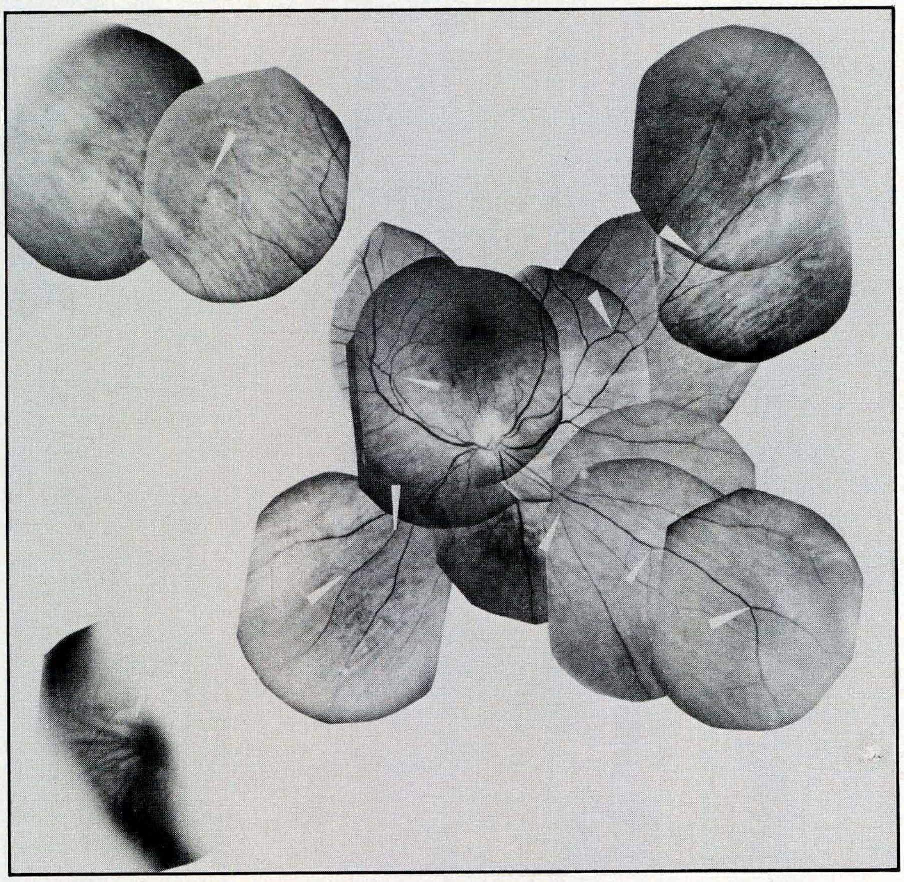

Fig. 1

Discussion

While it is known that the corneal and lenticular refracting powers change as one moves away from the visual axis, such changes are probably very slight for the markers closest to the nerve head. Moreover, it would be difficult to explain the results in Figs. 2, 3, and 4 on the basis of changes in the peripheral cornea and lens since the changes observed are not qualitatively similar in all four quadrants. Further, the refracting power decreases steadily as one considers increasingly marginal portions of the system, whereas the dioptric changes seen in three quadrants change from negative to positive as one moves toward the periphery.

It would appear that there is a lowering of the retinal level in three quadrants at approximately 15 degrees from the nerve head. This does not occur in the inferior temporal quadrant. The lowering of the retinal level in three quadrants in our patient is 1 to 1.5 D. The optic nerve would appear to have been pushed

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into the eyeball, although this would not be correct either embryologically (such pushing does not occur during the growth of the retina and optic nerve) or anatomically (there is normally a considerable slack in the optic nerve behind the eyeball).

