

# JOURNAL OF OPTOMETRIC EDUCATION

Spring 1990  
Volume 15, Number 3



## CLINICAL ROTATION OF FOURTH-YEAR OPTOMETRY STUDENTS: A CURRICULUM MODEL





# Association of Schools and Colleges of Optometry

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## Professionalism and the Life-Long Learner

The term professionalism is one that, most recently, has evoked debate about practice mode, the ethics of the doctor/patient relationship, rules of conduct and the influence of external forces. Unfortunately, one of the most critical characteristics of professionalism, of being a professional, has been conspicuously absent from the debate. This characteristic is a commitment to life-long learning. As professionals, we affirm our commitment to "ENHANCE continuously [our] knowledge and technical proficiency to the end that [our] patients shall receive the benefits of all acknowledged improvements on visual care." (AOA: Code of Ethics) Unfortunately, our behavior often does not reflect this standard.

At a time when all fifty states allow for the use of diagnostic pharmaceuticals and half that number have approved therapeutics, it is discouraging to hear continued debate within optometry about whether or not to practice at the highest level allowed by law. It is disheartening to see members of the profession choose not to become certified to use these diagnostic and therapeutic agents. If we are most concerned with protecting the visual well-being of our patients and the public as a whole, there should be minimal debate over whether or not to expand our scope of practice as legislation permits. And, if we as professionals have followed our commitment to life-long learning, then the increased responsibility that comes with new legislation should not be so overwhelming as to send some members of the profession into retreat. Wherein lies the failure? Why do so many members of our profession avoid the specter of significant continuing education?

Educational institutions and educators share responsibility for fostering the characteristics of the life-long learner within our students. The primary care optometrist as a life-long learner possesses self-motivation, a desire to acquire knowledge and a critical mind. Without these characteristics and continued growth, stagnation occurs; eventually the risk of failing to provide the most complete available treatment or of doing actual harm to the patient will arise. With these characteristics, satisfaction with a stagnant knowledge base or a limited practice mode would be unthinkable. While it is unreasonable to expect that as educators we can instill these virtues in every student, it is our responsibility to try.

It is important to consider two principal variables which may serve to either expand or diminish our students' desire for knowledge and continued growth. The first variable rests within our teaching and evaluative methods. A preponderance of fact-based teaching and evaluation can take the challenge out of learning. This is an area where we can have a significant impact, on either an individual or institu-

tional level. The structure of our curriculum, our teaching methods and our evaluation techniques must be reviewed and revised to encourage self-motivation and inquiry.

The second variable is role modeling. Role modeling is perhaps the most powerful element we have to foster independent learning as a characteristic of our students after graduation. Faculty as individuals are, in general, life-long learners. Indeed, it is the opportunity for continued growth that attracts many of us to education. If we purport life-long learning as an expectation of the professional, do we adhere to the principle when viewed through the eyes of the student? Our students are bright and they assess us based upon the light in which they see us. As role models we most profoundly affect our students through our teaching, not through research, committee work and external speaking engagements. Are our courses dynamic? Up-to-date with the latest research? Do we try different teaching methods to improve the quality of the teaching/learning experience? Or do we teach the same course year after year? In the clinic are we as faculty a resource that provides our students with current clinical knowledge? To expect our students to demonstrate continued growth, we must do the same.

The power of the role modeling resides, not only in the individual, but also within the institution. Each school and college of optometry has a character of its own. We must also ask if the institution behaves as if it too is a life-long learner. Faculty (as a group) are the driving force of higher education. While faculty productivity is affected (and hopefully facilitated) by administrative direction, faculty are responsible for defining the curriculum and setting the educational standards. The action of the faculty in addressing curriculum change and teaching innovation must reflect the life-long learning principles of faculty as individuals. The results are not only institutional curricula that are proactive rather than reactive, but institutions with an academic atmosphere that embraces the principle of life-long learning.

As optometry continues to change, it is critical that we observe and try to overcome the obstacles created not only by external forces, but also those that are self-inflicted.



David A. Heath, O.D.  
JOE Editor

**NEW**

# Volk QuadrAspheric Fundus Lens®

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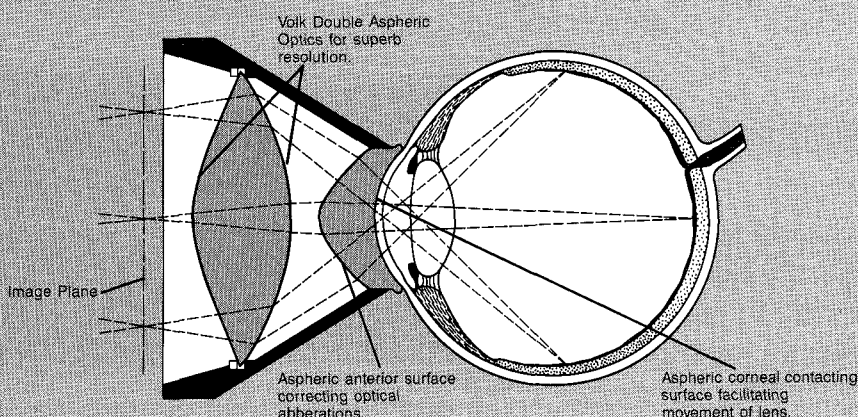
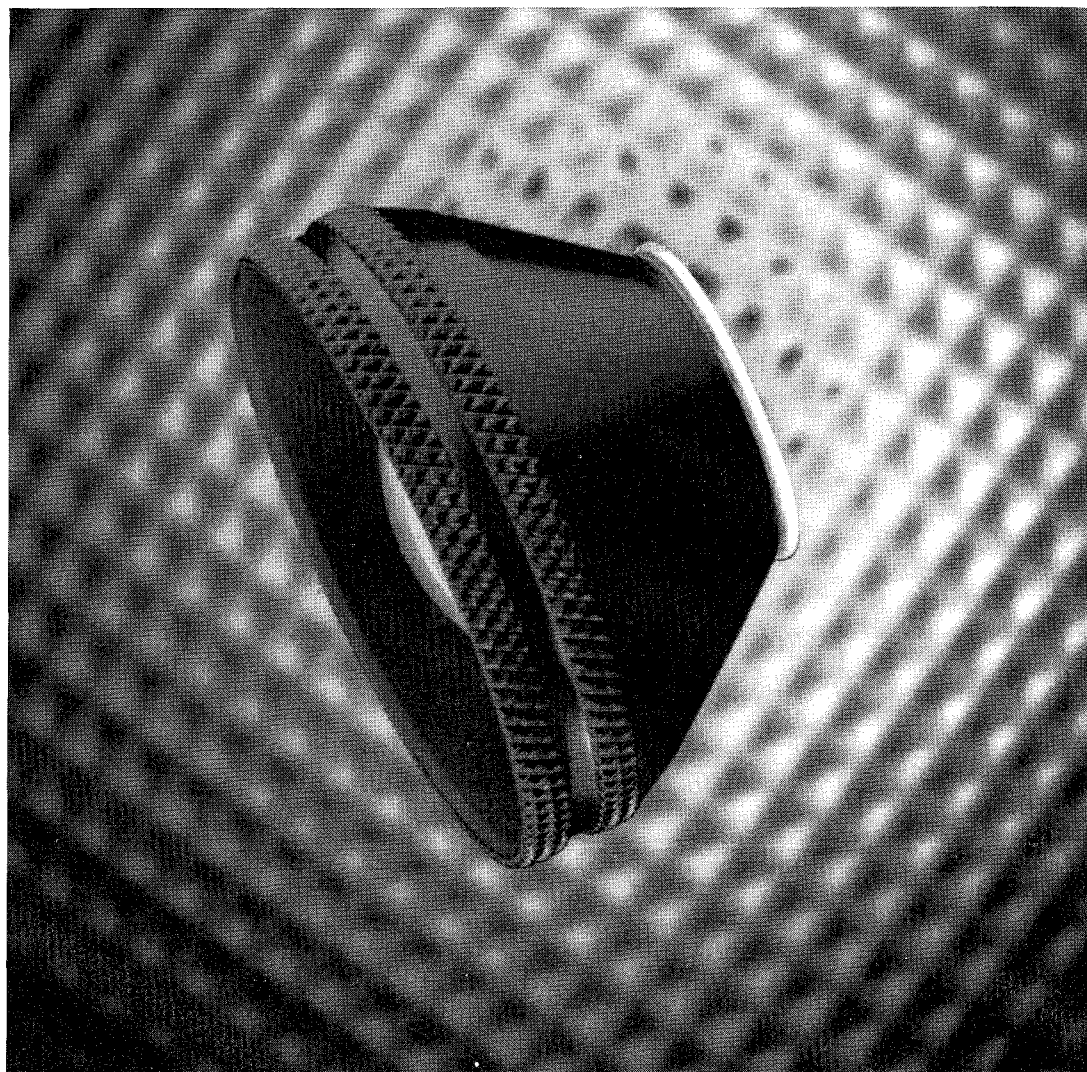
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# SUSTAINING MEMBER NEWS

*Sustaining Members support ASCO initiatives on behalf of the optometric education community. 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 Program Aids Proper Dispensing of Contact Lenses**

Vistakon, Inc., the manufacturer of ACUVUE® (etafilcon A), disposable contact lenses, has initiated a two-pronged program to further ensure that its contact lenses be dispensed exclusively through licensed eyecare practitioners.

