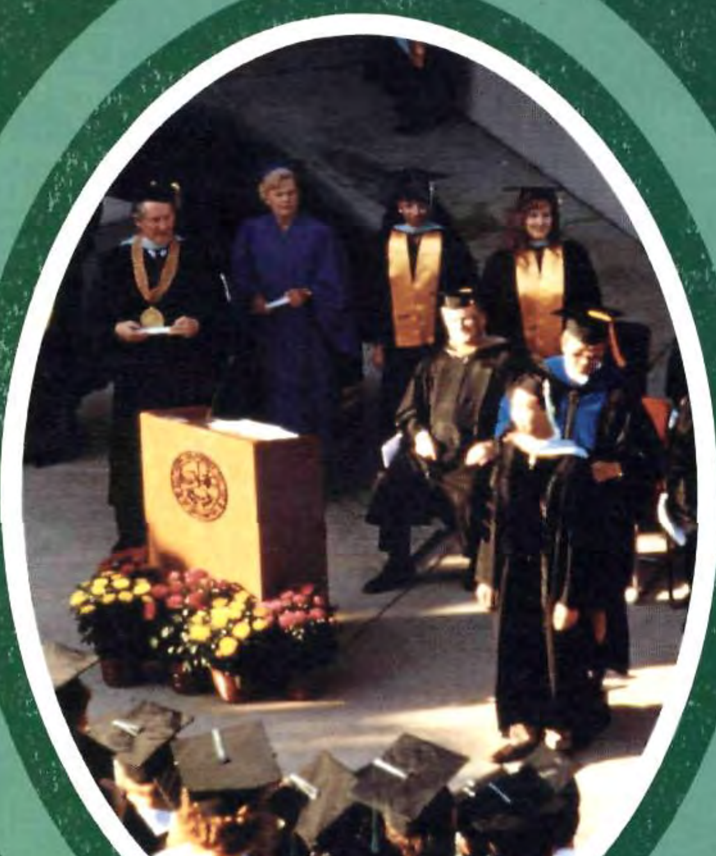
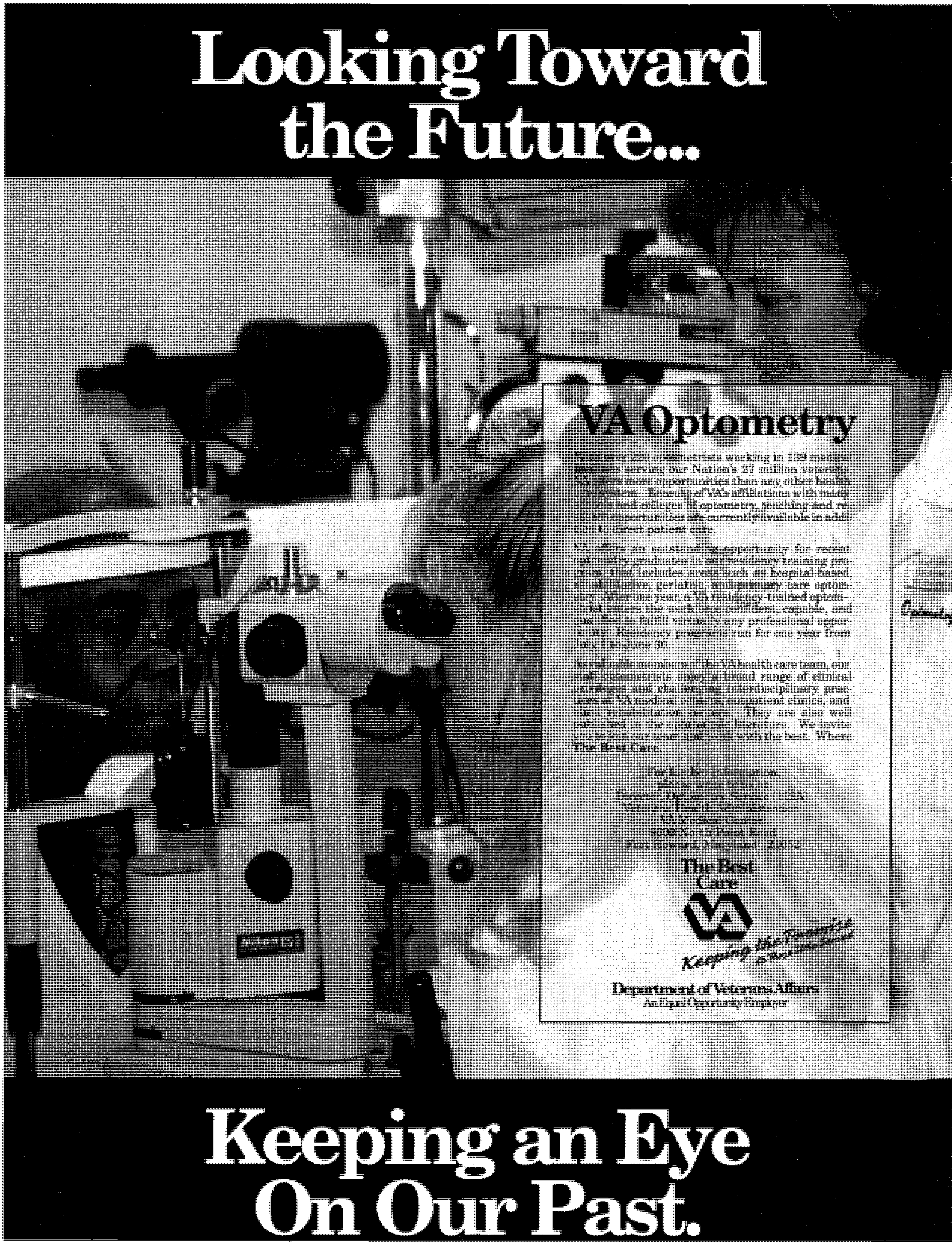
The Journal of the Association of Schools and Colleges of Optometry

OPTOMETRIC EDUCATION

Volume 20, Number 4 Summer 1995



Developing Faculties for the Future



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As of June, 1995

Developing Faculties for the Future

Optometry's credibility as a profession hinges on a number of key ingredients. One essential component is the ability to produce specifically trained and credentialed optometric faculty, especially in rapidly developing areas such as clinical training and biomedical sciences. This issue of *Optometric Education* features three articles by well-known optometric educators on the subject of education and training programs that prepare graduate optometrists for faculty careers.

The treatise by Dr. Anthony J. Adams was a featured presentation at the Georgetown Summit on Postgraduate Education and Training. It is a truly excellent overview. This paper is written from the perspective that our faculty needs are continually changing, and that this change is driven, in part, by the increasing requirements for biomedical and clinical training opportunities. Dean Adams discusses these issues in the broadest strokes, but in reading his paper, I also appreciated his specificity in recommending various innovative approaches the profession might consider.

Equally important, but more narrowly focused, were the papers by Dean Richard M. Hill and Professor Thomas F. Freddo which dealt with specific programs currently existing at their respective institutions, thus providing us with graphic examples of the ongoing process of change in optometric education described by Dr. Adams. Dr. Hill's paper describes the traditional combined OD-PhD and OD-MS degree programs but also highlights the relatively unique Ohio State MS-residency program which provides an important option for the optometric clinician who is interested in clinical research.

The Boston University OD-PhD program described by Dr. Freddo is also unique, due to its biomedical approach and its interinstitutional exchange format. In presenting his program, Dr. Freddo argues that there is currently a significant void in clinically-based ophthalmic research, which can be filled effectively by the research-trained OD clinician. This is a critical need, he contends, since the outcomes of science ultimately should solve clinical problems.

From an editorial perspective, it seems that the changes we are experiencing in optometric education and hence, in our faculty requirements, are a natural outgrowth of optometry's continuing progress in becoming the primary source for eye care. Certainly in my own practice lifetime, there has been dramatic improvement in the clinical "readiness to practice" of our students which has enabled us to produce an entry-level practitioner at graduation. There is also no doubt that additional advances in residency training opportunities will increase the momentum for improvement of the clinical basis of our training. In turn, this progress will continue to improve the level and capabilities of practitioners entering the field.

The larger issue, then, is how we can support and develop the research-based scientific training of future faculty members when our traditional graduate programs are narrowly focused and are faced with a dwindling pool of potential trainees.

Effective solutions to this issue are apparently hampered by many problems, i.e., the debt load of our graduates, reduced funding for research, larger faculty teaching loads and the increasing societal need for specific, usable research outcomes. I say "apparently" because what is really needed is an adjustment in our thinking about these relative "barriers" to forward progress. As we read in the papers published in this issue of *Optometric Education*, creative solutions and approaches do exist, if we will but seek them.

Finally, it is perhaps most important to realize that the interest in an academic career is a deep-seated desire in many individuals, one which is not driven primarily by financial considerations. Our future optometric faculty are out there in our graduation classes. It is up to us to help them to identify themselves and to discover their principal academic interests. When there is the will, then most often the way will be found, however circuitous it may be.

Felix M. Barker, II, O.D., M.S.
Editor

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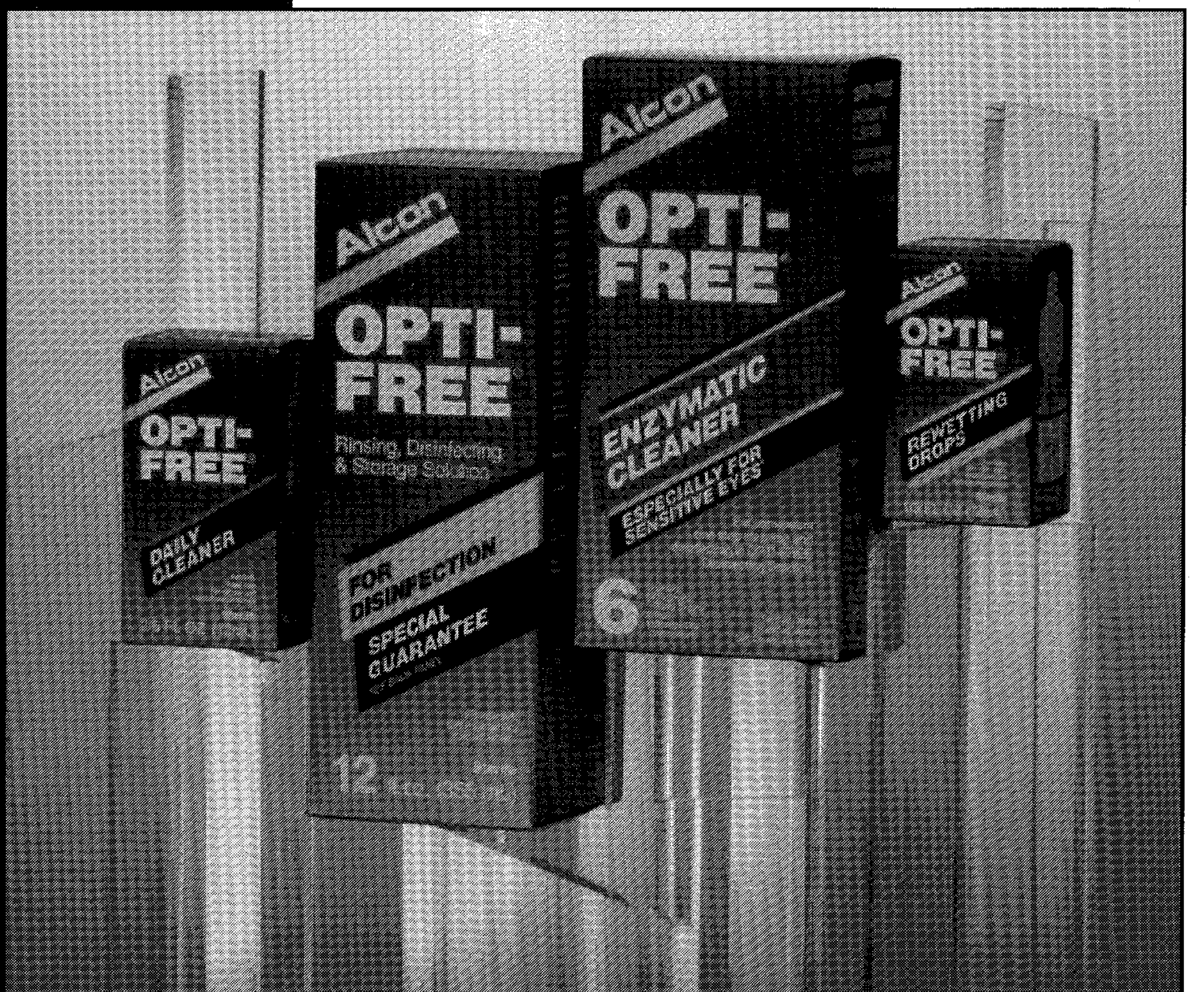

Everything Your Patients Need For Comfortable Contacts

OPHTHALMIC

INDUSTRY NEWS

Companies appearing on these pages are members of ASCO's Sustaining Member Program. Sustaining Members are listed on the inside front cover of each issue. Membership is open to manufacturers and distributors of ophthalmic equipment and supplies and pharmaceutical companies.