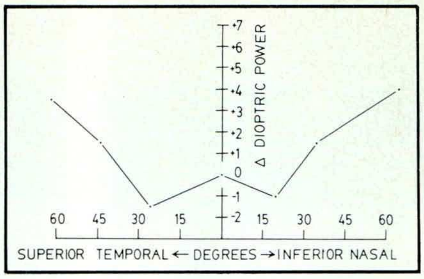

Fig. 2

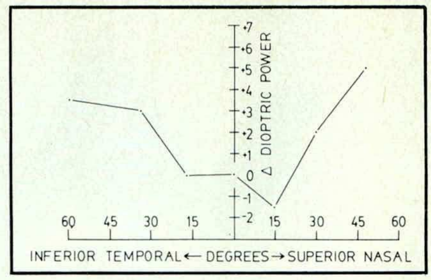

Fig.3

The retinal periphery (up to the exits of the vortex veins) may be seen through natural pupils (at least in young patients). The amount of additional plus power required to view the retinal periphery is between 3 and 5 D for this patient, and this agrees with the experience of many clinicians. Lens power required for ophthalmoscopy in all four meridians are shown in Fig. 4. For this patient, the most steeply sloped quadrant was the superior nasal quadrant. The least steeply sloped quadrant was the inferior temporal quadrant. There appears to be little congruity among the quadrants, except for the final points measured in the inferior nasal, inferior temporal, and superior temporal quadrants.

For those clinicians who have always found a poor view of the vortex vein region, perhaps part of the difficulty is a failure to introduce enough additional plus power. For this study, the patient was instructed to turn his eye toward the quadrant to be examined, while the observer angled his view similarly, so the best possible view could be obtained. The peripheral retina does not appear much distorted, even though observed very obliquely through the pupil. It would appear that the system of patient's eye and direct ophthalmoscope (especially with a natural pupil) is not subject to the degree of marginal astigmatism which is predicted by many authors. Changes in spherical lens power give good resolution of retinal details which are at right angles to each other.

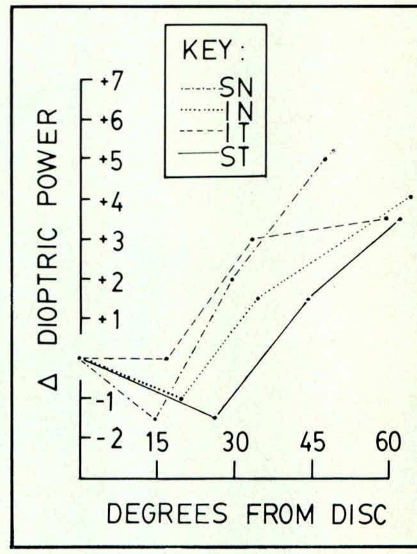

Fig. 4

Acknowledgements

We thank Dr. Brian Schmidt for his generous co-operation.

Canadian Ophthalmologists to work in Blindness Prevention Overseas*

Vancouver, B.C. - The Canadian Ophthalmological Society Executive, at the close of their Annual General Meeting in Vancouver June 12 approved a resolution authorizing a voluntary levy on its membership. The money raised, "will be paid into the C.O.S. fund for the advancement of vision and eye care, to be used in blindness prevention in the third world and disadvantaged areas."

The action by the C.O.S. followed a presentation by Professor Barrie Jones, London, England, on Trachoma to the more than 300 Ophthalmologists attending the conference. Professor Jones is a Director of the World Health Organization Collaborating Centre for Reference and Research on Trachoma and other Chlamydial Infections.

Trachoma is the major cause of blindness world wide. The organism is a leading cause of infection in urinary and genital systems in both males and females. There are many forms of the organism, some of which are specific to the eye, others to both the eye and uro-genital systems. Trachoma has also been linked to an arthritic associated condition, known as Reiter's Syndrome.

Trachoma exists in North America and is a cause of eye infection in some North Americans but seldom causes blindness. In underdeveloped countries due to constant reinfection, often spread by flys, it is the leading cause of blindness.

Dr. Jones has had first hand experience with Trachoma in West Africa, Iran and Indonesia. One village in Iran he visited had an overall incidence of blindness of 9%, two thirds due to Trachoma. A corresponding North American population would have .02% of the population blind from all causes of blindness.

Trachoma is an easily treatable condition. Large numbers of people can be treated at low cost. The problem in many areas of the world is a shortage of trained manpower and limited funds. "Through the levy and our research fund we will be able to provide financial support for Canadian Ophthalmologists to travel to these countries and supply them with the necessary drugs to combat this dreadful disease", said Dr. Clive Mortimer, the newly elected President of the C.O.S.