Bernard W. Walsh, president of Vistakon, said, "We have sent a letter to drug and pharmacy associations seeking their cooperation in informing their memberships that ACUVUE should only be sold to consumers by licensed optometrists, ophthalmologists and opticians, where allowed by law."

"Vistakon, a Johnson & Johnson company, continues to maintain its commitment to the professional which is why we are taking these steps to further ensure that the ACUVUE Contact Lens is dispensed properly," Walsh said.

The company is recommending that consumer be advised that contact lenses can only be obtained through licensed eyecare practitioners, who will determine overall patient suitability for ACUVUE and what wearing schedule is appropriate.

Secondarily, Vistakon announced a change on the label of the ACUVUE six-pack lens container to read: "This label is not a prescription. Unlawful to dispense without a prescription." This new label, which strongly reinforces the professional positioning of ACUVUE, will be available in the first quarter of 1990.

ACUVUE, which was introduced in Florida in July of 1987 and launched nationally in June of 1988, has already become the number one choice of practitioners for new extended wear patients, with a 24.0 percent market share of new extended wear fits. Recently the company received U.S. Food and Drug Administration approval for ACUVUE to be used in a daily wear, two-week replacement wearing regimen. "This means ACUVUE can now compete in the daily wear contact lens market and provide eyecare professionals broader prescribing guidelines and greater flexibility to select the most appropriate ACUVUE wearing regimen for each patient," said Walsh.

## **Paragon Gains FDA Go-Ahead on Color Enhancing Tints, Bifocals, Torics, Aspherics**

Paragon Optical, the world leader in oxygen permeable contact lens technology, embarks on the 1990s with new and important marketing clearances from the U.S. Food and Drug Administration (FDA). In addition to releasing

new color enhancing gray and green tints in its FluoroPerm® fluorosilicone acrylate RGP lines, Paragon's network of independent manufacturing laboratories may begin making FluoroPerm® 92, FluoroPerm® 60, FluoroPerm® 30, Paraperm® 02, and Paraperm® EW RGP lenses in such special designs as torics, bitorics, aspheric, aspheric multifocals, and monocentric and concentric bifocals. Krist Jani, Paragon's Marketing Director, commented: "These approvals serve to further enhance the FluoroPerm RGP Lens System. Now, in addition to three Dk levels, daily and extended-wear regimens, a unique materials manufacturing process, and a full line of companion care products, you can add the most complete complement of colors and range of designs."

Even more significant may be the official clearance of the specialty lens designs for FluoroPerm RGP Contact Lenses. "There's no doubt that we've seen improved performance of toric soft contact lenses in recent years," said Jani, "but, for the correction of astigmatism, nothing can compete with the optics in a well made RGP lens of a physiologically compatible material like FluoroPerm." The outlook for bifocals and multifocals may even be brighter. "The presbyopic population is growing at twice the rate of all other age groups," according to Jani, "and of the 76 million 'baby boomers' in the U.S. alone who'll reach their 40s this decade, a significant number are already contact lens wearers." Jani predicts that many will benefit from FluoroPerm RGP lenses in classical monocentric, concentric, and aspheric designs.

Further information and product labeling may be obtained from Paragon Optical (1-800-528-8279) or any of its network of authorized manufacturing laboratories.

## **Varilux Infinity Available in PhotoGray Extra**

Varilux Corporation announces the addition of PhotoGray® Extra to the Varilux Infinity progressive addition lens.

Introduced in June 1988, Varilux Infinity was recognized by the Optical Laboratories Association as the "Best New Development in Lens Design" for that year. This multi-design progressive addition lens, with lower additions, incorporates a very soft and comfortable transition between far and intermediate, with minimal peripheral aberration. "Varilux Infinity's 12 different designs have had a great effect for Varilux in the optical industry. It offers the practitioner less fitting problems and increased adaptability," said Karen Wilmer, vice presi-

dent of marketing. "New presbyopes, including those who have never worn glasses adapt more easily and quickly. Today, you can offer your patients the advantages of PhotoGray Extra with all the benefits of the Varilux Infinity, the one lens you can truly recommend to all your presbyopic patients."

PhotoGray Extra glass made from (Corning™ lenses that change) provides wearers with 100% UVB and 97% UVA absorption. PhotoGray Extra, with its pleasing neutral gray tint, changes from eyeglasses to sunglasses in less than sixty seconds.

Varilux Infinity in PhotoGray Extra is available in 4.00, 5.00 and 6.00 base curves, in 70+5 diameters. The add range is +0.75 through +3.5.

To order, please contact Varilux at 1-800-BEST-PAL.

## **Dr. Wolfberg Named Bausch & Lomb Consultant**

Dr. Melvin D. Wolfberg has been named a special consultant to the Contact Lens Division of Bausch & Lomb.

Dr. Wolfberg, past president of the Pennsylvania College of Optometry and a resident of Port St. Lucie, Florida, will provide "broad-based advice on a variety of issues related to the needs of the professions, the schools of optometry, and our position as an industry leader," said Harold O. Johnson, senior vice president and president of Bausch & Lomb's Contact Lens Division.

"Mel Wolfberg's credentials and accomplishments in the field of eye care are well known," Johnson said. "In addition to building a highly successful practice in Pennsylvania, Mel has been a leading figure in professional associations and in education. The decade of the '90s is going to be an exciting one for all of us in the eye care field, and we will look to Dr. Wolfberg for assistance as we formulate our plans for the coming years."

Dr. Wolfberg said he was "pleased to have the opportunity to work with Bausch & Lomb, which has been so important in the development of the eye care professions in this country."

## **MediVision to Award 16 Annual Optometric Scholarships**

MediVision, Inc., recently established the MediVision Optometric Scholarships to recognize clinical and academic excellence among optometry students throughout the United States.

Each year MediVision will award a \$1,000 scholarship to an entering senior at each of the nation's 16 schools of optometry. Students, selected by each school's clinical faculty, must have a GPA of at least 3.50 (on a 4.00 scale), demonstrate superior clinical skills, and be scheduled to intern at a MediVision center.

"By supporting the education of future optometrists, we can help assure the quality of care available to patients and continue our support of the optometric educational process," said William Wallace, O.D., MediVision's vice president of professional services.

MediVision is the nation's largest medical group dedicated to eye health care. MediVision's 28 diagnostic and surgery centers provide secondary eye care services.

### Sola Announces Promotion Programs

"Grow With The Best" is the theme of Sola Optical's Spring/Summer 1990 Co-Opportunity campaign. The campaign is designed to help independent dispensers expand their practices with XL and VIP progressives and SmartSeg, the advanced flat top that recently won the OLA's 1989 "Best in Lenses" award.

The Co-Op Program includes a patient newsletter, co-op advertising, and patient recall postcards. Participating dispensers will receive, free of charge, 250 to 1,000 copies of the seventh edition of "Eyecare Update," Sola's informative and entertaining patient newsletter. Sola will also pay each participant \$250 in XL, VIP, and SmartSeg coupons toward the costs of mailing the newsletter.

A multi-media, Co-Op advertising program, in which Sola pays from 50% to 100% of advertising costs for XL, VIP and SmartSeg, is also offered to participating retailers. These payments will be made in XL, VIP and SmartSeg coupons.

"It's more important than ever for independent dispensers to stay competitive," says Mark Sachs, director of marketing. "Providing patients with quality lenses like XL, VIP and SmartSeg is the first step. The second is telling patients about these products. Sola's Co-Op program helps dispensers do just that—in a way that's both professional and economical."

Eyecare professionals can choose one or all of the above Co-Op elements. For information, call Sola's Customer Service Hotline at (800) 358-8258.

### Wesley-Jessen Award Program for Optometry Students

Wesley-Jessen has established a scholarship program for third and fourth year optometry students called "Aquaflex Excellence Award," designed to further the understanding of contact lenses and cornea-related issues.

Three student research papers written between January 1, 1989, and March 9, 1990, will be selected as winners by an independent panel of distinguished judges. The papers cannot be previously published or presented before a major eye care meeting. Papers should contain new research; literature review papers will not qualify. The criteria for selection

include quality of research, written presentation and originality of topic.

First place honors will include a \$3,000 scholarship, plus an all-expenses paid trip for two to the Educational Symposium of the American Optometric Association's Contact Lens Section, which is being held in Hawaii in June 1990. Plans call for the research to be presented at the symposium.

Second honors will receive a \$2,000 scholarship. Third honors will receive a \$1,000 scholarship.

All eligible participants will receive a complimentary Aquaflex Fitting Set.

### Allergan Optical Offers Marketing Support to Practitioners

Allergan Optical has introduced the Hydron® ECHELON™ Lens Practice Marketing System, an array of marketing tools and educational materials for use with the new Hydron ECHELON (polymacon) Bifocal Hydrophilic Contact Lens.