Vistakon Names Purcell Director, Professional Affairs

The appointment of Howard B. Purcell, O.D., as director of professional affairs was announced by Gary K. Kunkle, president of Vistakon.

In his new position, Dr. Purcell will report to Stanley J. Yamane, O.D., vice president of professional affairs. His responsibilities will include management of professional affairs programs in conjunction with professional organizations in optometry, ophthalmology and opticianry. He will also be involved with technical and educational information associated with professional affairs activities in the United States.

Dr. Purcell has been in private practice in Miami Beach, Florida, specializing in contact lenses, for more than 10 years. During his career, he has held leadership, management and administrative positions with various professional, educational, business and community organizations. Since 1991, he has held faculty and administrative positions at the Nova Southeastern University, College of Optometry in North Miami Beach, Florida. Most recently, he was deputy dean and chairman of the Department of Cornea & Contact Lenses. Dr. Purcell has also been a clinical investigator for contact lens companies.

"Serving as a liaison to the professional community, Dr. Purcell will complement our professional affairs management team," said Kunkle. "The appointment of this well-respected clinician and educator further demonstrates Vistakon's commitment to the future of contact lenses. We are pleased to welcome him aboard."

Dr. Purcell received his doctorate of optometry from the New England College of Optometry in 1984.

Alcon Announces Immediate Relief for Ocular Itching

Alcon Laboratories, Inc. announced the immediate over-the-counter availability of NAPHCON A® Eye Drops. NAPHCON A® combines a proven antihistamine with an effective decongestant to relieve ocular itching and redness for up to 120 minutes per instillation. Relief of ocular itching was previously available by prescription only. NAPHCON A's comfortable formulation relieves redness and itching caused by pollen, animal hair and ragweed.

NAPHCON A® has a long history of patient acceptance and has led its category as the most often prescribed ocular antihistamine/decongestant brand.

For further information on NAPHCON A® or other Alcon products, please contact your Alcon sales representative or call (800) 451-3937.

CIBA Sponsors SECO's Continuing Education Track

CIBA Vision Corporation recently extended financial support to the Southern Council of Optometrists (SECO) for their first annual Educational Forum for Ophthalmic Technicians/Paraoptometrics with a $35,000 sponsorship. The timely program introduced new opportunity for ophthalmic technicians/paraoptometrics to obtain advanced training in a variety of JCAHPO-approved courses.

More than 650 technicians/paraoptometrics attended the educational forum. Commented SECO President L. Wayne Brown, O.D., "In this period of rapid change in the optometric marketplace, we are thrilled that CIBA supported this new initiative to provide a distinct educational track for paraoptometrics and ophthalmic technicians that will help them stay current on new procedures, technologies, and products."

"With the reality of managed care, we believe that providing ophthalmic technicians/paraoptometrics with specialized education courses will help eye care practitioners provide optimal patient care," said Richard Weisbarth, O.D., executive director of professional services and customer satisfaction.

Wesley-Jessen Expands FreshLook® Parameters

Wesley-Jessen has expanded the parameter range for its FreshLook® line of disposable lenses. FreshLook® LiteTint® disposable lenses are now available from -0.25D to -8.00D in 0.25D increments. FreshLook® Colors are available in plano to -7.75D.

The 55% water content lenses feature a median base cuve and a 14.5mm diameter. FreshLook® disposable lenses are appropriate for flexible wear or daily wear.

The expanded parameters are available immediately. For more information, contact a Wesley-Jessen professional sales representative at 1-800-348-9595.

Varilux Announces Student Grant Awards

Varilux Corporation announced the 1994-1995 recipients of the Annual Student Grant Award Program for optometry schools. This year's national winner is Jimmy Ka-Keung So, a student at the University of California

Berkeley, California. So's paper, "A Case Presentation Involving Varilux Progressive Addition Lenses," was chosen for his thorough presentation of medical/clinical information. "Varilux Corporation is proud to acknowledge a student with such intuition for his future profession. This well-written case study looked at all aspects of the patient's medical history and found the best lens solution based on this research," stated Dr. Rod Tahran, vice president, professional relations and clinical affairs.

So and his faculty advisor, George Lee, O.D., will each receive an all expense paid trip for two to the American Optometric Association Congress Meeting June 23-27, 1995, in Nashville, Tennessee.

Sixteen other students, chosen by the clinical staffs at each of their schools, received $500 grants.

Vistakon Funds Student Travel

Vistakon provided funding for students and residents from the Pennsylvania College of Optometry (PCO) to attend the American Academy of Optometry meeting in San Diego. "The college had the largest contingency at the meeting of any optometric institution," said Felix Barker, O.D., M.S., PCO director of research, "Thanks to the generosity of Vistakon . . . this trip was made more affordable for the 12 students and 10 residents who attended the annual event."

Bausch & Lomb Offers Disposable Colored Contacts

Bausch & Lomb announced the nationwide introduction of OptimaTM Colors, the company's first disposable contact lens that allows patients to affordably enhance the color of their eyes.

Optima Colors are enhancing tint contact lenses that can be worn for corrective vision or as a fashion accessory. The lenses are packaged for use in planned replacement and disposable systems.

Unlike other tinted contact lenses, Optima Colors are available in two-packs and multipacks that eye care practitioners can customize for their patients. This unique packaging system gives eye care practitioners an unmatched range of dispensing options.

Bausch & Lomb is offering Optima Colors lenses through eye care practitioners nationwide. "We're pleased to offer a product that gives practitioners so many dispensing options and provides patients with an affordable way to enhance their eye color," said Patrick D. King, Bausch & Lomb marketing director, contact lens division. "Optima Colors will generate excitement among patients and give practitioners opportunities to not only increase patient satisfaction, but also to generate incremental income for their practices."

Polymer's Diedrich Named CLSA Fellow

Polymer Technology, the leading manufacturer of rigid gas permeable (RGP) contact lenses and solutions, is pleased to announce that Paul Diedrich was named a Fellow of The Contact Lens Society of America (CLSA) at the 40th annual meeting held in New Orleans, Louisiana.

Diedrich, a professional relations consultant at Polymer Technology, joins three other Polymer Technology fellows: Alex Cannella, national practitioner relations manager; Jane Beeman, professional services manager; and Ken Kopp, a professional relations manager. According to the CLSA, Polymer Technology has the highest number of Fellows of all the member companies.

"We are proud of Paul and his accomplishment," said Bob Thompson, Polymer Technology president. "Paul's extensive knowledge in contact lens fitting and his understanding of business and industry issues has made him a vital member of Polymer Technology's RGP fitting program for practitioners."

Diedrich is a certified National Contact Lens Examiner contact lens fitter. He joined Polymer Technology in 1994 as a professional relations consultant.

Paragon Vision Sciences Remembers Inventor of FluoroPerm

Dr. William James Burke, known throughout the contact lens industry for his part in the invention of FluoroPerm contact lens material, died recently at the age of 82. Of the many polymers created during Burke's research, he was proudest of FluoroPerm because it had a direct effect on the betterment of life through chemistry — a lifetime research philosophy Dr. Burke carried from his early career at DuPont.

Dr. Burke began his patent history in the early 1930's during his employment with DuPont. After leaving DuPont in 1946 Dr. Burke taught at Ohio University and The University of Utah before coming to Arizona State University in 1962 as executive vice president and professor of chemistry. During his employment at ASU, Dr. Burke was appointed the first vice president of research and the founding dean of the graduate college. Dr. Burke retired from ASU after 14 years of service in 1983. Ten years later in the summer of 1993 Dr. Burke attended the launch of the space shuttle Endeavor that carried the first zero-gravity experiments on two forms of his extended wear contact lens material polymer.

"Bill Burke brought a keen scientific mind to Paragon Vision Sciences," said Krist Jani, vice president of marketing and sales for Paragon Vision Sciences. "He was an intelligent man and one who was able to skillfully translate his knowledge into a working product. Bill was a man of impeccable integrity; his experience and contributions at Paragon will be greatly missed," concluded Jani. □

Preparation of Basic and Clinical Sciences Faculty

Anthony J. Adams, O.D., Ph.D.

Introduction

It is an understatement to say that optometry in the 1990s bears little resemblance, in terms of its responsibility to the public, to that of the 1950s. The strength of optometry is owed both to legislative efforts, in more recent decades, and to the solid research underpinnings of the profession in optics, binocular vision, low vision, contact lenses and environmental vision.

The decades of the 1970s, with increased responsibilities for diagnosis of disease, and of the 1980s and early 1990s, with an emphasis on the therapeutic management of eye disease utilizing pharmaceuticals, now position optometry as a primary care practitioner–the primary eye care practitioner.

With the first Georgetown Conference early in 1992, optometry began an articulation of its current and future responsibilities and the challenges in planning that would be required to advance it into the 21st century. The impact of the primary care role of an optometrist on education, research and clinical training immediately takes center stage.

Dr. Adams is dean of the University of California, Berkeley, School of Optometry. This paper is based on a talk he delivered at the ASCO/AOA Summit on Optometric Education, Conference on Graduate Education, Residencies and Fellowships.

What Will the Practicing Optometrist Be Doing at the End of the 1990s?

We can reasonably expect that 85% of the patients seen by optometrists will be seen entirely by generalists (now called primary care); an additional 5-10% can be expected to require specialty, non-primary care treatment within optometry. The remainder of the patients — upwards of 3-5% — can be expected to require surgical or tertiary eye care. While one may argue with the actual percentages and predictions, and certainly there must be data that would provide a more refined number, it is important to comprehend how patient needs will develop over the next ten years.

The growth of our profession depends in large part on the addition of a productive *faculty* to conduct biology-based teaching & research in optometry, including basic and clinical science with applied biology. Optometry must recognize the challenges involved in developing a strong faculty in biology. Chief among these is the enormous investment in resources that educational institutions must make in order to attract top faculty. We must rethink our commitment to supporting training in these areas. And we will need to concede at the outset that not all schools will be able to do this.

Schools and colleges of optometry now appear to be moving toward a training model that defies traditional boundaries of specialty clinics which have had the major function of providing organized training experience for our four-year curriculum students. Now specialty clinics must focus on training programs for residencies with a different approach than that used in the training for the student in the four-year program. There are also important implications for the development of a training program that encourages intraprofessional referrals - a culture foreign to optometry. How do we nurture those concepts within our teaching programs and how do we train faculty to adopt a new culture?

Who Are Our Current Faculty — What Training Do They Have?

Optometry faculty traditionally came through training in vision sciences — particularly faculty who are in institutions demanding research accomplishment. Other faculty came from basic sciences training in non vision science (few) areas and from clinical practice (typically solo or small group practice).

With the advent of residency training programs almost 20 years ago in 1974 (Kansas City VA) there has been, at first very slow and now quite accelerated, a growing section of our Optometry faculty with both OD and residency training- today 15% of our FTE.

Grosvenor's 1992 survey of 16/19 schools indicates that of the approximately 600 (588)FTE faculty in the US and Canada, 500 (495) (84%) have OD degrees, i.e., less than 20% (16%) have not received the OD or equivalent training.[1]

Of those 500 with OD degrees,

40% (206/495=42%) have *only* the OD degree; and almost

20% (88/495=18%) have the additional residency training only;

40% (201/495= 41%) of our OD faculty have either an MS or Ph.D. degree.

Who Will Be Our Faculty in 2002?

Obviously there is now a significant percentage of our faculty who have been residency-trained (15%), and the predictions from Grosvenor's same survey suggest that the percentage of these OD faculty will increase (111/247= 45% from 18%) in the next 10 years. The survey suggested that the demand for OD-only faculty will decrease by a factor of four but that the demand for OD/Ph.D.-MS will be sustained or slightly reduced while the demand for non-OD research-trained faculty will increase slightly.

It is difficult to know what assumptions for long range plans are used by the chief executive officers who completed these surveys. It is, however, worth taking a methodical look at the assumptions we *could* make about our needs for optometric faculty and see if we are really well positioned for the changes in the scope and delivery of care that have been set in motion by optometry-initiated legislative changes as well as by the impending changes in health care delivery.

Predictions Consistent With Assumptions Made Since the Georgetown Conference

Let me make some explicit assumptions — ones we have made for new curriculum and for our clinical patient care training programs at UCB, headed by Dr. Ken Polse. Many of the assumptions are consistent with the proceedings of the Georgetown Conference (March 1992), the subsequent conferences on Scope of Practice of Optometry in St. Louis (May 1992), the Curriculum Conference in Denver (August 1992) and the Conference on Optometric Research in Birmingham (April 1993).