*Release from the Canadian Ophthalmological Society.

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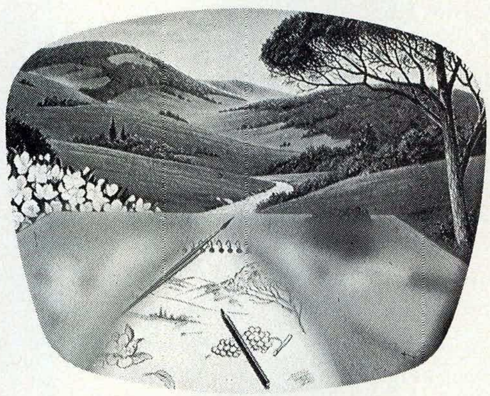

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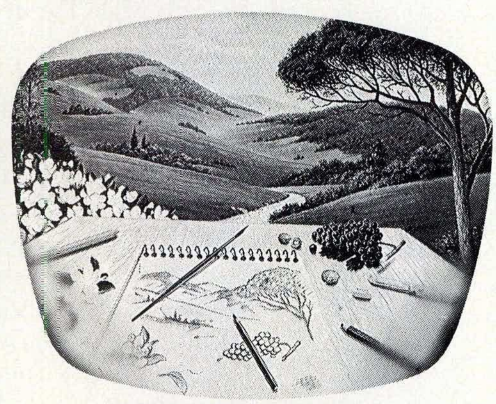

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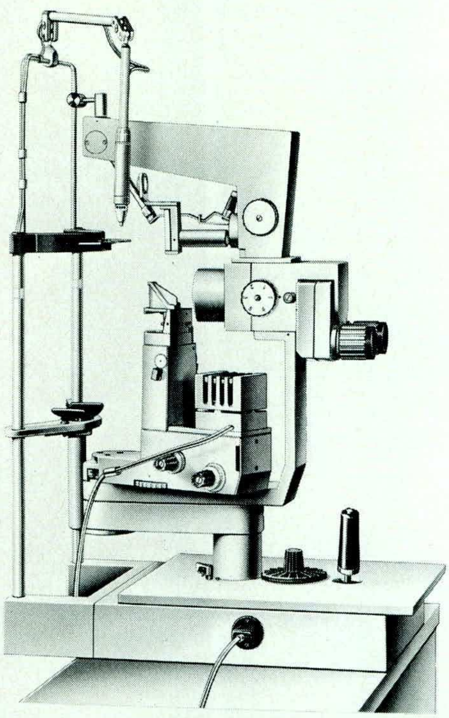

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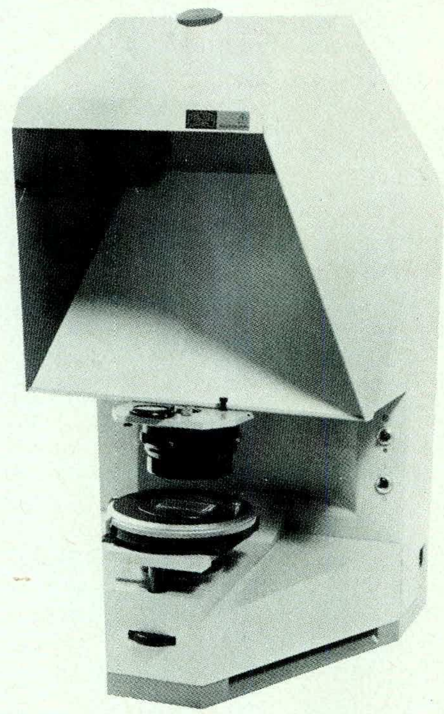

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CASE REPORT

Diagnosis of a Microtropia

by
William R. Bobier*

Microtropia is defined as a small angle strabismus, (about 5Δ) which characteristically shows eccentric fixation and anomalous correspondence.[2] Cohen states that this condition is difficult to detect with the cover test as the angle of eccentric fixation often equals the angle of anomaly. Thus the patient exhibits a lowered acuity (usually 20/40) in one eye without a readily apparent sensory motor etiology.