Designed to aid practitioners in expanding and marketing their practices, the system shows practitioners how programs such as advertising and public relations can help a practice grow with economical and easy-to-implement marketing efforts. The materials are devised to reach both professional and consumer audiences and include statement stuffers, counter cards, posters, brochures, in-office videos, print, radio and television advertising, press releases and photos.

"The potential for practice-building is enormous," said Allergan Optical Senior Product Manager Patricia Townsend. "Of the estimated 27 million presbyopes in the United States, about 70,000 currently wear multifocal contact lenses. There is a large, untapped contact lens market and a large number of these new patients are viable candidates for the Hydron ECHELON lens."

At the same time, Ms. Townsend notes, it is important for practitioners to be comfortable in assessing potential candidates and in knowing how to fit the Hydron® ECHELON™ lens accurately. "Our professional education materials, fitting guides and fitting videos, for example, specifically address these issues."

The Hydron ECHELON lens is the first diffractive soft bifocal contact lens cleared for marketing in the United States. According to Ms. Townsend, the lens offers many advantages for practitioner and patient alike: it is easy to fit, comfortable to wear, provides good visual acuity, can be prescribed for a wide variety of patients and is compatible with all soft contact lens care regimens. Practitioners now have a reliable, high-performance contact lens as an option for the ever-increasing presbyopic population.

For more information, contact Allergan Optical, 185 Crossways Park Drive, Woodbury, NY 11797, 800/645-7544 (in New York 800/632-7526).

The Hydron ECHELON Bifocal Hydrophilic Contact Lens joins the growing line of innovative contact lenses introduced by Allergan Optical, including the Hydron® Ultra T™ (polymacon B) Toric Hydrophilic Contact Lens and the

ALLERGAN ADVENT® (flurofocon A) Contact Lens.

Allergan Optical is a division of Allergan, Inc., one of the world's leading eye care companies. Allergan, Inc., based in Irvine, California, is comprised of six business units: Allergan Pharmaceuticals—prescription and nonprescription eye care products; Allergan Optical—contact lenses and lens care products; Allergan Medical Optics—intraocular lenses (IOLs) and surgical ophthalmic products and services; Allergan Humphrey—microprocessor-based ophthalmic diagnostic instruments; Herbert Laboratories—prescription and nonprescription skin care products; and Allergan International, which markets Allergan's products around the world.

### Stroupe Named New President of Wesley-Jessen

Charles M. Stroupe is the new president of Wesley-Jessen Corp. Stroupe took over the helm of the company on January 17, following the resignation of Grady Deal.

Stroupe comes to W-J from Schering Laboratories in Kenilworth, NJ, where he was senior vice president of marketing and sales. Like W-J, Schering Laboratories is a subsidiary of pharmaceutical giant Schering-Plough Corp., Madison, NJ.

Before joining Schering in 1988, Stroupe was vice president of marketing for the Rorer U.S. division of Rorer Group, Inc., Fort Washington, PA. Previous to that he was director of product management for the Revlon Health Care Division of Revlon Group, Inc., Tarrytown, NY.

## CALENDAR

**March 15-18**

ASCO National Conference on  
Basic Science  
Washington, D.C.

**March 30-April 1**

ASCO Board Meeting  
Forest Grove, Oregon

**April 20-21**

ASCO/Vistalux  
Optics Faculty Meeting  
Tucson, Arizona

**June 23-25**

ASCO Annual Meeting  
Hawaii

**June 27-30**

National Association of Advisors  
for the Health Professions  
San Diego, California

**October 19-21**

ASCO Board Meeting  
Annapolis, Maryland

# A Clinical Curriculum Model for Training Fourth-Year Optometry Students

Roger J. Wilson, O.D.

## Abstract

*The scope of optometric practice has widened as a result of legislative efforts during the 1970s and 1980s. These changes are mirrored in a standard of care which routinely includes the medical management of a variety of ocular conditions. The New England College of Optometry (NEWENCO) has developed a dynamic clinical curriculum which is responsive to these trends in optometric practice. This curriculum design utilizes external clinical affiliates as an integral part of the fourth-year training process. Educational opportunities in primary, secondary, and tertiary care settings provide our students with a wide range of patient care experiences. This paper describes the curriculum model adopted by NEWENCO to train fourth-year students. Details of this curriculum model are provided to assist other schools and colleges of optometry that may be interested in developing similar training programs.*

**Key words:** clinical curriculum model, external clinical program, training optometry students

In the early 1980s, the national trend in legislation governing the practice of optometry was well developed with respect to the use of diagnostic pharmaceutical agents in the routine care of patients. Optometry's leadership then lobbied for

therapeutic privileges as the scope of care widened. In response to these legislative agendas and the 1978 ASCO report outlining a curriculum model for optometry schools,<sup>1</sup> the New England College of Optometry embarked on the development of a new clinical curriculum plan for the training of fourth-year students.

The first phase of planning was to accept as the basis of our curricular goals the comprehensive definition of a primary care optometrist put forth by the ASCO curriculum model.<sup>1</sup> Next, a plan was developed for training students to achieve these and other internally agreed upon curricular goals. This plan involved the restructuring of the didactic and clinical curricula at the College.<sup>2</sup> The outcome of these efforts provided our students with a fourth year of training entirely clinical in nature.

The challenge was to provide a comprehensive clinical experience for each student which would address the expanding definition of primary care optometry. Clinical rotations were needed which would provide students with experience, training and increasing responsibility in the diagnosis and management of patients' problems. Other clinical experiences were needed where students would learn how to manage problems beyond the scope and abilities of a particular setting (and sometimes beyond the scope of individual state laws governing the practice of optometry; for example, Massachusetts does not have therapeutic pharmaceutical agent statutes).

During the second and third years of clinical training at the New England College of Optometry (NEWENCO), students are taught primary care philos-

ophy. The problem-oriented record-keeping system has been adopted as a uniform method of providing care to patients and as a teaching tool to assist students in the development of their clinical thinking skills.<sup>3,4</sup> Students are evaluated with the Problem-Oriented Evaluation Matrix developed by Heath et. al.<sup>5</sup> that uses predetermined descriptors of desired performance in the areas of technique, knowledge and analysis.

With primary care problem-oriented philosophy stressed in the early part of the clinical program and with the didactic curriculum expanding to address optometry's role in the treatment and management of ocular disease, the groundwork was laid for an innovative fourth year clinical training program to commence. This plan included the aggressive development and expansion of new clinical rotations (affiliations) that would meet our curriculum goals. Our students were to graduate as experienced primary care optometrists.

The development of the external clinical program was a gradual and orderly process. In the 1970s the College was approached by some of the inner city health centers and asked to assist in the establishment of their eye clinics. The momentum for affiliation status continued with some of the Boston-based Veterans Administration Medical Centers. Over the years NEWENCO graduates who were trained in these original sites went on to work in settings where future affiliations were established. This trend continued and evolved into the extensive network of affiliates the College currently maintains.

The curriculum model described in this

*Dr. Wilson is an associate professor of optometry at the New England College of Optometry and director of external clinics. He is also the associate director of eye care services at the Dorchester House Multi-Service Center.*