- Licensed optometry will be at *entry level and for primary care.*
- Primary care, entry level optometry will be licensed based on a *four-year* professional curriculum.
- Our *specialty clinics will be the home of college/school-based residency training.*
- *Primary care training will involve training within specialty clinics, but without individual direct patient care responsibility.* Specialty training programs, and their clinic chiefs, must formulate the training programs both in the primary care clinics and within their specialty clinics. How will we adapt to teaching primary care elements of low vision, contact lenses, binocular vision, infant vision, etc. in the primary care clinics?
- *Direct patient care within specialty clinics will be the domain of clinical faculty and residents.* This most certainly leads to a reconsideration of our existing school-based residency programs and careful planning in training of faculty. For example, have we adequately planned for the development of true specialty areas in traditional optometric practice (binocular vision, pediatric optometry, low vision, contact lenses, and environmental/occupational vision)? Are these specialty clinics truly specialty or are they still providing primary care? Are our faculty suited to teach true optometric specialty and receive referrals from optometrists for non-primary care? Are they appropriately trained to teach residents in their clinic?
- Our school-based residency training programs must be able to meet the needs of specialty practice; *graduating residents should have an expectation that they can sustain a clinical practice in that specialty.*

This raises the question of whether different kinds of residency programs will emerge — one for specialty practice and another for additional training for primary care practitioners for special populations or for experience in a particular setting of practice, e.g., hospital or co-managed based practice. Primary care residencies will almost certainly lead to a five-year optometry curriculum before licensure, since a two-tiered optometrist will emerge in primary care if we maintain primary care residencies.

If we want a five-year curriculum, then we shouldn't *back* into it! In our haste to seek primary care residency money, we may inadvertently bring about a five-year curriculum. With tongue only slightly in cheek, I suggest we consider the possibility of designing our curriculum for truly primary care and declare the fourth year of the curriculum as the mandatory primary care residency year. Current residencies could then be declared as fellowships or postdoctoral clinical training programs!!

- *Specialty clinics in optometry must be the home of secondary/tertiary care and will depend on optometric referrals.*
- *Optometrists will need to be trained to understand the importance of intraprofessional referrals,* and they must begin to understand that during their four-year primary care training.
- *Extramural training experiences must enhance and complete the primary care training program* both for patient encounter purposes and as a component of understanding important modes of optometric health care delivery that are difficult or impossible to provide in the college clinics (hospital-based optometry, HMO's and co-managed care environments, and in community health clinics).
- *Clinical research must continue to form the foundation of advances in optometry and clinical practice* — both to maintain optometry as an independent profession and to survive in an increasingly sophisticated and demanding third party payer (government and industry). See for example the 1991 formation of AHCPR and their clinical guidelines. Does it really work? Is the treatment better than the "no treatment" or the less expensive treatment? Are the patients any better off in their lives? (outcomes assessment and quality of life issues). Optometrists, and therefore our faculty who teach them, must be trained to understand these issues and their relationship to ethical issues.

What Are the Implications of This Model and Set of Assumptions for Education and the Development of Faculty to Deliver This Education?

- We must immediately make decisions about what *primary care and non-primary care* training should include.

The debate can go on — and should— but initial decisions cannot be delayed within an institution so that a rational curriculum and methods of teaching can proceed. How much exposure to patients in specialty clinics should our four-year primary care trainees experience? At what level of involvement in the examination, and with what guidelines for referral, including within optometry referral, should there be when they encounter these patients in practice?

- We must develop faculty who can *approach teaching from the case report* approach (problem-based learning) and who can integrate basic and clinical sciences into their teaching.
- We must *develop faculty who can provide the research programs that sustain optometry as an independent profession* as well as provide the basis for appropriate diagnosis and treatment decisions (clinical research).
- We must develop *faculty who understand the emerging forms of practice* and the need for team approaches to health care delivery.
- We must more carefully define our agenda for what areas will be included in non-primary care optometric practice and hence *plan our needs in specialty clinics.*
- We must immediately engage our optometric colleagues in a referral mentality and *change the "non-referral within optometry" culture.* This is needed to strengthen our specialty clinics as MAYO clinic referral centers for our colleagues.
- We must *reexamine what constitutes a specialty clinic* and do an about turn on the kinds of patients we refer to those clinics (so only *non-primary* care patients attend those clinics). This will be traumatic for our clinic chiefs and staff who have been in a very different environment for many years, e.g., contact lens clinics are mostly primary care patients now. We may have to acknowledge the existence and continued need for *two* kinds of residencies, each with a different purpose and curriculum. We now use residencies primarily for extended clinical training in contrast to specialty training for most of our external residencies.
- We will need to *develop faculty who have a reputation for advanced and highly regarded specialty skills, to attract referrals* and to see those patients with the resident.
- We will need to *find ways to engage all of our faculty in some aspect of clinical research that places them at the frontier of clinical knowledge* and, in some institutions, allows them to make career advances at that institution.
- We will need to *provide new clinical and research exposures for our current faculty,* e.g., faculty exchange, VA or HMO rotations, clinic research workshops and collaborative inter-institutional research projects, primary care workshops for faculty who have become specialized, and workshops for basic science faculty who support the clinical teaching program.

How Does This Profile of Faculty Needs Translate into Graduate Training, Residencies and Fellowships?

Graduate training

Research is essential for independent and vital optometry. It is not a luxury for the profession. Our faculty who contribute to the research vitality of optometry have typically been trained in physiological optics and vision science graduate programs with strong optics, psychology, physiology and perception bases of vision and eye research; until recently we have attracted OD's to this traditional research agenda of optometry. And there is every reason to continue to foster this avenue of research — the need remains.

With the expanded scope of optometric practice in the biologically based sciences, we must expand the research base in this area. This brings with it great challenges including providing the considerably higher costs associated with carrying out this research. We must consider joint Ph.D. programs, bringing well-trained scientists in biology to the optometric research agenda. We at UCB have considered joint programs, i.e., collaborative research with campus researchers in other departments (optometry doesn't always have to house the research to advance the optometric research agenda!).

Our vision science training programs, with adaptations, can, therefore, continue to be involved in developing biologically-trained faculty. We face a real challenge-highlighted by both Haffner[2] and Grosvenor[1] in recent publications — that we are attracting fewer OD's to research training and that a very small percentage — about 20% — of non-OD's trained in vision sciences become optometry faculty.

Our graduate research training programs need to develop the faculty and resources that allow clinical research training, including clinical trials, collaborative patient-based research and a full range of research activities focused on patient care diagnosis and treatment problems.

Residencies

Optometrists with residency training have been attractive candidates for faculty positions and indeed they represent the fastest growing component of our faculty.

In the next five to six years their percentage of the faculty will continue to grow, but I believe we will quickly see that a residency alone will be insufficient to be competitive for a faculty position.

A phase, perhaps three to five years long, can be expected where an OD with both a residency training and a Masters degree training in research will then be a sufficient credential to find faculty positions in optometry.

However, I believe that we will finally be looking for faculty whose research training allows them to conduct independent and significant investigative research, whether that be with Masters level training or as PhD's with postdoctoral training. We must recognize the importance of post-Ph.D. training for our faculty members who plan to be at the cutting edge of research in their area of interest.

Summary

The expanded scope of practice, and a decision to move optometry to a primary care curriculum with residencies reserved for specialty training, lead to a logical change in our educational process.

Specialty clinics should logically serve as the training grounds for residents; primary care training within them is important but must be reexamined. Residencies in these clinics must follow a logical plan based upon optometry's expectations for its scope of secondary/tertiary care practices. These practices should be based on the realities of patient populations and the prevalence of conditions requiring diagnosis and treatment at the non-primary care level.

Faculty training will need to be strongly grounded in the biological and optical sciences.

Faculty will also need a firm understanding of the variety of practice situations that optometrists will be encountering. Within five years, residency training is likely to account for the activities of more that 50% of our graduates. Hence residency training alone will no longer be sufficient to provide faculty employment. This will lead to combining residency experiences with research training programs.

Basic science faculty will continue to be in demand, both in the traditional visual and optical sciences, as well as in more biology-based areas related to ocular and systemic disease. Training programs for the latter will need to begin immediately. The profession must acknowledge the greater magnitude of the resources and support necessary with this new emphasis.

Clinical faculty will constantly face the dilemma of combining on-going clinical practice experience with didactic and patient care responsibilities. The specialty clinics offer opportunities for the development of a faculty member whose talents and skills are nourished by a strong patient referral system.

A new generation of clinical scholar must emerge. Collaborative clinical, patient-based, research will form a strong basis for this new enterprise. Interdisciplinary research efforts involving epidemiologists, biologists, optical and psycho-physical scientists and others, must join the team of clinical researchers and scholars in optometry.

Sabbaticals and planned faculty development leaves must be part of all programs if we are to bring our current faculty to the new enterprise. □

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The Optometric Scientist Program at Boston University

Thomas F. Freddo, O.D., Ph.D.

Introduction

Although much of the recent focus of interest in the optometric community has been on "clinical research," this discussion focuses on the clinician-basic scientist. More specifically, this discussion pertains to clinician-basic scientists in the area of disease management-basic biomedical sciences, the newest and thus most underrepresented at our institutions.

The purpose of this discussion is to review the struggles of other health professions to train and sustain clinician-scientists in this area and to describe a new graduate program designed to address this underrepresentation.

Dr. Freddo is associate professor of ophthalmology, pathology and anatomy at the Boston University School of Medicine and associate professor at the New England College of Optometry. This paper is based on a talk he delivered at the ASCO/AOA Summit on Optometric Education, Conference on Graduate Education, Residencies and Fellowships.

The Challenge of Training and Sustaining Clinician-Scientists

As the practice of optometry has evolved, the inclusion of therapeutics has placed new and fundamentally different demands on optometric institutions. Based upon the changes that have been made in the ASCO curriculum model and in the national board examinations, the various disciplines within the basic biomedical sciences are beginning to take a dominant position in the optometric curriculum. Areas of basic biomedical sciences that previously needed only cursory discussion must now be taught in detail by faculty with new and different areas of expertise.

While optometry could hire Ph.D.'s in these disciplines to provide the requisite coursework, it would be nearly impossible for individuals without optometric backgrounds (or without a few years spent at an optometric institution) to know where emphasis must be placed. Without such insight, the amount of material that will be added to new courses in these areas will likely be more than is necessary, thus adding weight to an already overloaded curriculum. Possibly worse, by not training optometrists to fill at least some of these faculty positions, it will not be possible to make the requisite clinical linkages through pathobiology that are so essential when teaching basic sciences to future clinicians. Finally, for optometry to become a credible authority on management of eye disease, we must develop a cadre of optometrists who are competitive for federal funding in eye disease research and who can speak with authority on such issues for the profession.

Medicine has recently begun to feel the effect of losing the cadre of such individuals that they once had. Dr. Irwin Arias, writing in *The New England Journal of Medicine*,[1] concluded that the jobs of clinician, teacher and researcher have each become positions that require nearly a full-time commitment in order to remain competitive. He also appropriately notes that the explosion of new information in the biomedical sciences has largely precluded most academic physicians from keeping abreast of developments in basic sciences. Thus, if basic scientists are not sufficiently conversant in the clinical aspects of their work, then the most important link in the chain is lost — the bridge between basic science and its application to human disease. Dr. Arias' conclusion is that most graduate programs, whether designed for clinicians or graduate students, lack sufficient training in *pathobiology*.

Within ophthalmology, the question of whether the clinician-scientist can remain viable has also been raised. Dr. David Epstein, writing in *The Archives of Ophthalmology*, stated, "Although lip-service is still given to the need for clinician-scientists, and although there are various moanings and grumblings about the need for developing programs to sustain such individuals, the truth is that, to a greater or lesser extent, many departments have turned away from supporting such physicians, especially those involved in laboratory investigation."[2]

Epstein also notes that "one of the saddest consequences of the crisis in academic ophthalmology, as I see it, is the movement away from disease-related research. Although as ophthalmologists we are interested in 'how we see' and therefore support fundamental vision research and neuroscience, it is a basic mission for ophthalmology departments to try to cure eye diseases. *For this, the ophthalmic clinician-investigator is essential.* Simply giving research money to basic scientists will not achieve this goal."[2]

With recent changes in optometric scope of practice, one can easily and appropriately substitute the word optometrist in Epstein's editorial. Optometrists have been granted formidable authority in the area of disease management, including authority to prescribe a wide range of systemic medications, both oral and injected. With this new authority has come the stipulation that the optometrist be held to the same standard of practice as the physician in these areas. At the same time, the profession has inherited the same responsibilities outlined by Epstein regarding the search to cure eye disease. We are thus presented with the same dilemma regarding the training and sustaining of individuals to accomplish the critical task of linking research progress to clinical practice.