History and Findings

Patient C.M. age 32, complained of difficulty seeing clearly up close and in the distance. She was aware that she had astigmatism; but, did not wear her Rx. as it was out of style. Family history revealed that her eight year old daughter was strabismic, however, the trait was not present in her husband nor per parents.

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Refractive examination showed a consistent reduction of acuity in the left eye at 6M and 40cm.

O.D. +0.50 − 1.25 x 012
V.A. 20/15
O.S. +0.50 − 0.75 x 170
V.A. 20/30-2

The use of a 3mm pinhole again showed lowered acuity in the left eye.

O.D. 20/20
O.S. 20/40

Internal examination and biomicroscopy showed no signs of pathology in either eye. I.O.P. and centralfields were normal O.U.

The unilateral cover test had shown a fused response at distance and at near. A repitition of the test gave the same results. Von Graefe ductions suggested normal binocular vision; however, some fading of the target viewed by the left eye was reported.

6M exo		
	BI. x/12/6	B.O. x/12/6
40 cm 5 exo		
	B.I. 12/12/6	16/18/12

A second examination was made in which further binocular testing was carried out.

Stereo acuity (Titmus Fly) was found to be low (200 sec.) Using the grid pattern of a Welch Allyn ophthalmoscope, the monocular fixation of the left eye was found to be unsteady and slightly masal. Fixation was centered and steady in the right eye.

The nasal eccentric fixation of the left eye was confirmed using the Hadinger Brush Target of the M.I.T. Tester (Bernell Corp.). The After Image Transfer Test described in Long, revealed anomalous correspondence of an amount equal to the angle of eccentric fixation. The diagnosis of microtropia was made.

The visual direction of the retinal receptors of the deviating eye has shifted in order that the point of eccentric fixation of the deviating eye corresponds to the fovea of the non deviating eye. (preferred eye). This anomalous correspondence is deep and would be difficult to break down. Thus orthoptic therapy is not advised for cases of microtropia.[1]

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2. December 1978, Boston Mass.
Long, W.S. Manual of Strabismus and Orthoptics, ed. 2, 1977. University of Waterloo, Waterloo, Ontario.

BOOK REVIEW

TOPICS IN NEURO-OPHTHALMOLOGY

by H. Stanley Thompson, M.D.

Williams & Wilkins, Baltimore/London

Although many of the topics discussed in this book are too specialised to be used in everyday optometric practice, I found it to be extremely interesting.

As the preface states, the book is addressed to the neuro-ophthalmologist, neurologist or ophthalmologist. I feel that research optometrists would also find this book very helpful.

The author has divided this work into five chapters, each one headed by an authority in the field who has had colleagues author each subdivision.

The latest techniques in perimetry, pupil investigation and eye movements are dealt with. I found the chapter devoted to perimetric and tangent screen result interpretation has opened new vistas for me.

Interspersed between very detailed neurological discussions important information is divulged which can be of great importance in daily practice. For example in the chapter on pupils, it was noted that there is a loss of corneal sensitivity in Adie's pupil patients. This must be taken into account when fitting these people with contact lenses.

The chapter on the pathophysiology of optic nerve disease is also out of our sphere of operation, although I got a better understanding of the difficulties encountered when dealing with the VER.

Two topics discussed which also are almost must reading for the optometrist, are eye movements and nystagmus. Any optometrist either engaged in orthoptics or contemplating entering the field, should read the neurological background and research being done in the eye movements section. It brings home just how complicated the problem of eye movement disfunction really is.

The last chapter on CT screening in neuro-ophthalmology can be read for interest's sake, but I doubt if it can be useful for the average optometrist.

I do not think this book belongs on every optometrist's shelf, but it should be a part of every optometric school library.

Lorne G. Hart, O.D., F.A.A.O.

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*Although efforts are being made to create a third school of optometry in the west, the location is by no means certain. For administrative reasons we urge that all donations for a third school therefore not specify location.