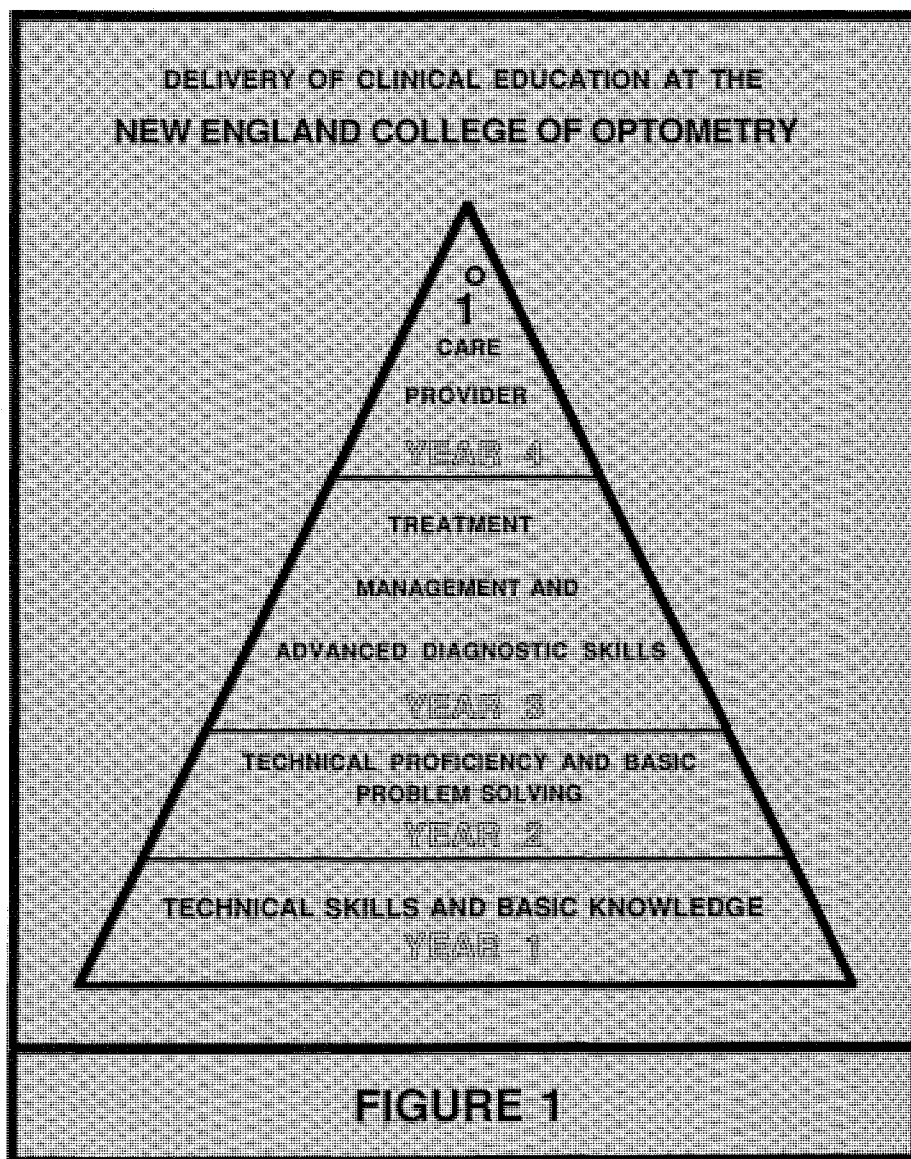


paper addresses the needs of our expanding professional abilities to treat more of our patients' problems by training our students in areas beyond the traditional scope of practice. Emphasis has been placed on developing affiliations with multidisciplinary sites, interdisciplinary co-management centers, and hospital-based rotations. This approach to optometric education is consistent with the expanding scope of practice of optometry<sup>6,7,8</sup> as well as other educators' views on the subject of training sites outside the "walls" of the schools and colleges of optometry.<sup>9,10</sup> In effect, this curriculum model has enabled NEWENCO to routinely train students in a mode of practice approximating the level of competency states require of newly-licensed practitioners. This training includes the use of therapeutic pharmaceutical agents.

The purpose of this paper is to review the existing clinical curriculum design for fourth-year students at NEWENCO and demonstrate how this unique use of multiple external affiliated clinics can fulfill curriculum objectives. The author believes that this clinical curriculum model meets the demands of our changing professional responsibilities by utilizing a wide variety of settings. The expertise of the clinical educators at these affiliates encompasses all levels of optometric practice. This model is described in detail to assist other schools and colleges that are considering the development of external clinical programs for the training of their students. (See Figure 1)

### Overview of Primary Care Clinical Curriculum

Clinical training at NEWENCO begins in the internal clinic (the Boston Optometric Center) at the start of the second year. Students are scheduled for one-half day per week in patient care. This includes routine eye examinations, vision screenings, and the eyeglass dispensary. Each student is scheduled for a two-week fulltime rotation during the summer quarter between the second and third year. The clinical program intensifies during the third year. Students are scheduled one day per week for regular patient care, vision screenings and the dispensary. Specialty clinics (visual fields, ophthalmology, contact lens, and ocular photography) and binocular vision cases comprise the remainder of the third-year clinical curriculum. Third-year students who achieve "honors" grades at the Boston Optometric Center are eligible for an alternative assignment at a local external



<b>FIGURE 2: TRIAD OF HEALTH CARE</b>			
<b>CHARACTERISTICS</b>	<b>PRIMARY</b>	<b>SECONDARY</b>	<b>TERTIARY</b>
<b>AMBULATORY CENTER</b> • MULTIDISCIPLINARY/COMPREHENSIVE • PATIENT MAKES OWN APPOINTMENT • MEDICAL CAPABILITY	X		
<b>CONSULTATION CENTER</b> • INTERDISCIPLINARY • APPOINTMENT ARRANGED • SPECIALIZED CARE • SURGICAL CAPABILITY		X	
<b>REHABILITATIVE CENTER</b> • MULTIDISCIPLINARY • APPOINTMENT ARRANGED • REHABILITATIVE CARE • MAX/OOTHER INTERVENTION			X

**PRIMARY CARE DESIGNATED ROTATIONS  
ALL ARE LOCATED IN BOSTON**

**BRIGHTON MARINE PUBLIC HEALTH CENTER  
DIMOCK COMMUNITY HEALTH CENTER  
DORCHESTER HOUSE MULTI-SERVICE CENTER  
E. BOSTON NEIGHBORHOOD HEALTH CENTER  
MARTHA ELIOT HEALTH CENTER  
NORTH END COMMUNITY HEALTH CENTER  
S. BOSTON NEIGHBORHOOD HEALTH CENTER  
SOUTH END COMMUNITY HEALTH CENTER  
UPHAM'S CORNER HEALTH CENTER**

**FIGURE 3**

clinic. This "external module" experience benefits the student by providing him/her with a greater number and variety of patient encounters.

Fourth-year students are placed in three different clinical settings, each with its own unique patient populations. These settings provide a broad "real world" type of experience to the student who can select from approximately 50 different clinical affiliations located in the Boston area, in the New England region and across the nation. The College also maintains two international affiliations. Each clinical rotation is approximately 12 weeks in length. The student is required to attend three clinical quarters out of the four quarters in the fourth year. The fourth quarter may be used for additional training.

The external clinical curriculum is designed to assist each student in developing the skills of a primary care practitioner and to expose our students to a variety of modes of practice, including specialty areas. Patient care extends beyond the immediate visual problems of each patient. Comprehensive care includes preventive diagnostic techniques, treatment of diseases, management of acute and chronic visual and systemic conditions, evaluation of socio-economic factors and psychological issues, and most importantly promotes patient education as a mechanism to enhance compliance and follow-up care. Students learn how to function as primary care providers who take an active role in the well-being of each patient by coordinating other aspects of care such as consultations with

specialists or referrals to other professionals.

The concept that we have adopted in the curriculum design is one which recognizes the three levels of care customarily included in the triad of the health care system in this country.<sup>11</sup> Our clinical rotations accordingly are divided into three categories to assist us in placing students in three clinical sites that approximate these three levels of care. The rotations are defined in terms of distinct curricular areas: "**primary care curriculum**" rotations, "**secondary care curriculum**" rotations, and "**tertiary care/elective curriculum**" rotations. (See Figure 2)

The **primary care rotation** is designed to provide the student with a wide range of patient ages and problems. The patients at these sites are generally coming for "routine" care. For planning purposes, these rotations are located exclusively at neighborhood health centers within the greater Boston area. These centers are ambulatory, multidisciplinary sites where optometry is one of many services offered to patients. These rotations represent the primary point of entry for these patients into the health care system. The clinical preceptors are closely aligned with the College's programs, with many being employed directly by the College. Students gain experience in a wide range of areas including refraction, contact lenses, spectacle ordering, verification and dispensing, visual fields, ocular photography, binocular and accommodative disorders as well as strabismus and low vision cases that can be handled at a primary care level.<sup>12</sup> In the course of the examination the student may diagnose other problems (visual/ocular, medical psychosocial, etc. . . .) that may require further care. These clinics routinely use diagnostic pharmaceutical agents and commonly use therapeutic agents for the treatment of anterior segment disease and glaucoma.

The **secondary level care rotations** are defined as those settings that will teach students how to make advanced diagnoses and treat many ocular and oculo-systemic diseases. Secondary care rotations were developed to enhance students' competencies in the treatment of anterior segment disease and glaucoma, to teach students how to treat and manage posterior segment disorders and diseases, to teach pre- and post-surgical care, to teach (by observation and follow-up care) techniques using laser treatment and fundus fluorescein angiography, and

to gain experience in the co-management concept. Patients at these sites often have a diagnosed problem that cannot be managed at the primary care site or have a problem where a consultation is needed. Unlike the primary care setting, appointments for these patients are often arranged by the primary care optometrist. They are usually institutionally based and/or interdisciplinary in the delivery of services in a co-management setting where optometry and ophthalmology work together in caring for and managing the patient.<sup>13</sup> Accredited postgraduate residency programs at many of these hospital based sites intensify the training process for fourth-year externs.<sup>14</sup>

Finally, **tertiary care rotations** are clinical settings where our students learn how to care for patients with chronic and debilitating diseases and/or challenging visual, perceptual, or behavioral problems, often on a long-term basis. Rehabilitation is the goal at these sites. They are most often multidisciplinary so as to assist patients in the most complete management of their problem(s) by offering expertise in alternative approaches to problem solving. As these patients already have a diagnosis of a chronic or debilitating visual loss, the appointments at these facilities are also typically arranged by the primary or secondary care doctor.