Even if we assume that the series of summit conferences espousing the need for clinician scientists in optometry went beyond the mere "lip-service" that Epstein sees within departments of ophthalmology, a number of challenging questions need to be addressed:

From Where are the Optometrists with Clinically-linked Advanced Graduate Training in the Basic Biomedical Sciences Going to Come?

Our optometric institutions have done an excellent job of providing well-trained faculty in the traditional areas of physiological optics and vision science through their graduate programs. These programs were made possible because there were concentrations of vision science faculty at various institutions who together formed a strong base for their graduate programs. The basic biomedical sciences, however, present an especially difficult problem in optometry because most optometric institutions currently have at most one faculty member in each of the individual biomedical disciplines, e.g., anatomy, microbiology, pathology, physiology, pharmacology, and none approach the concentrations of faculty in each discipline that are necessary to provide the same quality of graduate training that is currently being provided in traditional areas. This may explain why no such program has been developed within our institutions despite the growing need for such individuals.

Where Can Optometrists Go to Obtain This Graduate Training?

Several prominent optometric educators have concluded that, at least in the short term, these optometrists will have to be trained outside our own institutions, as a limited number have been in the past. Most likely, these individuals will train at a large academic medical center. But until recently, optometrists who wanted to pursue this pathway had to do so on their or her own. This often meant arriving at a medical center that was unfamiliar with optometrists, knew nothing about their backgrounds or their specific academic needs and rarely accorded optometric training any respect, let alone the entry with advanced standing that was given to M.D.'s pursuing graduate studies in the same areas.

The Boston University Optometric Scientist Program

Attempting to address all of these issues, a new O.D.-Ph.D. program has been developed at Boston University in conjunction with both the Illinois and Pennsylvania Colleges of Optometry. In addition, a Ph.D. program specifically designed to meet the needs of the optometrist has been developed which is available to any qualified optometric graduate.

There are a large number of National Eye Institute-funded biomedical science faculty among the graduate school faculty at Boston University; there are more than 20 such individuals, in an array of basic disciplines, who devote much or all of their time to biomedical eye and vision research. Most of these individuals are investigators on National Eye Institute grants. The balance fund their eye and vision research from other sources, including other NIH institutes, industry and private sources.

Drawing from the strength of this multidisciplinary faculty within a single graduate school, a training program centered in ocular and visual cell biology has been developed which includes supplemental components especially designed to foster the development of an optometric clinician who is well-versed in pathobiology and who is comfortable bridging the gap between the basic and clinical sciences.

The program is, at its core, an excellent graduate program with rigorous course requirements, a qualifying examination and original research culminating in a dissertation in one of several biomedical science disciplines. Included in the program is a special, clinical course which provides a broad exposure to clinically relevant material in eye care; it is also the principal didactic component of the ophthalmology residency program at Boston University. The course spans two years and covers each subspecialty within eye care, e.g., cornea and external disease, retina, glaucoma, optics and refraction, uveitis, cataract, neuro-ophthalmology, plastics, strabismus and amblyopia, tumors and pathology.

Another important outcome for optometrists is an increased understanding of the role they can play in epidemiologic and clinical research. Both of these disciplines have been traditional areas of strength at Boston University, as exemplified by the renowned Framingham Eye Study which was conducted by Boston University and which was recognized for excellence by the Vision Care Section of the American Public Health Association. Drawing upon this additional strength, a course combining epidemiology, experimental design, clinical trials and biostatistics has been incorporated into the core curriculum of the training program. It is based upon a successful course that was initially developed by Boston University faculty for presentation annually in conjunction with the ARVO meeting in Florida.

Finally, each optometrist who enters the program, regardless of the faculty member with whom he or she chooses to train, is provided a substantial background in clinico-pathological correlates, ocular histopathology and pathobiology, through participation in grand rounds and by working one-on-one with the director of the Eye Pathology Service at the Boston University Medical Center.

Depending upon the department and the major advisor chosen, individual trainees could be qualified in any of the following disciplines upon completion of their training: anatomy, biochemistry, cell biology, molecular biology, neuroscience, pathology or physiology.

The Combined Degree Program

In situations where individuals are sufficiently committed to an academic career early in their optometric training, a combined degree program is available, through two optometric institutions. In these cases, the clinical training component and its terminal degree (the Doctor of Optometry degree) are conferred by the participating college of optometry, while the graduate component and its terminal degree (the Ph.D. in a basic medical science) are conferred by Boston University.

Candidates are admitted separately into the optometric and graduate training institutions on a competitive basis. If accepted into both degree programs, the candidate first completes three of the four years of optometric training. To ensure integration of the degree programs, during part or all of the first two summers of optometry school, the trainees begins their graduate experience at Boston University, completing required laboratory rotations and some coursework. At the end of the third clinical year, the students move to Boston, committing the next three years principally to graduate training and completion of the doctoral dissertation. The trainees then return to the parent institution for additional intensive clinical experiences to maintain clinical skills during the graduate training period. Finally, upon successful completion of the Ph.D. degree requirements, the trainees return to complete their fourth year of clinical training. Both degrees are obtained after approximately seven years and include the supplemental curriculum previously outlined.

No program can, by itself, meet the need for optometric scientists in the area of disease management-basic biomedical sciences. But this pressing need will also not be adequately met through the current method of sporadic and non-programmatic placement of optometrists at scattered academic medical centers. Without at least one program in this area designed for optometrists, many young graduates will continue to give up on graduate school in favor of residency training.

The program at Boston University is still in its infancy. It graduated its first trainee in 1994. Its long-term viability will depend upon whether the optometric profession is prepared to offer support beyond the "lip-service" that Epstein sees among our ophthalmological counterparts. □

Graduate Education Programs at The Ohio State University College of Optometry

Richard M. Hill, O.D., Ph.D.

Postclinical degree scientific training has been a source of significant giants in our field, e.g., Charles Sheard, Meredith Morgan, Glenn Fry, and Henry Hofstetter. Such contributions have formed the core of the basic and applied dimensions of our relatively young profession. I believe this pattern of contribution will continue well into the future.

Where new and greater emphasis may now be merited is in how research-oriented degree education might more closely resonate with our professional programs. Since the 1960s, Ohio State has been experimenting and developing two advanced degree models which depart in significant ways from traditional formats. These are the combined professional (O.D.) and research degree (M.S. or Ph.D.) programs and combined residency and research degree (M.S.) programs.

Combined Professional and Research Degree Programs

For the last three decades a combined degree opportunity has been offered to the top ten percentile of our professional (pre-O.D.) student body. Our program parallels those in medicine, dentistry, veterinary medicine, and law, and is based on a cooperative arrangement between the graduate school dean and the dean of each of the graduate-professional programs.

The advantages of these O.D.-M.S. and O.D.-Ph.D. combination programs range from: (1) providing the additional customized challenge that an outstanding student often needs; (2) allowing a student to explore and be a part of the leading edge of a specialty practice area; and (3) the opportunity to publish.

While very demanding — one or more summer terms are required, an additional credit load is carried on the student's regular term schedules, and every regular requirement of the graduate school for those advanced degrees, including a comprehensive examination and thesis "defense" must be met — it has remained a consistently productive program for generating combined professional and research degree graduates at Ohio State.

Combined Residency and Research Degree Programs

Another variation which Ohio State has found to be successful is a two-year post-O.D. format in which a half-time patient care residency program, and a half-time master of science (thesis) degree program progress in parallel. While originally focused on contact lens studies (physiology, tear chemistry, corneal topography), our College now offers a total of four such tracks, the others being in the areas of family practice, pediatrics, orthoptics and vision rehabilitation.

Among the objectives of these combined residency-research degree programs are the training of future clinic chiefs, industry scientists and research practitioners in private practice, e.g., able to participate in FDA trials. The nearly 20 graduates to date are highly successful examples, each functioning in one or more of those roles, in education and practice settings across the country.

Summary

The challenge before us as a profession moving into a decade of exceptional growth, both in scope of practice, and in better ways to serve each patient's needs, is to rethink the formats and the applications of advanced and research degree education in order to better meet our expanding requirements. The programs described here are just two of many successful models we should be exploring and developing for the years of opportunity just ahead. □

Dr. Hill is dean of The Ohio State University, College of Optometry. This paper is based on a talk he delivered at the ASCO/AOA Summit on Optometric Education, Conference on Graduate Education, Residencies and Fellowships.

Requirements for Hepatitis B Vaccinations Among Optometry Students

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Cheryl A. Engels, O.D.
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Abstract

Over 240,000 new cases of the Hepatitis B virus (HBV) are reported yearly. HBV has been isolated in tears as well as blood. A literature review was conducted to investigate the transmission and risk factors of HBV. A telephone survey was conducted of the 19 North American schools and colleges of optometry to determine HBV vaccination requirements. Results showed that 31.6% (6/19) of the schools mandate the vaccination for students. The vaccine as a safe preventative measure has been available for over ten years but is underused. As optometry expands its scope of practice, there is a greater risk of exposure to the virus. Schools and colleges of optometry should require HBV vaccination of all students in their program.

Key Words: Center for Disease Control and Prevention (CDC), Bloodborne pathogens, Hepatitis B Virus (HBV), health care workers, serous products, optometry, health care education.

Introduction

As the profession of optometry expands its scope of practice, there is a greater potential for practitioners to become exposed to infectious disease. New procedures are being incorporated into the profession of optometry. With these procedures there is a greater propensity for optometrists to come in contact with blood and other potentially infectious body fluids.

The goal of this paper is to increase the awareness that optometry students can be at a substantial risk for transmitting/contracting HBV during optometric examination procedures. As the scope of optometry expands, so does the need for mandatory vaccinations among entry level optometry students. Schools and colleges of optometry should require Hepatitis B vaccinations upon entry into the program.

Viral Hepatitis

Viral Hepatitis is an infection of the liver caused by one of four groups consisting of Hepatitis A, non-A non-B, Delta, and Hepatitis B (HBV). Hepatitis A, the most common form, is also known as Infectious Hepatitis. Transmission of Hepatitis A is by the fecal-oral route and is most commonly contracted in areas of poor sanitation, nursery schools, and institutions for the developmentally disabled.[1] The incubation period ranges from 15 to 50 days, with an average of 28 days[2] Non-A non-B is most commonly transmitted during blood transfusions.[3] Although this is a milder type than HBV, it may still develop into chronic illness.[4] The delta virus can only survive in coexistence with Hepatitis B.5 This can manifest itself in a Hepatitis B Virus (HBV) carrier or in an acute HBV infection.[5] HBV is most prevalent in the health care setting and represents the greatest risk for health care workers. This paper will focus on transmission and prevention of HBV in the optometric setting.

Currently, it is estimated by the Centers for Disease Control and Prevention (CDC) that one million people in the U.S. are carriers of HBV.[5,6] Worldwide, this number increases to 200 million.[7] As of September 1993, the CDC reported that more than 240,000 people contract Hepatitis B annually in the U.S.[6]

HBV, formally known as serologic hepatitis, has been isolated in low concentrations in feces and breast milk with moderate concentrations being found in semen, vaginal fluid and saliva.[8] The highest concentrations have been linked to blood and serous products.[8] Although research has also shown the HBV antigen to be present in tears, there is no evidence to date of transmission by this mode.[4]

The incubation period of HBV varies from 40 to 160 days with an average of 120 days. The symptoms associated with HBV consist of jaundice of the skin and eyes, loss of appetite, stomach pain, nausea, vomiting, fatigue, fever, and arthralgia.[6] Fifty percent of individuals infected with HBV each year are asymptomatic with the remaining fifty percent expressing symptoms.[8] Although most of these will produce antibodies

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and recover, 5 to 10% of the total cases will progress to a carrier state.[4,6,8] Approximately 0.05% of the symptomatic cases will result in death without ever progressing to the carrier state.[8] Carriers are those individuals who failed to produce adequate antibodies in the presence of HBV in the liver. Most of the chronic carriers remain healthy due to the host defense mechanism.[4] However, a small percentage progress to serious liver damage. The chronic carrier group consists of mostly young black males.[4] As of September 1993, the CDC estimates that "Each year, approximately 5,000 persons in the United States die of cirrhosis of the liver related to Hepatitis B, and another 1,500 die of liver cancer related to Hepatitis B. Worldwide, Hepatitis B is the most common cause of liver cancer."[6]

HBV is transmitted by sexual contact, perinatal transmission, parenteral drug abuse, and blood transfusions. Those at high risk for contracting HBV include health care workers, individuals with multiple sex partners and drug abusers. The more a health care worker is involved with percutaneous and permucosal exposure to blood or blood products, the greater the chance of being infected with the virus. The Immunization Practices Advisory Committee (ACIP) recommends that "If those tasks involve contact with blood or blood-contaminated body fluids, such workers should be vaccinated."[2] People who work with institutionalized patients should also be vaccinated because of their contact with weeping skin lesions and the possibility of being bitten.