COMING EVENTS

SEPTEMBER

IS EDUCATION TRUST FUND MONTH

Alberta Optometric Association Annual Meeting
Contact:
Mr. A. Berry,
1225A Kensington Rd. N.W.,
CALGARY, Alberta T2N 3P8

5-7
International Symposium on the Present and Future of Contact Lenses
ORLANDA, Florida
Contact:
Raymond I. Myers O.D.
Secretary International Society
for Contact Lens Research
950 Francis Place,
St. Louis, MO, 63105

18–20
New Brunswick Optometric Association Annual Meeting
Contact: Tom Hickey, O.D.
565 Priestman St.
Fredericton, N.B.
E3B 5X8

24-29
6th Annual Contact Lens Seminar and Orthokeratology Congress
ORLANDO, Florida
Contact:
Dr. R. Timothy Carter,
Park Central Plaza,
P.O. Box 566,
Orange Park, Florida 32073

26-29
National Optical Congress University of Lancaster
Contact:
John Allcutt,
21 Spruce Way,
Formby, Liverpool,
ENGLAND, L37 2YF

10-12
Optifair West
ANAHEIM, Calif.
Contact:
Optifair Inc.,
Conference Mgmt. Corp.,
500 Summer St.,
STAMFORD, Connecticut,
06901

30
Alberta Optometric Association sponsors Symposium
"LIGHT" — It's effect on Health Safety & Performance
Chairman Dr. Craig McQueen
Contact: AOA Office
1225A Kensington Road, N.W.
CALGARY, Alberta
T2N 3P8

OCTOBER

13-18
New Zealand Optometric Association 50th Jubilee
WELLINGTON, N.Z.
Contact:
E.R. Neal, Secty.,
NZOA,
40 Syndrum Ave.,
LOWER HUTT, N.Z.

20-22
Optifair Midwest
ST. LOUIS, Mo.
Contact:
Optifair Inc.,
Conference Mgmt. Corp.,
500 Summer St.,
STAMFORD, Connecticut,
06901

24-26
European Symposium on Soft Contact Lens
LONDON, England
Contact:
Dr. Stephen E. Schock,
Bausch & Lomb, Inc.,
Soflens Division,
1400 N. Goodman St.,
Rochester, N.Y. 14602

(Mid-October)
Nova Scotia Optometrical Association Continuing Education Seminars
Contact:
NSOA,
Mr. Jim Lotz,
Box 3393 South,
HALIFAX, N.S. B3J 3J1

10-17
Northern Rockies Optometric Conference
Kuilima, Oahu,
HAWAII
Contact:
Dr. Jack McNees,
P.O. Box 47,
win Falls, ID 83301

18-21
Annual Meeting - College of Optometrists in Vision Development
NEW ORLEANS, LA
Contact:
Robert Wold, O.D.
P.O. Box 285,
Chula Vista, CA 92010

20-22
2nd Int'l. Congress on Vision and Road Safety
PARIS, France
Theme: Night Driving
Languages: English, French, German
Contact:
R. Pansard,
La Prevention Routière Int'l.
Linas 91310,
MONTLHERY, France

20-23
International Optical Fair World Trade Centre
SINGAPORE
Contact:
McComm Private Limited,
36 Prinsep Street,
SINGAPORE 0718

NOVEMBER

Oct. 31-Nov. 5
Société d'Optométrie d'Europe Congress
LONDON, England
Contact:
H. Rosenwasser, O.D.,
1518 Walnut St.,
Suite 1401
PHILADELPHIA, Penn.
19102

5-8
5th Latin American Congress of Optometry and Optics
Contact:
Secretaria Fedopto
Apartado 53259,
BOGOTA D.E., Colombia
Suramerica

9-11
Saskatchewan Optometric Association Annual Meeting
Contact:
L.J. Koltun, O.D.,
#1, 2072 McIntyre St.,
REGINA, Sask. S4P 2R6

8-22
Optometry Down Under
Travel/Study Tour
LOS ANGELES - NEW ZEALAND
AUSTRALIA
Contact:
Richard B. Elliott,
Southern California,
College of Optometry,
2001 Associated Rd.,
Fullerton, CA 92631
by Sept. 1/80

DECEMBER

11-16
American Academy of Optometry Annual Meeting
CHICAGO, Ill.
Contact:
Dr. J. Schoen,
115 W. Broadway,
Box 365,
OWATONNA, Minnesota.

6–7
17th Biennial Congress Is Coming
July 6-7 — 1981
St. John's Newfoundland


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