For example, an intense low vision experience can be gained through the rotation at the Eastern Blind Rehabilitation Center of the Veterans Hospital in West Haven, Connecticut. The Joslin Diabetes Center/Beetham Eye Unit rotation offers our students a complete experience in the care and management of diabetic patients. Other examples of rotations in this group include the Gesell Institute for Human Development and the Specialty Services rotation within the College's Boston Optometric Center. The Gesell Institute offers students an opportunity to work with specialists in the fields of behavioral and developmental optometry. The Specialty Services rotation emphasizes pediatric optometry and vision training, experience in providing care to handicapped children, the latest techniques in the treatment and management of strabismus, and some exposure to electrodiagnostic techniques, advanced color vision testing, and low vision experience. (See Figures 3, 4, 5)

The placement of students in both a primary care rotation and a secondary care rotation is mandatory. Because of the limited number of tertiary care affiliates, the third portion of the external clinical

SECONDARY CARE DESIGNATED ROTATIONS	
AZAR-MEDIVISION NEW ORLEANS, LA	VAMC BEDFORD, MA
BOULDER VALLEY EYE CLINIC/SURGICAL CENTER BOULDER, CO	VAMC BROCTON, MA
CAPITAL EYE CONSULTANTS FAIRFAX, VA	VAMC FORT HOWARD, MD
CENTER FOR SIGHT VENICE, FL	VAMC-JAMAICA PLAIN BOSTON, MA
EYE FOUNDATION OF UTAH SALT LAKE CITY, UTAH	VAMC MANCHESTER, NH
OMNI EYE SERVICES ATLANTA, GA	VAMC NEWINGTON, CT
OMNI EYE SERVICES BALTIMORE, MD	VAMC NORTHAMPTON, MA
OMNI EYE SERVICES ISELIN, NJ	VAMC PROVIDENCE, RI
OMNI EYE SERVICES NEW ORLEANS, LA	VAMC VANCOUVER, WA
OMNI EYE SERVICES PHOENIX, AZ	VISUAL HEALTH & SURGICAL CENTER OF MIAMI N. MIAMI BEACH, FL

FIGURE 4

cal curriculum is referred to as the **tertiary/elective care** rotation. In fulfillment of this requirement the student is able to select from rotations that emphasize primary care, secondary care, or tertiary care. This elective curriculum allows the student to develop competencies in an area of intended specialty or enhance the experience within a particular level of care most suited to the student's developing mode of practice.

The anticipated outcome for the placement of students in three distinct clinical settings is to provide the student with a

well-balanced clinical experience. At the same time, we wish to take into consideration the various requirements for licensure and practice in different states.

### The Clinical Rotation Assignment Format

The format for developing the clinical rotations assignment for each student takes into consideration the requirements for graduation and the College's academic calendar. The requirements for graduation within the fourth-year curricu-



lum include three assigned quarters of external rotations and two contact lens clinic rotations. (See Figure 6)

The contact lens rotations are assigned within the College's own contact lens service at the Boston Optometric Center. The didactic curriculum relating to contact lenses, including laboratories, has been scheduled to finish prior to the start of the fourth year. This plan assists us in scheduling each student with one contact lens rotation during the third year and the other in a compatible (Boston-based) quarter during the fourth year.

The fourth year operates on a quarter system, with each clinical quarter being approximately 12 weeks in duration. For ease of scheduling, the calendar roughly follows the seasons so that our quarters are referred to as the "summer," "fall," "winter," and "spring" quarters.

To assist our students in planning for their fourth year, the director of external clinics assigns a fourth year "off" quarter to all students at the beginning of their second year of optometry school.

This process is random except in cases of marginal students. The director of external clinics meets privately with the Student (Academic) Affairs Committee and selected first-year faculty to confidentially identify students who are likely to have academic and/or clinical problems in the coming years. This is accomplished by reviewing academic and preclinical laboratory performance (which assesses technical skills, knowledge base, analytical ability, and interpersonal skills). These students are then assigned the "winter" quarter as "off." This schedule allows the student to attend two clinical rotations during the summer and fall quarters of their fourth year, have the winter quarter "off" (available to do an additional quarter of clinic if problems are identified in the first two rotations), and have the spring quarter scheduled as their final rotation. This system allows us to prepare for the remediation of a potentially weak student during their "off" quarter if the need arises, while being sensitive to the student's concern for graduating on time and being eligible to take state board licensing examinations.

Since approximately 25% of each class is scheduled with the spring quarter as "off," these students will have technically completed their requirements for graduation by the end of the winter quarter (around March 1) each year. To some observers, this design represents a concern in that there is a period of time that elapses between patient care and licens-

TERTIARY CARE / ELECTIVE ROTATIONS	
34th GENERAL ARMY HOSPITAL AUGSBURG, GERMANY	LAHEY CLINIC MED CTR BURLINGTON, MA
BROOKE ARMY MED CTR SAN ANTONIO, TX	LEAHEY EYE CLINIC, INC. LOWELL, MA
HADASSAH HOSPITAL JERUSALEM, ISRAEL	NEW ENG COL OPTOMETRY SPECIALTIES SERVICE BOSTON, MA
INDIAN HEALTH SERVICE PUBLIC HEALTH SERVICE NEW MEXICO	OPTICARE EYE HEALTH AND VISION CENTERS WATERBURY, CT
JACKSONVILLE EYE CTR JACKSONVILLE, FL	VABRC (BLIND REHAB) WEST HAVEN, CT
JOSLIN DIABETES CTR BOSTON, MA	WESTERN MA ST HOSP WESTFIELD, MA

FIGURE 5

ing examinations. However, these students all have the option of taking a voluntary extra rotation (which is not graded and is *non-tuition based*) to maintain their skills. These voluntary assignments may be either full-time or part-time and are arranged on an individual basis with the director of external clinics.

The **contact lens service** operates during evenings and Saturdays. This arrangement has been convenient for patients and has minimized scheduling conflicts with students assigned to the Boston-based external clinics. This plan also enables us to offer students two opportunities in clinical training at sites away from Boston if they desire a more diverse fourth year. Because three of the four quarters in the fourth year are assignable to external rotations, the second contact lens rotation can occur either during students' Boston-based primary care (day-time) rotation or during their "unassigned" fourth quarter. (See Figure 7 of sample schedule)

## The Placement Process

In order for the placement of students to occur in a systematic fashion that takes into account the College's requirements and the students' individual requests, a Placement Committee was formed. The committee members include the director of external clinics as chairperson, the director of student tutorial services, the coordinator of the second year clinical curriculum, and the coordinator of the third year clinical curriculum.

The key months for this activity are September through December of each academic year. In September, the director of external clinics meets with the third year class to distribute placement information and to explain the placement process. The months of October and November are dedicated to the assignment of students to their rotations. The results are published in early December. This calendar of events has several advantages. By placing students into fourth year rotations while they are still in their

third year of training, there is time for the students to plan decisions for taking national board exams, working and family/living considerations, and for making travel plans. We have found that it is especially helpful to our students if we publish their clinic rotation schedules prior to the school break in December.

At the initial meeting in September, the class receives two important documents:

- **The rotation handbook**—a compilation of detailed descriptions of all clinical rotations offered. This handbook is updated annually.

- **The clinic rotation selection form**—which each student completes and submits to the Placement Committee. The selection form includes financial aid information pertaining to the repayment of students' loans (grace periods differ for students who graduate at the end of the winter quarter versus spring quarter), the tuition policy for the fourth year, travel policies pertaining to external clinics, and goals and objectives of the fourth year. The external clinic program is summarized in this document and the rationale for the patient care triad (primary, secondary and tertiary care rotations) is discussed. Strategies for placement activities are reviewed.

The selection form divides the clinical rotations into three main groups corresponding to the primary care, secondary, and tertiary/elective care affiliates. The students are instructed to rank order their preferences within each group so that the Placement Committee will know their priorities. The last page of the selection form is the "ideal rotation schedule" sheet. Space is provided for three different preferred sequences, the first of which is considered "ideal." The other two sequences serve as "back-ups" if the ideal slots are already assigned to other students. Knowing the students' priorities in conjunction with their ideal requests considerably facilitates the placement process.

Communication is essential when educating the students about our placement process. There is an active and ongoing dialogue between the class and the director of external clinics during the entire process. In addition to distributing handbooks and forms, the director explains how the Placement Committee will make assignment decisions for each student.

For example, some of our affiliated clinics may take only one student per quarter while others take as many as seven. The odds of being assigned to a clinic vary according to the number of

slots available, when the student is assigned in the placement process, and the student's abilities.

The students are advised to be as flexible as possible with their requests. They are asked to make a personal self-assessment which includes their clinical grades, rank in academic coursework, which quarter they have "off," the number of slots available at each clinic they are interested in attending, understanding when they are likely to be placed in the sequence of events, their ability to work independently, their level of self-confidence, and any personal or educational restrictions that might help or hinder their assignments. The class is also educated about the College's responsibility to treat each student fairly no matter what their rank or abilities. The art of compromise is discussed so that the students can appreciate the need for the College to provide every student with a balanced and educationally sound schedule in the fourth year.

To commence the placement activities and make placement decisions, the following information is accessed: the academic record, the clinical record, financial aid data (as needed), and the students' preferences for clinical rotations.

Traditionally, the committee places the highest 20 students (primarily by academic rank) in the first phase. The next group to be placed are the 20 students who are academically ranked as the lowest and those students who have been identified as potentially weak clinicians. The purpose is to ensure that weaker students can be placed in clinics where the environment is highly structured and the preceptor will have ample time to spend

with the student. By placing this group early, the committee also is able to advance the students in a consecutive fashion so that their skills and knowledge base are gradually challenged through the academic year. (These are usually the same students who are given the winter quarter "off" so that they have a preprogrammed time slot for remedial work if needed.)