The next group at high risk are those individuals who have multiple sexual partners. The risk is greatest for individuals between the ages of 15 and 29. Sixty-three percent of the infected individuals fall in this age category.[9] The age group of 30 to 44 years accounts for 26%, followed by 45 years and up at 11%.[9]

Other groups that pose a risk for acquiring and transmitting HBV include immigrants and drug abusers. The ACIP suggests that immigrants from highly endemic areas, such as eastern Asia and Africa, should be screened and vaccinated for HBV upon entry into the U.S. because HBV is also high among this group. Parenteral drug users pose a higher risk than non-drug users, and these individuals should be vaccinated as early as possible after their drug abuse begins.

TABLE 1
Telephone survey

1. Currently, do you require Hepatitis B vaccination upon entry into the first year of optometry school?
2. Do you require it of your second, third, or fourth year students?
3. Who covers the cost of the vaccination series?
4. What year do your students first provide patient care?

Hepatitis B Vaccine

The first vaccine for Hepatitis B was licensed in 1982.[8,10,11] This vaccine was a plasma-derived vaccine developed from the plasma of chronically infected people. It is no longer available in the U.S.[5] This original vaccine was known as Heptavax and was marketed by Merck, Sharp and Dohme.[7]

Today, there are only two vaccines approved for use in the U.S.: Recombivax by Merck, Sharp and Dohme and Engerix-B by Smith, Kline, Beecham Pharmaceuticals.[7] These two currently licensed vaccines were made available in the late 1980's.[11] They are recombinant vaccines produced by using the Hepatitis B antigen synthesized by Saccharomyces cerevisiae (common bakers yeast) into which a plasmid containing the gene for the antigen has been inserted.[5] Thimerosal is used as a preservative.[5]

The recombinant vaccine is given in a three-dose series intramuscularly, with the second dose given one month and the third dose given 6 months after the initial vaccination. There are no data to indicate that a booster shot is needed within ten years of the initial vaccination. "Cohort and population-based studies indicate that persons immunized against HBV retain a protective immune response for up to ten years, even if they have lost detectable antibodies."[10] The importance of Hepatitis B testing of pregnant women has been stressed for a number of years. The CDC reports that "there is no apparent risk of adverse effects to developing fetuses when Hepatitis B vaccine is administered to pregnant women."[5] One documented side effect of the recombinant vaccine is pain at the injection site. This is reported in 3 to 29% of vaccine recipients.[5] Another infrequent side effect is a rise in body temperature to greater than 37.7° C in 1 to 6% of patients.[5]

Recent studies indicate that there is a four-fold increase in risk that a health care worker will contract HBV compared to the general adult population.[2] According to the ACIP, "Risks among health care professionals ... are often highest during the professional training period. For this reason, when possible, vaccination should be completed during training in schools of medicine, dentistry, nursing, laboratory technology, and other allied health professions before workers have their first contact with blood."[2]

Methods

A literature review was conducted to gain knowledge of the transmission and risk factors associated with Hepatitis B as they relate to the profession of optometry. The admission offices of the 19 schools and colleges of optometry in the United States and Canada were surveyed by telephone. The survey includes questions concerning preadmission requirements for Hepatitis B vaccinations.

Results

Table 1 shows the four telephone survey questions that were asked of the admissions offices of the schools. Of the 19 schools and colleges of optometry that were surveyed, 8 are in states that have therapeutic pharmaceutical legislation as of September 1, 1993. When asked about HBV vaccination requirements for entering optometry students, 6 of 19 (31.6%) stated that it is currently mandatory. These schools are listed in Table 2. The Illinois College of Optometry and Nova Southeastern University, Health Professions Division report they have opted to cover the cost of vaccinating their students. Two of the eight schools located in states that legislate therapeutic pharmaceutical use by optometrists report they currently require the Hepatitis B vaccination.

Discussion

The percentage of optometry schools that require a Hepatitis B vaccination for students (6 out of 19 or 31.6%) is not adequate to meet the demands placed upon the profession of optometry today. Forty-one states legislate therapeutic pharmaceutical privileges. The procedures involved in a primary care optometric examination are becoming more advanced.

For example, patients with ocular trauma may initially be examined by their optometrist. If a patient presents with a laceration to the globe and lid with profuse bleeding due to a glass bottle, it is the standard of care to clean the eye, perform a Seidel test to determine globe perforation, shield the eye and refer for further care. This type of procedure exposes the practitioner to blood and serous products, the most common vehicles for transmission of HBV. An additional example of a procedure that may involve contact with blood and tears is removal of a deeply embedded conjunctival foreign body. Practitioners

TABLE 2:
HEPATITIS B VACCINATION REQUIREMENTS OF OPTOMETRY STUDENTS

Institution	TPA Legislation	First Patient Contact (which training year)	Mandatory Hepatitis B Vaccination (which) training year)	Cost Coverage
University of Alabama at Birmingham (School of Optometry)	No	2nd	Yes - 1st	Student
University of California, Berkeley School of Optometry	No	No		
Ferris State University College of Optometry	No	2nd	No	
University of Houston College of Optometry	Yes	2nd	Yes - 1st	Student
Illinois College of Optometry	No	2nd	Yes - 1st	College
Indiana University School of Optometry	Yes	Between 2nd & 3rd	No*	
InterAmerican University of Puerto Rico School of Optometry	N/A	3rd	Yes - starting in the upcoming year	Student
University of Missouri - St. Louis	Yes	3rd	No	
University of Montreal School of Optometry	N/A	No		
New England College of Optometry	No	2nd	No	
State University of New York College of Optometry	No	2nd	No	
Northeastern State University College of Optometry	Yes	2nd	No***	
The Ohio State University College of Optometry	Yes	2nd	No	
Pacific University College of Optometry	Yes	3rd	No	
Pennsylvania College of Optometry	No	2nd	Yes - 1st	Student
Nova Southeastern University Health Professions Division	Yes	1st	Yes - 1st	College
Southern California College of Optometry	No	2nd	No	
Southern College of Optometry	Yes	1st	No**	
University of Waterloo School of Optometry	N/A	3rd	No	

* highly recommended ** option available to students at reduced cost

may also work with incontinent patients or be exposed to vomitus.

As previously noted, the ACIP states that the risk of contraction is highest during the occupational training period. Students at Southern California College of Optometry perform glucometry testing on fellow clinicians during the second year as part of their training in the care and management of diabetes. Also, many students are now learning techniques related to fluorescein angiography, a procedure that involves venapuncture. These procedures present the possibility of coming into contact with infected blood. Although there is no evidence yet of transmission of HBV through tears, the virus is present and has been shown to be viable for up to six months at room temperature.[4]

Commonly used disinfectants in an optometric practice such as isopropyl alcohol and heat are not effective in destroying HBV.[4] Since tonometer tips could theoretically serve as fomites for HBV, students may be at risk when practicing tonometry on classmates. Soft contact lenses disinfected with heat could also be potential fomites. Routine contact with tears may prove to be a vehicle for transmission if the clinician has an open wound on the fingers and is not wearing protective gloves. The American Optometric Association recommends frequent inspection for cuts or abrasions on the hands.[12] Lastly, there are many opportunities to observe ophthalmic procedures that may involve contact with blood and serous products.

There is a risk of transmission of HBV in the optometric setting and therefore, vaccinating health care workers in optometric settings is indicated. There are various options available. The Association of Schools and Colleges of Optometry (ASCO) has discussed three possible alternatives.

The first involves "testing of faculty for 3-5 successive years to identify an incidence rate if one exists."[13] With 240,000 new cases of the HBV infection every year, 3 to 5 years is too long a period to monitor incidence rates. Also, there will be changes in faculty members and changes in faculty responsibilities among the individuals involved in the study during the proposed testing time.

The second option given by ASCO is "a one-time test of all individuals involved in the clinical setting to determine prevalence. These results could be stratified into employee categories and further stratified within these categories by longevity of service/exposure."[13] The problem with this method is in determining when the prevalence is high enough to initiate vaccinations. This method also does not control for other routes of exposure, i.e., sexual contact.

The final option mentioned by ASCO is "a program of immunization for all employees considered to be at risk of exposure. This would, by necessity, be a commitment to an ongoing program of immunization of new students and employees."[13] This is the best option for the schools so that they may protect their students, faculty, staff, and patients.

A research study that was conducted from 1981-88 revealed a 75% decrease in the incidence of HBV infections among health care workers.[9] The decline was due mostly to the introduction of the vaccine to health care workers. Furthermore, the Occupational Safety and Health Administration (OSHA) Bloodborne Pathogens Rule, effective March 6, 1992, "requires employers to insure that any of their employees who may be at risk for exposure to blood and other potentially infectious materials are appropriately protected."[14] Certainly, the best solution to this problem would be universal infant immunization. However, this may take many years to have a significant effect on the number of HBV cases per year. A greater reduction of the number of cases would be evident if retroactive programs were initiated.

When an optometry school decides to initiate a mandatory HBV vaccination program, cost will be a definite consideration. Two of the six schools that currently require the vaccination have chosen to absorb the cost. At the other four schools, the students incur the cost of the vaccine. One of the pharmaceutical companies contacted indicated the cost can be significantly reduced if a school does a group vaccination and provides a doctor to administer the vaccinations.

Summary

It is necessary that schools and colleges of optometry require students to undergo the three-dose HBV vaccination program. This study of the 19 schools and colleges of optometry in the U.S. and Canada has shown that only 6 of 19 (31.6%) currently have this requirement. The cost, a major factor in this issue, is covered by two of the six institutions. Given the knowledge we have today about the Hepatitis B virus and its relationship to optometry, optometry students are at risk of contracting the virus during their training period. No cure is available for Hepatitis B, so prevention is crucial. We advocate Hepatitis B vaccinations for all optometry students. Perhaps this will be the first step towards mandatory HBV vaccinations of all optometrists. □

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Application of Latent Image Technology to the Multiple-Choice Test Format

Paul Abplanalp, Ph.D.,O.D.

Abstract

When multiple-choice answer sheets are printed in the latent image format, students may be required to select alternatives until they identify the correct one. This provides immediate feedback and permits the use of more complicated test formats, but it also introduces novel ways to cheat and may engender substantial anxiety in test-takers unless appropriate counter-measures are taken.

Key Words: *Latent Image Tests, Test Anxiety, Multiple-Choice Format, Self-Scoring Tests*

Introduction

Multiple choice (M-C) items offend many people. They are offensive to students who have to answer them even when they believe (perhaps correctly) that the best answer possible is not among the alternatives listed. They are offensive to faculty who must use the format even when they believe that some other means of evaluation would permit them to sample more complex student behaviors. And they are offensive to administrators who are expected to endorse course grades which were determined largely on the basis of students' responses to M-C items even when they harbor doubts about the reliability and validity of this formata. In spite of these perceptions, as long as a significant proportion of college and professional school classes contain far more students than can be evaluated on an individual basis, M-C items will continue to be a rational and, indeed, a necessary choice as an evaluative instrument.

M-C items have been the subject of numerous criticisms — some of which have more merit than others. Most of these criticisms fall into two categories: (1) there are those who claim that M-C items reveal nothing about students' thought processes, nor even whether they can think at all, and (2) success or failure in answering a battery of M-C items will tell students very little about what they are doing right or wrong. Bannesh Hoffman[1], in a vitriolic[b] little essay whimsically entitled The *Tyranny of Testing*, goes so far as to claim that M-C items actually discriminate against deep (sic) students, although the depth possessed by the students he puts forth as examples seems to be confined to obfuscation and befuddlement.

It is true that many M-C items demand only that students regurgitate memorized facts about rather minor issues, but this is less a reflection of the inherent shortcomings of the item format than it is of the ineptitude of particular item writers.[2] It is nevertheless true that M-C items can be answered with absolutely no thought processes at all no matter how well they are written. Any student can pick answers at random, and some mathematically predictable proportion of these answers will be correct. Certainly, when instructors peruse student answer sheets for an M-C examination, they may gain no insight whatsoever into the thought processes which students have brought to bear upon the various items. Likewise, students may believe that they have applied an impeccable line of reasoning in selecting a particular answer when, in fact, their reasoning may be completely "off the wall" even when it yields the correct answer.

In point of fact, many of the problems with M-C items *are* highly intractable. For example, there is not much one can do to induce faculty members to improve the quality of M-C items which they write if they are fundamentally suspicious of the efficacy of the format in the first place. Students will continue to select answers at random when they have no knowledge of the stem of an item, even when a statistical penalty for guessing is applied. Students who have partial knowledge about the stem of an item may, nevertheless, select the wrong answer from among the alternatives and receive zero credit for the item. Writing and other expository skills can hardly be assessed by a format which does not require or even permit any writing to take place.