The last group to be placed is the middle of the class. This is done on a random basis. The class is fully advised of this process. The director of external clinics explains the limitations of this system and asks the understanding and cooperation of the class, particularly in this case of the "middle class" group. Five years of experience utilizing this approach has yielded few problems with dissatisfied students or poorly sequenced clinical schedules.

## Student Evaluation

Fourth-year students are evaluated using the same concept and format as that used with second and third year students at the College. The Problem-Oriented Evaluation Matrix (POEM)<sup>5</sup> was developed by clinical faculty at the New England College of Optometry to provide students with periodic skills assessment. The POEM matrix adapts the goals and objectives of the fourth year to the evaluation form. Student competencies are defined in terms of descriptors in the areas of technique, knowledge and analysis. As the student proceeds through the three clinical quarters the descriptors that apply to each rotation change with re-

## CORRECTION

The article, "High Test Reliability: Cause for Celebration or Concern," co-authored by Drs. Jack E. Terry and Leon J. Gross, and published in the winter (Vol. 15, 2) issue, contained a data table with a missing entry. The correct Table 2 (originally published on p. 48) follows. JOE regrets the error.

TABLE 2  
Comparison of Test Items and Examinees

Item Type	Number of Items	All Examinees	Upper Third	Lower Third	Mean Discrimination (All Examinees)
Diagnostic (assumed)	7	77.0	89.7	66.0	30
Therapeutic (taught)	50	88.1	96.1	79.9	23
TOTAL	57	87.0	95.4	78.3	24

In addition, for the CE examination results reported in the text of the article, the reliability was .70.

spect to the level of competency expected. These predetermined competency areas are evaluated at mid-quarter and at the end of each quarter. Students who are determined to be at risk for clinically related problems are also evaluated at two weeks. At the end of the third (and final) quarter of clinic the students are expected to be at a level of practice where they can easily pass any state board examination and enter the profession as a capable primary care optometrist.

### Clinical Preceptor and Site Evaluation

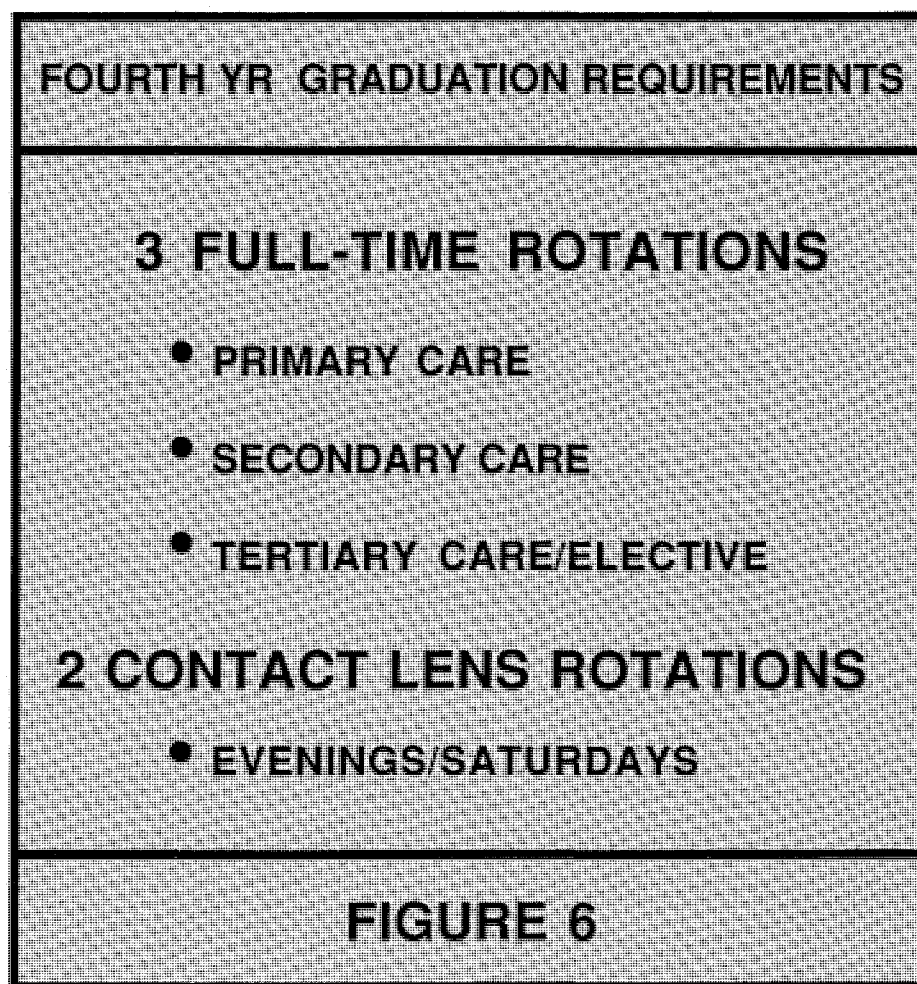
The evaluation system in place for the external clinical program consists of direct and indirect documentation. Students are required to submit patient encounter logs, a site evaluation form, and a clinical preceptor evaluation form at the end of each rotation. The evaluation system in place at the New England College of Optometry is similar to that in place at other colleges.<sup>15</sup>

The **Patient Encounter Logs** provide direct feedback to the College about the numbers, age ranges, problems, and treatment/management modes of practice at each site. The logs allow us to keep track of the types of patient experiences our students receive, thereby enabling the refinement of the assignment of affiliations to one of our three clinical rotation categories. Patient logs also are required for administrative purposes, insurance statistics, and accreditation.

The **Site Evaluation Form** asks the students to describe in written format the clinical and educational attributes of their preceptor(s), the equipment at the site (in terms of quality, quantity, state of repair, etc. . . .), the overall patient base, learning experiences at the rotation (we require the student to report the use and frequency of use of both diagnostic and therapeutic pharmaceutical agents in this space), problems at the rotations, and their proposed solutions to the stated problems.

The third type of evaluation is the **Clinical Preceptor Form**. The student is asked to quantify (from "not at all descriptive" to "very descriptive") their preceptor's skills in the areas of professional breadth, instructor-student relationship, and doctor-patient relationship.

These forms assist the director of external clinics in managing the curriculum and monitoring individual sites. Each quarter all preceptors receive photo-



copies of the previous quarter's student evaluations. This direct feedback to the individual doctors allows them to adjust teaching strategies for future students.

The final feature of the external clinics evaluation protocol is the periodic on-site visitations. The goal is to conduct a formal site evaluation of each affiliate every two to three years. Curriculum objectives, educational process, student evaluations, and any concerns are discussed. A report summarizing the site visit is written by the director of external clinics. A copy is sent to the affiliate along with recommendations for improving the teaching program. Occasionally, site visits are conducted by other members of the faculty who may be visiting the general area where an affiliate is located. The inability to conduct regular visits at distant affiliates (especially international sites) represents a significant administrative challenge for the College. This problem is managed by carefully selecting only highly qualified students for these rotations, and by maintaining a constant dia-

logue with the preceptor via correspondence and telephone conversations until a site visit can be arranged.

### The Clinical Affiliation Process

In order to qualify as a clinical affiliate of the New England College of Optometry, the optometrist from the proposed site (the primary preceptor) must complete an application and forward a curriculum vitae and personal references to the director of external clinics. This process is followed by a "site visit" where the practice is evaluated with respect to providing the resources necessary to properly train the College's students. We require that the students participate in the "direct" care of patients and that they have full-time use of a fully equipped examination room. A complete reference library is also essential for affiliation.

The full-time presence of the main preceptor (who must be an optometrist) is a requirement for all affiliates. This individual typically has experience in clinical education or has engaged in post-



ROTATION	CLINICAL QUARTERS					
	THIRD YEAR			FOURTH YEAR		
	WINTER	SPRING	SUMMER	FALL	WINTER	SPRING
PRIMARY CARE			X	OFF		
SECONDARY				OFF		X
TERTIARY OR ELECTIVE				OFF	X	
CONTACT LENS	X			OFF		
CONTACT LENS				OFF	X	

**FIGURE 7: SCHEDULING EXAMPLE**

graduate training. A record of scholarly activity also is desirable. Other providers at the site (ophthalmologists, internists, psychologists, etc. . . ) are encouraged to participate in the training of our students.

If approved, a **"Memorandum of Affiliation"** is signed by both parties and the optometrist is granted **Adjunct Clinical Faculty** status. This legal document ensures that our students will receive thorough training according to the College's rigorous standards.

## Conclusion

The New England College of Optometry has developed a dynamic clinical curriculum model for training fourth-year students in the expanding practice of optometry. The program consists of three clinical rotations that train students in a philosophy of health care which embraces primary, secondary and tertiary care. Our clinical program is constantly changing in response to the changes in the scope of practice of optometry.

By adding new clinical rotations we have been able to offer our students clinical

training opportunities that are beyond the scope of practice according to our state laws. The chief problem with such a program is in dealing with the more distant sites. While an ongoing dialogue exists between the College and each individual preceptor and student, the College's ability to influence teaching and training is diminished at some sites. This is particularly true for affiliates where the optometrist is not employed by the College.