Multiple-choice examinations may, indeed, consist exclusively of items which probe the students' minds for the most trivial memorized sorts of information/knowledge, but they need not be so restricted. The format lends itself well to the identification of oddities and analogies; alternatives

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can be written so that instead of consisting of simple one-word responses, they are accompanied by the reasons they are correct or not; in a word, M-C items *can* be written in such a manner that they require students to engage in reasoning processes, not just simple recall.

The utility of the format can also be broadened by the application of modern technology. Interactive programs with computers immediately come to mind, and, are almost as quickly dismissed because the "hardware" is expensive and the "software" cannot easily be produced by the user, in spite of what computer advertisements claim. A less elaborate, but vastly cheaper and more facile form of interactive testing may be provided by latent image technology.

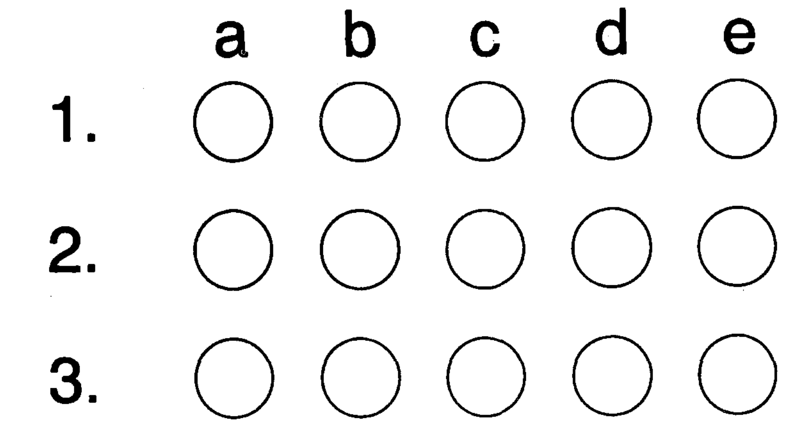

Figure Ia.
Example of the general format of an unused latent-image answer sheet.

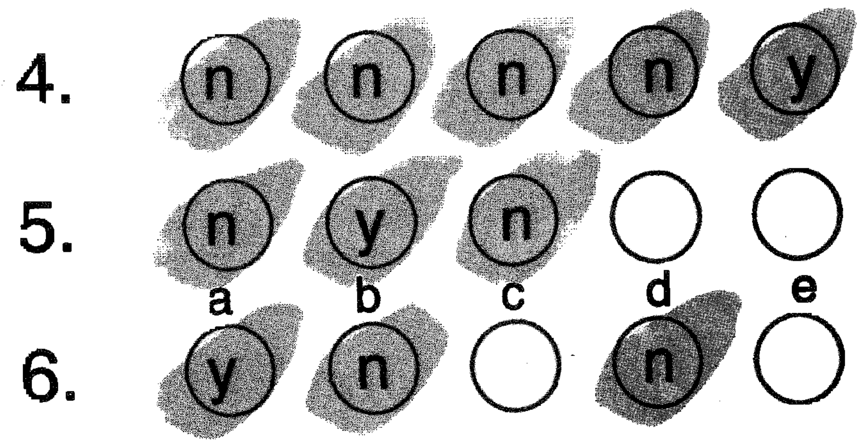

Figure Ib.
A latent-image answer sheet in which several of the alternatives have been "raised" by the use of the latent-image marking pen.

Latent Image Technology

The term "latent image" as it is used in this essay refers to some mark on a paper such as a picture, word or letter, which is invisible to the naked eye unless it is raised with a special chemical marker. Pease3 has briefly described a specific application of latent-image technology to the M-C test format. In our modification of this format, all students provided with examination booklets consisting of a series of M-C items and a corresponding answer sheet consisting of a numbered series of circles representing the possible alternatives to these M-C items as shown in Figure 1a. In its pristine form, all the circles on the answer sheet are blank, but students are equipped with special chemical "pens" which have the capability of developing the letters "y" or "n" within each of the circles. Students are instructed to read the stem of each M-C item, select their choice of the correct answer from among the alternatives, and develop the corresponding image on the answer sheet. If the student has chosen the correct answer, the letter "y" will be raised on the corresponding circle on the answer sheet. If the student has selected an incorrect answer, the letter "n" appears, as shown in figure lb. Students are instructed to continue selecting answers and marking them on the answer sheet until they identify the correct alternative. Otherwise, the LI method is no different than any other method of recording answers[c].

The manner in which LI examinations are scored is an important issue, because students are unlikely to continue selecting answers until they get the correct one, unless they also get partial credit for doing so. The format that I have typically used awards students four points if they answer an item correctly on their first try, two points if they require a second choice, and one point if they need yet another choice. No credit is given if the student requires more than three choices. This is based on the assumption that all the items are constructed to have four or five alternatives.

It is important that students not be awarded anymore than half credit if they require a second choice; consider the "worst case scenario" in which a student would not get a single item correct on first choice - i.e., the student misses every item! Clearly, any student who does not know any of the correct answers should not pass the test. Suppose, however, that this hypothetical student managed to answer every one of the items on the second "guess." This student would earn a score of only 50% which would be a (deservedly) failing grade except at those institutions that don't award failing grades as a matter of policy. But, if the grading schema allowed, say, three points for a second "guess," two for a third, etc., our hypothetical student would wind up with a grade of 75% - well within the passing range at most institutions.

In actual practice, awarding partial credit for second or third selections has the effect of spreading out the grades at the low end of the distribution. Please see Figure 3 and the

Table 1
Comparison of LI vs Conventional Item Analysis

	Response Frequency				
	A	B	C	D	E
Conventional Scoring	60	30*	3	3	4
LI Scoring	60	100*	28	49	80

accompanying textual explanation later in this paper.

Advantages Associated with LI Technology

Even the simple application of the latent image (LI) format described in the paragraph above confers several advantages upon M-C items. Students receive immediate feedback; students with partial knowledge about the item may also obtain partial credit for it; students who may have misread the item stem in the first place will certainly read it more carefully when they are obligated to make a second effort with it; and students leave the test setting with explicit information about their weak points.

The LI format permits more elaborate methods of testing, as well. For example, one may employ sequential items in which the student must know the correct answer to one item in order to evaluate the next. Also, one can encode a series of latent image "hints" for very difficult items. If a student, upon reading the item stem, decides help is needed in selecting an answer, the student could develop one or more of the accompanying bits of information provided as hints until gaining certainty of providing an answer. Of course, credit would be reduced in proportion to the number of hints used.

Very complex problem solving behaviors can be appraised using LI technology. For example, our own National Board of Examiners in optometry assesses critical elements of students' ability to analyze cases by using so-called patient-management problems (PMPs). In this format, the student is first presented with the case history for a hypothetical patient. In real life, a clinician would select various diagnostic tests to perform upon the patient depending upon an interpretation of the patient's case history. With the LI format, students can, in effect, do the same thing. They can decide which diagnostic tests would yield useful information and obtain that information by simply developing the latent image associated with the test. Shrewdly chosen tests will yield useful diagnostic information, while poorly chosen ones will yield results which lie within the "normal" range. Efficient clinicians can be expected to reach a correct diagnosis of each case by a short and efficient battery of tests, while clinicians who pursue a lot of false leads will waste time on unnecessary tests — just as they do in real life. Analogies to PMPs can be devised for most disciplines, although this requires the instructor to teach students to think in the first place rather than to simply regurgitate memorized facts!

Latent image tests have a latent advantage, themselves, because they may reveal hidden elements of the instructor's behavior, as well. Consider the item analysis for a conventionally administered M-C item shown in the first line in Table 1, for example. The keyed correct answer is *b*, and the item has been answered by 100 students. Only 30 of them answered the item correctly when using conventional scoring, and twice that number picked the distracter *a*. There are several ways to interpret this item analysis. It may simply identify a very difficult item, because 70% of the students answered it incorrectly. It may also be interpreted to mean that alternatives *c*, *d*, and *e* were poorly conceived, because so few students selected them. Or - most serious of all — it may mean that alternative *a* introduced ambiguity into the item by sharing properties with the keyed correct choice, *b*. Suppose, however, the item had been written in the latent image format and yielded the item analysis presented in the second line of Table 1. Remember that the total number of answers will exceed the total of 100 students who took the test, because each student may select as many as five answers (or as few as one). Ultimately, everyone selects the correct answer, so alternative *b* is picked by 100/100 students. But the quality of distracters *c*, *d*, and *e* emerges more impressively. While these three distracters were the first choice of very few people, they were, obviously, the second, third or fourth choice of many more. This suggests that the item, itself, is merely difficult, not ambiguous, and the individual who constructed it is doing rather a better job than might appear by an analysis of the first line of Table 1.

A test administered in the LI format is bound to take longer for the average class of students to complete than a test using identical items scored in the conventional manner, because there will typically be a subset of items which individual students must continue to work with because they selected an incorrect first response. In practical terms, this means that one must allow students more time to complete an examination of given length or these examinations must contain fewer items. However, what actually happens in a real testing situation is that the differences in students' test-taking strategies are exaggerated. The very best students, i.e. the ones who miss the fewest items on the test, still complete the examination far ahead of the rest of the students for the simple and obvious reason that they have far fewer items which require them to make a second (or third) choice. For these students, the time expended on an examination is pretty much the same as it would be on a conventionally scored format. Among the students who do poorly in the sense that they make a lot of incorrect first choices, one can see two rather distinct groups. Some of these students, upon making an incorrect first choice, simply start marking answers in linear order - a, then b, then c, etc. — until they finally get the correct one. Other students clearly agonize over the items they have initially missed and take an exceptionally long time before they can force themselves to risk a second choice. When instructors contemplate the use of the LI format, they would be well advised to consider, in advance, what the appropriate attitude would be to exhibit towards this latter group of students. It would be a simple, if rather harsh, solution to simply "call time" on these students and insist that they select answers even in the face of grave doubts on their part. On the other hand, these students are typically the very ones who would benefit most clearly from the immediate feedback which is provided by the LI format - if only you allowed them enough time to get it. In any case, this is an issue which is much better confronted before the test begins rather than when you have this group of people sitting before you.

Disadvantages Implicit in LI Technology

Applications of LI technology to M-C tests are not an unequivocal advantage. The technology is significantly more expensive to use than conventional answer sheets such as the Scantron type. LI answer sheets are made upon demand, and the initial master sheet may be very expensive, although this cost is easily amortized by producing thousands of answer sheets. The students must be provided with an LI marker pen. While these are not expensive, they are often mislaid and there is no substitute. The LI ink which they contain is rather volatile, and, if the pens are not properly resealed when not in use (an admittedly trivial task), they are no longer viable. What it boils down to is a small additional expense.

LI answer sheets must be scored by hand, and to do so is to relinquish one of the advantages that you choose the M-C format to avoid. Further, if you want to obtain an item analysis of the examination, the data also must be entered by hand. These advantageous features are automated when you use conventional M-C answer sheets and a machine scoring device. Nevertheless, scoring LI answer sheets is a low-level function which can be performed by anyone who can count to five; obviously, therefore, it can be delegated to somebody besides the faculty member.

Perhaps the most troublesome disadvantage of LI technology is that it introduces new ways to cheat. That is not to say that it is, somehow, easier to cheat — that depends upon how well the students are monitored in the test environment - but there are novel things which must be considered. For example, if you are tempted to obtain and use only one form of answer sheet simply because the initial costs of producing alternative forms is too high, then you can expect students to figure this out in a hurry. By the time that you use the same sheet for the third time, some students will have undertaken the cumbersome task of memorizing the sequence of correct answers. The irony here is that such students will have undertaken, with a vengeance, the trivial type of learning which they claim M-C items foster in the first place. Of course, all you have to do to prevent this is to purchase alternative forms of the answer sheets.

But it doesn't end there. A thoughtful student may conclude that the person who corrects the examination may do so by simply counting up the number of latent image marks which appear on the examination sheet without bothering to read each answer to be sure that the correct answer was, eventually, chosen. Such students merely mark one and only one answer per item, and if the proctor is careless, they get full credit for the answer, because there was only

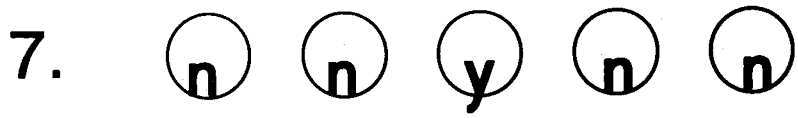

Figure 2.
An example of a latent-image answer sheet in which the answers intended to be raised by the LI marker are poorly aligned. The "y" in the third alternative protrudes beyond the boundary of the circle. This protrusion could be raised without actually invading the boundaries of the circle, thereby yielding a clue to the location of the correct answer.

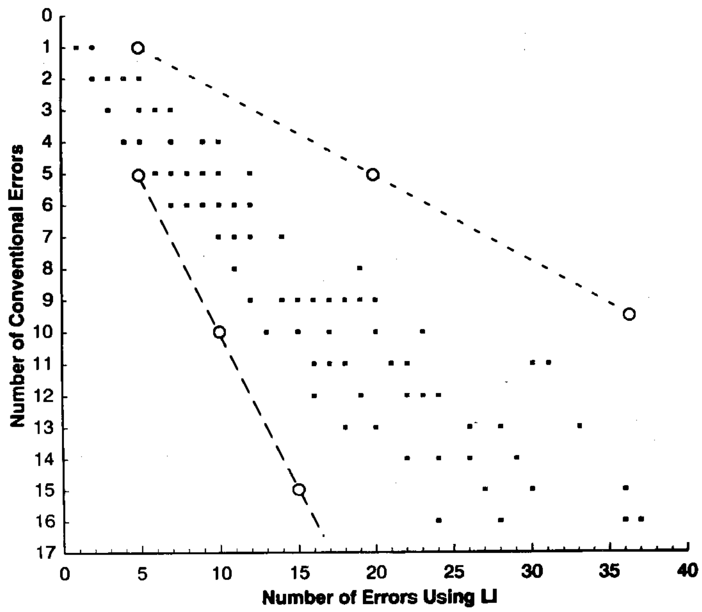

Figure 3.
Scores on an examination in neuroanatomy (n=74) in which the number of errors committed when the examination is scored conventionally is plotted as a function of the scores actually obtained on the LI format. The boundary conditions are shown by the dashed lines (maximum errors based on choosing all four possible alternatives for each item on the LI format; minimum errors resulting when every item is answered correctly with only one choice.)

one LI mark on that item — just as there would only be one mark if the answer chosen had been correct.

Students may claim that they "accidentally" marked something and should not be "penalized" for it. It will amaze you how many people not previously viewed as terminally clumsy manage to drop their LI marker - point downward - upon their answer sheet again and again. A prudent instructor simply announces, in advance, that any LI mark on the answer sheet will count as an incorrect choice no matter how it got there, on the ground that carelessness should be as much a cause for loss of credit as ignorance.

It sometimes happens that the LI component of an answer sheet is not perfectly aligned with the little circles within which students are directed to make their marks. In other words, the LI letters "y" or "n" may protrude a little bit beyond the boundaries of the circles as shown in Figure 2. If students have such answer sheets, they could very carefully make an LI mark just outside the boundaries of the circle until she revealed the protrusion which is characteristic of a "y" but not an "n." Then, of course, students can fully develop the rest of the letter which lies within the circle. The trouble is that it is very obvious when students have done this. It is obvious that they did it in order to cheat, and it is obvious that they believe their instructors to be fools to fall for it in the first place.

But, it does happen, and it means that each of the LI answer sheets must be examined for misalignment.

With the exception of the elements just mentioned, most of the disadvantages associated with LI fall, more or less, upon the shoulders of the students. It would be particularly prudent for a faculty member who contemplated the use of LI technology to relieve, to the maximum extent possible, these student-weighted disadvantages, because poor student performance should be attributable to ignorance of the material, not clumsiness with the test format.

The initial reaction of most students upon learning that their examination will be given in the LI format with the expectation that students will answer each item until they get it right is an extremely ungenerous one, i.e., they believe that this format will give the poorer students an undeserved advantage which would be, de facto, denied to the good students. This concern is entirely unfounded. Use of the LI format spreads out the range of grades at the bottom of the distribution, not at the top. Figure 3 shows the distribution of Scantron scores as a function of the LI scores that would have obtained had the examination been graded in the standard manner for an actual examination in neuroanatomy given by the author. The important point is that students who miss an item with their first response may require a total of up to five responses before they get the item right. The appropriate view to apply to this format is not that poor students get a second chance to get an item right, but that they get a second (or a third, or a fourth) chance to get it wrong. The lowest scores in the class are relatively *much* lower than they would have been had a conventional answer format been used. Indeed, except for the very top of the distribution, the LI format yields a much finer resolution of scores than the conventional format does, and this may be of distinct advantage to the instructor when dealing with students who are near a cut-off point for a particular letter grade.

When students mark answer booklets or Scantron sheets with #2 pencils, they can subsequently change their minds by erasing their marks, but they can't do this in the LI format. Once they commit answers to the LI sheet, they count, no matter what sort of inspiration is visited upon them subsequently. Most students do not experience this problem, but for the handful that do, it can be devastating. The issue can be neatly addressed by admonishing students that they should complete the entire examination by making marks in the test booklet - where they *can* erase if they have to do so - and transpose all their answers to the LI sheet only when they have finished the entire examination to their satisfaction.

No matter how careful they are, students will, occasionally, mark a wrong answer. Since there is no way to distinguish the occurrence of genuine errors from false claims that a choice was accidentally marked, the students who make such a mistake will just have to "take it on the chin." Imagine, if you can, the intestinal turmoil which takes place if an answer is miskeyed, especially among the students who were absolutely certain of the accuracy of their initial response. Their first reaction will be that they merely made the mistake of transposing their choice inappropriately. That will trigger anger; then they will go back to the test booklet to reread the item and, at least, make the second choice correctly. Instead, they find that they transposed accurately, but the answer that they were so sure was correct yielded, tauntingly, the letter "n" on the LI sheet. Now their initial emotion of anger competes with panic, chagrin, puzzlement and disgust. Ultimately, it may occur to them (or it may not) that the item has been miskeyed. But, in the meantime, students are seriously handicapped in their performance *not* by their difficulty with the material but by the format. This issue would never come up if the instructor had used the conventional format; the item would simply have been rekeyed, and the student would never have known the difference. Clearly, meticulous care must be exercised in preparing the answer keys using the LI format.

Not surprisingly, many students - good ones as well as poor ones - anticipate many of these difficulties and approach their first LI test in a state of near panic. The anxiety which many students feel can be substantially reduced by the following three measures.

First, provide students with a dry run at least one day before the real test is given. This should consist of a half-dozen or so very simple M-C items, including one which has been deliberately miskeyed. The latent image requires only a second or so to develop after it has been marked with the chemical pen; and yet many students respond to this modest passage of time by furiously rubbing the chosen circle with the marking pen. Sometimes they do this to such an extent that they rub a hole in the paper or remove so much of the latent ink that the image is unreadable. For some people, there does not exist a level of verbal admonition which will induce them to merely rub gently and wait a second for the image to appear; such people must have a dry run with the format. The inclusion of a deliberately miskeyed item will precipitate panic among those who were, in fact, able to follow verbal directions about gentleness between pen and paper, so that they, too, will benefit from the "dry run."

Second, give students appropriate directions well before the examination. In addition to the physical use of the LI format, which should have been taken care of on the "dry run," students should be encouraged to, first, answer *all* the items in the examination booklet before beginning to transpose *any* of them to the LI answer sheet. Then students should transpose their *first choice* for all of the items *before* selecting a second choice for the items missed. At this point, they should be encouraged to count up the items that they missed initially and contemplate the fact that, if this were a standard test format, this initial score would be exactly what they would get - there would be no second choices. Then they should direct their attention to the items which they missed the first time. Now they are, in effect, picking up extra points if the instructor is giving partial credit for second choices. Recognition of this fact goes a long way toward reducing the nervousness induced by knowing how badly one did initially. If, on the other hand, students transpose answers immediately and keep plugging away at it until they get it correct, they may find themselves in a disabling emotional state if, by chance, they get a particularly difficult item early in the test.

Third, avoid the use of a norm-referenced grading scale whereby student grades are determined by how well they do in relation to the other students in the class. Instead, determine, in advance, what the cut-off points will be for various letter grades; these cut-off points may be determined by the instructor's experience or judgment or by reference to some specific performance criterion or set of behavioral objectives.

This confers two advantages. It alters the perception that the LI format particularly favors poorer students, because an individual's grade depends exclusively upon performance; a grade is simply not influenced, either directly or indirectly, by the number of "second chances" that a weaker student may obtain. Second, when students know that the cut-off points for a grade are *in advance*, they are more likely to make as definitive an effort to get the correct answer on the second chance as he did on the first, because every point counts no matter how well the "others" do.

Parameters of Choice

The decision to replace conventional scoring technology for M-C tests with LI technology depends upon the balance of advantages vs. disadvantages for each individual instructor. Clearly, LI technology cannot be unequivocally recommended over conventional technology, because it has certain shortcomings uniquely associated with it. Students may perceive LI technology as favoring the weaker students over the better ones, but that is largely a misconception and may easily be explained away. More seriously, students may bring a great deal of tension to the testing environment with LI technology, but experience with the method should dampen that problem, as well. However, it is extremely important to remember that, although LI methods may seem to carry only an ephemeral level of tension when viewed from the instructor's perspective, the very real tension which the students *experience* may impair their test performance in ways that have nothing to do with their mastery of the material. Finally, LI technology is marginally more expensive to apply than conventional methods.

Against these shortcomings, the prospective user of LI technology must weigh some rather impressive advantages. LI technology facilitates the use of substantially more sophisticated item formats than are available with conventional scoring methods. This is a particularly important advantage when viewed against the persistent criticism that M-C items don't really require students to think in analytical terms. The trouble is, of course, that instructors must think in more analytical terms also, so that writing the items is rendered more difficult. This seems like a fair tradeoff; if the students are required to be more sophisticated, why shouldn't the instructors, as well? The LI format requires students to think every item through to its correct *solution*, and it provides immediate feedback along the way. While immediate feedback is clearly efficacious, it is very important to recognize that feedback does not do students much good unless it is used to alter their behavior in some way (see, e.g., references 4 and 5). Students may leave the test setting with explicit knowledge of their weak points, but they must act upon this knowledge if they are to benefit from it. □

Footnotes

a. Grades are an emotionally charged issue for everybody who has to confront them, including the parents of college students. The reader is invited to peruse the essay by Ohmer, M., Pollio, H. R., and Eison, J. A. entitled "Making Sense of College Grades," Jossey-Bass Publishers, 1986, to pick up on the pervasive sense of uneasiness and mistrust which surrounds grading systems. Multiple-choice items come in for a disproportionate share of criticism, perhaps because their use is so pervasive. In any case, it was to help soften this element of offensiveness associated with M-C items, that I have offered the alternative identified in this paper.

b. Some readers may take offense with my dismissal of the work of another with the descriptor "vitriolic," but, in fact, that is a relatively salubrious term to use. Indeed, when one reads this now rather difficult-to-find book, it is hard to believe that Hoffman intended it to be anything but vitriolic. Hoffman was an academic physicist mounting an attack on a corpus of work which clearly fell outside his area of expertise, i.e., psychometrics. He fell upon a relatively small sample of what he considered to be indefensible M-C items gleaned from tests intended to estimate general intelligence or achievement and administered to a large heterogeneous population of students. Psychometricians of that era responded rather vigorously to Hoffman's criticisms, but this response was forthcoming, in large measure, precisely because Hoffman *was* vitriolic. In historical perspective, this was not a cordial, polite, or "politically correct" academic exchange.

c. Latent image answer sheets, custom made to your specifications, may be obtained from Applied Measurement Professionals, 8310 Nieman Rd., Lenexa, Kansas, 66214. Ready-made answer cards, using an alternative technology in which a carbon shield is scraped away from the alternatives may be obtained as "Trainer-Tester Self-Scoring Response Cards" from VanValkenburg, Neville, and Nooger, 33 Gold St., Suite 212A, New York, NY, 10038.

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ABSTRACTS

Assigning Patients According to Curriculum: A Strategy for Improving Ambulatory Care Residency Training. Brush AD, Moore GT. Academic Med 1994;69:717-719.

The authors describe the traditional hospital setting for residency training as intensive and oriented toward the most acute/severe phases of patients' disease processes. In an attempt to provide a more realistic training experience in family medicine, a curriculum-based patient population was proposed for resident trainees within an HMO. Another purpose of this experimental program included serving as a model for future training in a realistic healthcare delivery model.

Patients were introduced to the program and allowed voluntary acceptance of the structure by letter. Using a computer to assign specific learning experiences for residents, preceptors were able to select patients from their practices to provide a tailored curriculum for each resident.

The authors describe their experiences as favorable from the learning/teaching as well as the patient acceptance standpoints. This is a model which may gain quick acceptance as we enter an era of decreased funding for hospital-based academic health centers. We in optometry are positioned to exploit this approach and already have it in place in many schools and colleges already. If not, now is the time!