However, the training opportunities at many of these sites cannot be duplicated. The number of nationally recognized experts within optometry who serve as affiliated preceptors to the New England College of Optometry is growing under our external clinical program. Many of the other schools and colleges of optometry have similar external training programs utilizing these same sites to train their students.

The schools and colleges of optometry have a responsibility to provide training opportunities to their students that approximate the level of professional services available to patients in any state at any given point in time. A dynamic

fourth-year clinical curriculum that complements early clinical training begins to fulfill that responsibility.

The fourth-year clinical curriculum developed at the New England College of Optometry has been described in this paper to assist other schools and colleges that are considering the development of external clinical programs for the training of their students.

## Acknowledgements:

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For additional information and details on the process of establishing and developing external clinical affiliates, please contact the author at the New England College of Optometry, 424 Beacon Street, Boston, Massachusetts 02115.

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# Attitudes of Optometry Students Toward the Disabled and the Visually Impaired

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## Abstract

*A negative attitude by optometrists toward the visually impaired can have a detrimental effect on the outcome of the rehabilitation process. The purposes of this study were to determine if (1) the attitudes of optometry students could be changed with structured experimental treatments; (2) any attitude change that did occur could be maintained over a short period of time; (3) differential treatment effects would occur due to different types of treatments. Students were assigned to one of four groups and presented either with films about blindness, a panel discussion with low vision consumers, both films and the panel discussion, or a control group that received no treatment. The results of this experiment suggest that attitudes did not change following the experimental treatments. Implications of this research for the present optometric curriculum will be presented.*

**Key words:** Attitudes, optometry students, visual impairment, handicapped

When the blind enter the health care delivery system, ophthalmologists and optometrists may be among the first professionals who are encountered. The attitudes of eye care specialists are vital to the quality of care provided to the blind consumer. Optometrists, as health care providers, have assumed an ever-

increasing role in the delivery of health-related services. Their strong alignment with the medical profession and their desire for close identification with the medical community place the optometry student in a learning environment similar to that of the medical student whose training is largely the acquisition of factual information.

Optometric education stresses factual information specifically related to visual sciences. Skills of decision-making and logical reasoning and the acquiring of appropriate attitudes toward handicapped patients are not developed deliberately or systematically in the present curriculum. Optometry students are instructed in pri-

mary care optometry, which allows for relatively few courses to effectively deal with the handicapped consumer or with the patient who cannot be helped by conventional optometric procedures.

Negative attitudes of health care professionals affect the handicapped patient's ability to obtain appropriate health care services. Visually impaired consumers often have difficulty obtaining services beyond those involving medical intervention.

## Changing Attitudes

When federal legislation of the 1970s mandated movement toward the integration of handicapped children, professionals and advocates began to search for effective methods to break down barriers of uncertainty and prejudice on the part of teachers, students and other service providers.<sup>1,2,3</sup> Techniques used in attempts to produce attitude changes toward disabled persons have been classified into the following categories: (1) direct or indirect contact with or exposure to disabled persons, (2) information about disabilities, (3) persuasive messages, (4) analysis of dynamics of prejudice, (5) disability simulation and (6) group discussion.<sup>4</sup> As described by Donaldson,<sup>4</sup> all conclusions from this literature must be tentative. However, of the six techniques, the first has had the clearest positive effect on attitudes.<sup>5,6</sup> It does appear that interaction with the disabled provides the greatest opportunity for attitude change but this interaction does not guarantee positive attitude change. Positive, or nonstereotypic attitudes will occur



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only if the disabled and nondisabled are of at least equal status and/or if the disabled do not present themselves in a stereotypic manner.<sup>5,7,8,9,10</sup>

The general area of concern in this research was to investigate the attitudes of optometry students toward the disabled and the visually impaired. The specific purpose was to determine what effects, if any, a variety of structured experimental treatments may have on optometry students' attitudes. In analyzing this issue, the researchers also examined whether changes in attitudes, when they did occur, were maintained over a short period of time. The third and final purpose of this research was to determine what differential effects, if any, occurred as a result of a variety of structured experimental treatments. The researchers were interested in whether one type of treatment had a greater effect on attitude than another.

## Method

### Subjects

The subjects for this experiment were second- and third-year optometry students at a private East Coast college of optometry. Each class had 149 students for a total sample of 298. Students were placed in a non-random fashion, alphabetically, into one of four research groups. For each class, one group of students acted as a control group while three other groups received different experimental treatments. The type of treatment each group received was determined in a random fashion.

To demonstrate that the two classes were not different from each other upon entry to optometry school, *t*-tests were completed on three sets of data. First, a *t*-test for age,  $t(296) = .03$ ,  $p > .05$ , suggested no difference for age upon entry to optometry school. Second, a *t*-test for OCAT scores,  $t(206) = 1.57$ ,  $p > .05$ , showed that no significant difference existed on OCAT scores. (In 1987 the OCAT was renamed OAT, the Optometry Admissions Test.) Finally, the distribution according to gender was examined. The second-year class had 109 males and 40 females while the third-year class had 110 males and 39 females, indicating that no difference existed according to gender. Based on these findings, it was concluded that the second- and third-year classes were not significantly different from one another. Therefore, subjects were grouped according to treatment received rather than class.

### Materials

Two self-report questionnaires were used in this research. The first questionnaire, the Attitudes Towards Disabled Persons (ATDP), attempts to measure attitudes toward disabled persons in general.<sup>11</sup> Each of the thirty statements suggests that disabled persons are either the same as or different from physically normal people. Two forms of the scale are available. Split-half reliabilities for the ATDP were established and ranged from .78 to .84.<sup>12</sup>

The second questionnaire was the Beliefs About Blindness Scale (BABS).<sup>13</sup> This is a forty-item scale of irrational beliefs. Responses are recorded on a 5 point Likert scale with high scores reflecting a more irrational belief about blind-

ness than low scores. Reliability of the BABS, using Cronbach's alpha for a sample of 100 blind patients' scores, was reported to be  $r = .83$ .<sup>14</sup>

### Procedures

The students were assigned to one of four treatment groups. The experimental treatments occurred during regularly scheduled laboratories. During the first lab meeting of the semester, all students were administered the ATDP and BABS scales with all responses made anonymously.

At the second meeting, six weeks later, group A received two audio-visual presentations. The first movie, *No Two Alike*, is a film designed for regular classroom teachers to show how blind and visually impaired children are integrated

TABLE 1  
Mean Scores and Standard Deviations:  
Attitudes Toward Disabled Persons

Posttest	Pretest	First Posttest	Second
Group			
A	120.80	128.77	119.70
SD	19.99	19.79	21.51
B	122.76	124.00	121.12
SD	17.34	18.85	16.24
C	119.63	130.37	121.74
SD	15.70	15.07	17.75
D	122.35	132.03	123.91
SD	16.65	18.51	18.22
GRAND MEAN	121.35	128.84	121.68
SD	17.42	18.13	18.43

TABLE 2  
Analysis of Covariance:  
Attitudes Toward Disabled Persons

Source	SS	DF	MS	F
Between				
Treatment	1584.69	3	528.23	2.32
Covariate	46296.17	1	46296.17	
Error	29792.06	131	227.42	
Within				
Time	3475.86	1	3475.86	38.57
Interaction	422.34	3	140.78	
Error	11804.88	132	89.43	



into a regular classroom. It shows a variety of professionals involved with visually impaired children, including optometrists. The second film, *What Do You Do When You Meet a Blind Person*, is a humorous portrayal of the most common stereotypes of blindness and offers constructive suggestions for interacting with the blind.

Group B served as the control group.

Group C participated in a discussion with a panel of two partially-sighted people. Both were in their late 20s or early 30s, college graduates, working professionals, and users of optical aids. One person was educated in a traditional residential school while the other had been one of the first mainstreamed students in the local public schools. They were

selected as potential peers of the optometry students. Each partially sighted person was given ten minutes to describe his/her life. Common issues were the perceptions of friends and family, the trials and tribulations of obtaining quality health care, specifically vision care, the challenges in entering the job market, and various light-hearted stories of a humanistic nature.

Group D received both the panel discussion and the movies.

At the conclusion of each group meeting, the ATDP and BABS were readministered. Six weeks following the experimental treatments, ATDP and BABS were readministered as a second posttest. Thus, the experiment had three measurements at six-week intervals.

## Results

### ATDP Analysis

Pretest and posttest mean scores and standard deviations for all groups are presented in Table 1.

At the pretest, the scores ranged from 119.63 to 122.76 with a grand mean of 121.35. At the first posttest, the scores ranged from 124.00 to 132.03 with a grand mean of 128.84. At the second posttest, the scores ranged from 119.70 to 123.91 with a grand mean of 121.68. The standard deviations for all groups ranged from a low of 15.07 to a high of 21.51 for an average of 17.99.

Repeated measures analyses of covariance were performed to determine if there were any statistically significant differences between the mean scores of the four groups on any of the dependent variables (Table 2).

The results of the ATDP analyses show that a significant main effect for treatment was not obtained  $F(3, 131) = 2.32, p = .078$ . The results also indicate that there was no significant interaction between type of treatment and time of testing  $F(3, 132) = 1.57, p = .20$ .