Reviewer: Dr. Leo P. Semes, University of Alabama, School of Optometry

The Prospect of Sweeping Reform in Graduate Medical Education. Ayanian JZ. Milbank Quarterly 1994;72(4):705-12.

Major transformations may be evolving in graduate medical education (GME) in the United States. Many health policy experts believe these changes are being imposed as a consequence of an excess in physician specialists and a shortage of general practice physicians. The impact on the public has been reflected in problems of physician access and escalating patient care costs. The changes imposed by "managed care models" may significantly change the historical emphasis of GME by de-emphasizing the demand for sub-specialists.

The federal government is a major source of funding for GME training; therefore, Congress has a strong say in what specialists receive training and what disciplines are emphasized for training opportunities. Currently, the emphasis is on primary care specialties (family medicine, general internal medicine, and general pediatrics). Academic centers risk the loss of financial and political support unless they adapt to this shift in emphasis imposed by market forces.

Improving Access

The target goal outlined by Congress is a 50:50 split between primary care practitioners and specialists. The author suggests that this may take as long as 50 years to accomplish because the physician graduates represent such a small fraction of the total workforce. Further, access will be disproportionately low in rural and inner city areas. Finally, patient access to sub-specialists and inner city areas. Finally, patient access to sub-specialists could be managed by generalist physicians, whereas the present scheme has patients seeking specialist care for treatment of routine problems.

Controlling Costs

Teaching hospitals will have to look at current staffing and training models and consider modifying the roles and experience of residents and fellows versus that of the house staff. Generalist physicians may have less expensive styles of practice than specialists; however, the economic impact of that difference may not be easily measured in the short term. Managed care plans are currently limiting specialist access and may be decreasing their demand in the delivery system by as much as 60% over the next ten years.

Maintaining Quality

Three critical areas of impact are proposed: prevention and early detection, patient care in chronic disease and high technology services.

Implementing Change

If Congress imposes these changes in the training institutions, it will dramatically alter the structure and traditional decentralized nature of the academic medical community. It is incumbent upon institutions to adjust in five to 10 years to reallocation of residencies and fellowships; however, the state representatives may intervene on the behalf of the institutions in their states by requesting extra funding, proposing a slower implementation schedule or a less focused end target.

Whatever the outcome of this GME dilemma, it is important that the schools and colleges of optometry show special interest and attention to the impact and outcome of legislative and market pressures on GME. Restructuring and modification of program emphasis are products of the global impact that managed care is imposing on healthcare education and healthcare delivery in general. These changes will ultimately affect our students, and practitioners throughout the country.

Reviewer: Dr. William A. Monaco, Northeastern State University, College of Optometry

RESOURCES IN REVIEW

Gonioscopy and the Glaucomas,

Barry M. Fisch, Butterworth-Heinemann, Boston, MA, 1993, 137 pages, $85.00.

Gonioscopy can be a difficult technique to master. Aside from performing the procedure itself, it takes experience to discern and interpret the view. Yet gonioscopy is an extremely useful tool, especially with respect to the diagnosis and treatment of glaucoma. Here is one text that does an excellent job of taking the reader from the basics of gonioscopy through the differential diagnosis of angle abnormalities and how they relate to underlying disease entities.

The text starts with a review of the history of gonioscopy and anterior chamber anatomy. Following are chapters on routine dilation and the risk of angle closure, the various gonioscopy systems, and several methods of recording. Though the Goldmann and Zeiss lenses are stressed throughout the text, other lens types are covered as well.

The second main section of the book is a basic discussion of the glaucomas. Primary angle closure, secondary angle closure, and open angle glaucomas are included, as well as congenital angle anomalies that may cause glaucoma.

Gonioscopy and the Glaucomas is a well written textbook and faithful to its main subject, which is gonioscopy, not the glaucomas.

Although it is not a clinical manual, it serves as a clinically relevant reference textbook for beginning to intermediate level. The frequent use of tables throughout the book makes it a practical and useful reference. There are many black and white illustrations complimented with a section with 50 color goniophotographs. The table of contents lists section headings within each chapter to facilitate finding a given topic.

Guest Reviewer:
Dr. David M. Krumholz
SUNY State College of Optometry

Visual Problems in Childhood,

Terry Buckingham (ed), Butterworth-Heinemann, Boston, 1993, 376 p, $95.00.

In his preface, editor Terry Buckingham, senior lecturer in the Department of Optometry, University of Bradford, UK, states that his aim for this book was "to consider the development of vision in infants, their management as patients, as well as reviewing the theoretical and practical aspects of assessing visual performance." In my estimation, he achieved his goal.

The book comprises eighteen chapters written by experts in the field that they write about. The authors represent a good mix of academics and practitioners, most of whom work in Britain. As such, the content of certain chapters reflects the difference between UK and US optometry.

The book is well organized, commencing with a chapter devoted to embryology of the eye, a second that examines human growth and development, and a third that discusses chronic disorders of childhood. These are excellent pieces; however, there is a problem in that the normative information they provide is based on British rather than U.S. data. This does not present much of a problem — for all practical purposes, the differences are not great, but there are differences. The remaining chapters are clinically oriented, ranging from a succinct discussion of the more common ocular pathologies children manifest to refraction (development and assessment), to binocular disorders, to the practical concerns of dispensing spectacles, contact lenses and low vision devises for very young patients, to specific learning disabilities, to the optometric needs of multiply-handicapped children.

I liked this book. True, there are a (very) few weak sections, (some U.S. optometrists may be disappointed in its paucity of information about the treatment of ocular disease), and it does have the aforementioned drawback of reflecting British epidemiological data and jurisprudence but, overall, I believe that it is a very good addition to the growing number of books devoted to the young patient.

Guest Reviewer:
Dr. Jerome Rosner
College of Optometry
University of Houston

The Fine Art of Prescribing Glasses Without Making a Spectacle of Yourself,

Benjamin Milder and Melvin L. Rubin, Triad, 1993, 526 pp., $78.00

This text reviews the art of prescribing eyeglasses for almost every type of patient that an optometrists or ophthalmologist is likely to examine. The book is divided into chapters which discuss the correction of hyperopia, myopia, astigmatism and presbyopia. Other chapters include in-depth discussions of contact lenses, cycloplegia, accommodation, anisometropia, cataracts and aphakia. There are chapters devoted to optics and lens variables as well as to progressive lenses and refractive surgery.

The chapters are filled with specific cases that help to illustrate the points being made. The style is informal and casual, and the reader feels that he/she is sitting in a lecture of an experienced refractionist who is imparting wisdom gained over the years. The wisdom is mixed with wit and humor which makes for enjoyable as well as informative reading. It is an excellent text for the beginning refractionist as well as for more experienced ones who truly appreciate the art of prescribing eyeglasses.

Guest Reviewer:
Dr. Stuart M. Podell
Commack, New York

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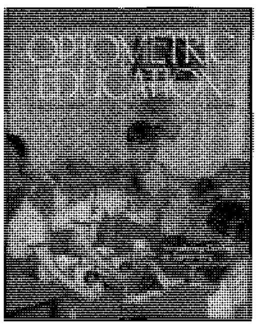

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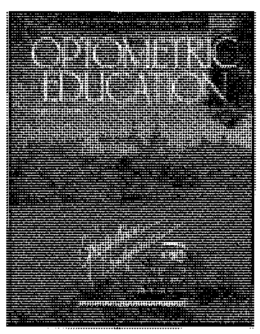

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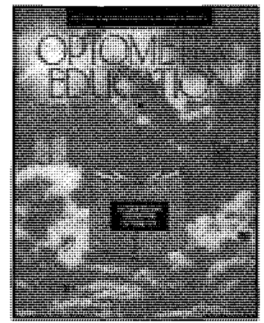

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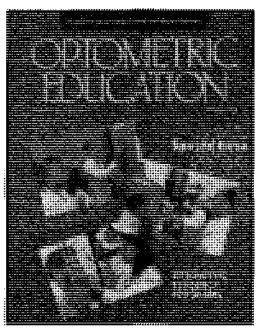

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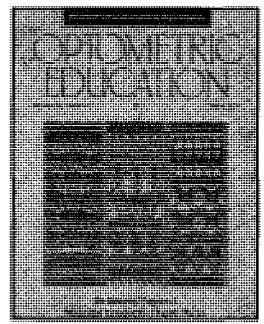

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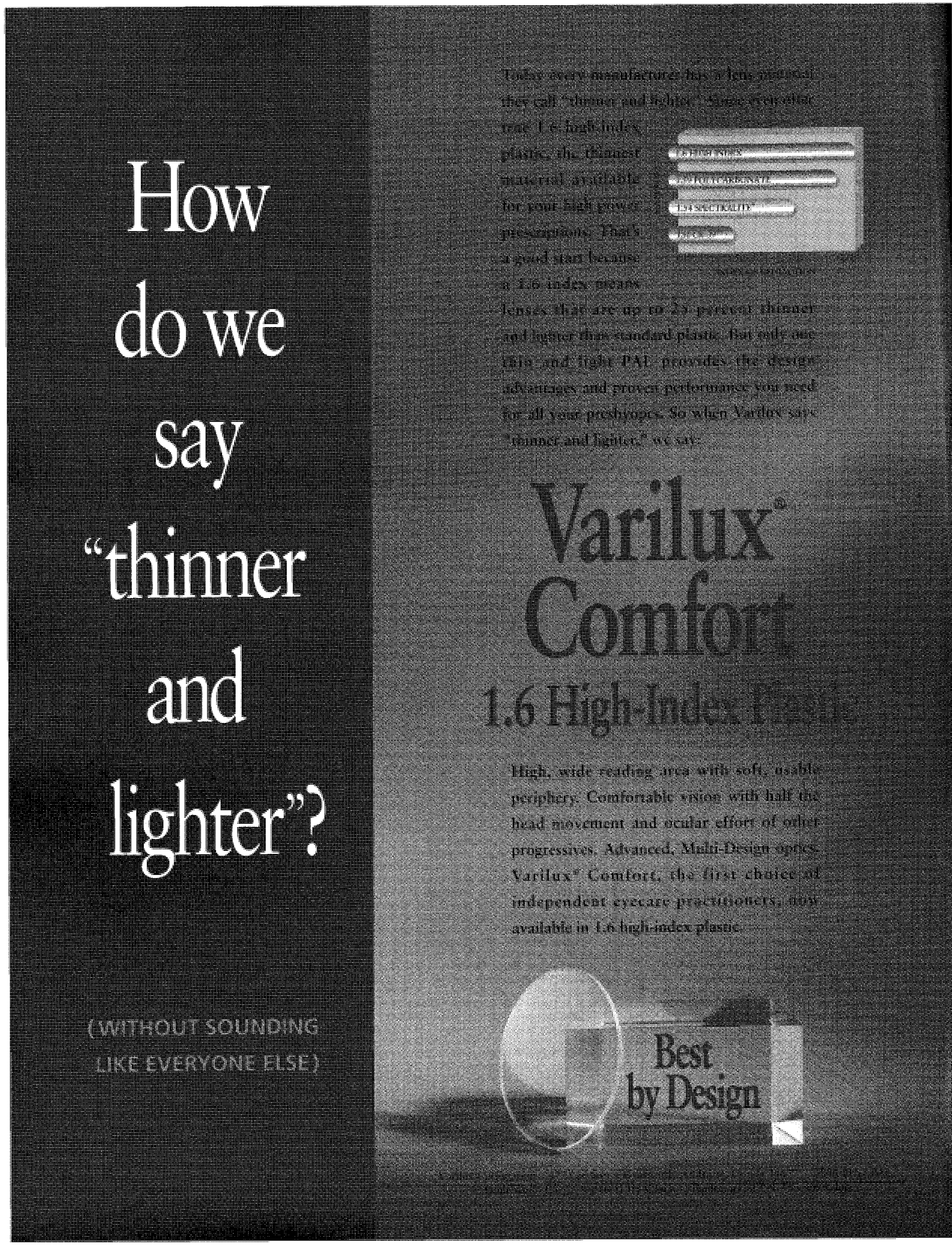
How do we say "thinner and lighter"?
(WITHOUT SOUNDING LIKE EVERYONE ELSE)
Today every manufacturer has a lens material they call "thinner and lighter". Some even offer true 1.6 high-index plastic, the thinnest material available for your high power prescriptions. That's a good start because a 1.6 index means lenses that are up to 25 percent thinner and lighter than standard plastic. But only one thin and light PAL provides the design advantages and proven performance you need for all your presbyopes. So when Varilux says "thinner and lighter," we say:
Varilux® Comfort
1.6 High-Index
High, wide reading area with soft, usable periphery. Comfortable vision with half the head movement and ocular effort of other progressives. Advanced, Multi-Design optics. Varilux® Comfort, the first choice of independent eyecare practitioners, now available in 1.6 high-index plastic.
Best by Design