### BABS Analysis.

Pretest and posttest mean scores and standard deviations on the BABS for all groups are presented in Table 3.

At the pretest, scores ranged from 95.41 to 98.92 with a grand mean of 97.65. At the first posttest, the scores ranged from 93.26 to 98.35 with a grand mean of 95.18. At the second posttest, the scores ranged from 94.03 to 98.29 with a grand mean of 96.23. The standard deviations for all groups ranged from a low of 8.25 to a high of 13.55 for an average of 11.09. The reader is reminded that for the ATDP, the higher the score, the more positive the attitude while for the BABS, the lower the score, the more positive the attitude. Thus, a decline in scores from the pretest to posttest on the BABS represents more positive attitudes.

The same repeated measures analyses of covariance were used on the BABS data. No significant main effect was obtained from the analysis of the treatment data for the type of treatment  $F(3, 131) = 1.37, p = 0.25$  (Table 4).

Results in Table 4 also indicate that no interaction between type of treatment and time of testing was present  $F(3, 132) = 0.35, p = 0.79$ . Therefore, no significant effects were present.

TABLE 3  
Mean Scores and Standard Deviations:  
Beliefs About Blindness Scale

Posttest	Pretest	First Posttest	Second
Group			
A	97.67	95.00	97.37
SD	9.03	13.55	9.58
B	98.44	98.35	98.29
SD	10.10	10.72	9.00
C	98.92	94.21	95.45
SD	8.25	12.32	12.15
D	95.41	93.26	94.03
SD	11.94	12.81	13.17
GRAND MEAN	97.65	95.18	96.23
SD	9.53	12.30	10.98

TABLE 4  
Summary Table for  
Analysis of Covariance:  
Beliefs About Blindness Scale

Source	SS	DF	MS	F
Between				
Treatment	556.41	3	185.47	1.37
Covariate	12591.76	1	12591.79	
Error	17688.38	131	135.03	
Within				
Time	78.38	1	78.38	1.67
Interaction	48.95	3	16.32	.79
Error	6198.92	132	46.95	

## Discussion

The purpose of this research was to investigate the attitudes of second- and third-year optometry students toward the disabled and the visually impaired. Our specific concern was to determine what effects, if any, a variety of structured experimental treatments would have on the optometry students' attitudes. Additionally, the researchers were interested in the maintenance of these attitude changes over a short period of time. The final purpose of this research was to determine what differential effects, if any, would occur from the various experimental treatments.

Results of this experiment for both the ATDP and BABS suggest that no treatment effect occurred as a result of viewing films, participating in a panel discussion with low vision consumers, or experiencing both the films and the panel discussion. The question then became "Why did a change not occur?" The review of the literature suggested that the use of handicapped peers and the selection of audio-visual materials presenting handicapped persons in a nonstereotypical manner would enhance the changing of attitudes in a positive direction. This change did not occur. The possible reasons include 1) experimental control, 2) attrition rate, and 3) positive attitudes of subjects at the pretest.

The experiment was implemented during regularly scheduled laboratories. This scheduling resulted in treatment groups meeting at 8:00 a.m., 10:00 a.m., 1:00 p.m. and 3:00 p.m. In general the 10:00 a.m. and 1:00 p.m. sessions were better attended. In addition, while the two panel discussions followed a similar format, the opportunity for the subjects to interact with the panelists did occur during the treatments. It was not possible to control for the type and duration of the interaction and consequently each session was slightly different. If subjects had been treated and tested during the same time period of the day, with one panel discussion to cover all groups, differential treatment effects might have been seen.

At the beginning of the experiment, there were 298 subjects or approximately 74 subjects in each treatment group. To be included in the data analysis, each subject had to complete the questionnaire on three separate occasions: the pretest, a first posttest six weeks later, and a second posttest six weeks after the first. Many subjects were present for one or

two of the pretest/posttest sessions but missed one of the sessions. This resulted in a high attrition rate. Specifically, the experiment began with 74 subjects in each group and was completed with 30 subjects in group A, 38 subjects in group B, 34 subjects in group C, and 34 subjects in group D for a total of 136 subjects. Therefore, this research had an attrition rate of approximately 55%. The use of data from this highly self-selected group may have resulted in ceiling effects and may not represent the potential effects of the treatments on a less-motivated group of subjects.

The positive nature of the attitudes in the samples is supported by comparison of their scores with the mean scores obtained with other groups. Research using form A of the ATDP has been reported showing scores that range from 110 with a sample of undergraduate human resource majors,<sup>15</sup> 110-116 for undergraduate psychology majors<sup>5</sup> and 117-127 for undergraduate and graduate volunteer counselling students.<sup>16</sup> In this research, the pretest mean score for optometry students was 121. This score places the optometry students at the upper half of attitude scores obtained from similar populations.

Related to the BABS, unpublished data<sup>17</sup> has shown mean scores of 80 for professionals working with the blind, 100 for college students, and 120 for blind people involved in rehabilitation. The pretest mean scores for the optometry students was 98. The comparison of the ATDP and BABS scores with similar populations shows that the pretest scores are at the upper half of scores obtained by college students. On the BABS, the scores are not as positive as professionals in the field, yet are more positive than blind people involved in rehabilitation. It may be that the current attitudes of the optometry students were not affected by the treatments because they were already positive.

One assumption of this research was that if attitudes are improved, then the service provided by eye care specialists would be improved. While this issue is beyond the stated hypotheses of the research, it is, nevertheless, an important consideration. In the health care delivery system, the handicapped patient can be affected by the attitude of the health care practitioner. This can be manifested through reactions of denial and avoidance, or through unwillingness to refer to, or recognize, other service providers who may be helpful to the patient.

In summary, this research investigated the effects which a variety of experimental treatments had on the attitudes of optometry students toward the disabled and visually impaired. The findings showed that a short (two hour) program of films, panel presentations, or both, did not have a measurable effect on the attitudes of the subjects. Attempting to change the attitudes of optometry students may require a more intense, long-term, and deliberate effort. □

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# A Neural Sciences Computer-Assisted Learning Package

Leonard Levine, Ph.D.

## Abstract

A Neural Sciences package of computer-assisted learning files has been created and placed on a Macintosh™ computer network at the Pacific University College of Optometry to supplement a course in optometric neurology.

The files created are in five categories:

(1) Text outlines of important topics which may be scrolled, edited, and printed;

(2) Comprehensive dual mode (study and reference) random-access databases, summarizing muscles, nerves, and health terms;

(3) Two-sided computer flashcard decks presenting cards in random order (a separate program creates additional decks);

(4) Multi-sided computer flashcards providing several independently controllable "reverse sides" for each obverse;

(5) Progressive charts revealing increasing detail about topics by "unpeeling" successive layers.

Files may be used directly on the network or copied to students' floppy disks. First-term student reaction to the learning files was strongly positive.

## Introduction

John, a first year optometry student, had a free hour before his next class. His midterm exam in Structure and Function of the Nervous System was only a week off, so he decided to use the time for re-

view. Finding an available Macintosh™ computer in the Student Resources Center, he logged on to the Optometry Student network and opened a folder labelled "Opt 357 Neuro." Inside the Neuro folder, he opened a folder named "Outlines," and selected a file called "Blood Brain Barriers," which then automatically loaded into a word processor. To this document, a comprehensive topical outline of the lectures on the blood brain barrier, he added, in appropriate places, some clarifying notes he had taken in class. After some cut-and-paste modifications to rearrange the outline more to his study style, he then sent the edited Outline to a printer via a spooler and, while it was being printed, he opened another Neuro folder, "HypoCard."

From within this folder, John ran a flashcard program, and "played" several decks of cards designed to assist learning: one on the subdivisions of the human brain, one on the arterial supply to the cortical lobes and one, which he had constructed himself, on the blood brain barrier. His study hour was now about half gone, so he closed the HypoCard program and opened another Neuro folder.

This folder, labeled "DataBases," contained several comprehensive, random-access files providing synopses of human muscles, human nerves, and health science terminology. He ran "Muscles of the Human Body," and used it for a 10 minute "review and learn" session on several fuzzily-remembered muscles which had been mentioned in class.

Next, John opened one of the remaining Neuro folders, "Study Guides," and ran the program inside. "Study Guides"

offered him several decks of multi-sided flashcards, where each obverse had associations with several reverse sides. The reverses could be revealed individually or as a group. He spent 10 minutes with two of these study guides, Cortical Lobes and Cranial Nerves.

For the final 10 minutes of his study hour, he opened the Neuro folder, "Charts," and ran the program inside. "Charts" offered a list of 15 choices, each of which begins with a partially completed chart, containing several labelled "pushbuttons." By clicking on any pushbutton, an additional layer of the chart is revealed, containing new pushbuttons. John ran charts labelled "Aphasias," "Asymmetry," and "Brodmann Areas," and then shut down the computer and went to class.

John and his study hour are imaginary, but all of the activities described are possible. The activities were used by a large number of real students, as part of a novel approach to computer-assisted learning which was implemented at Pacific University College of Optometry during the 1988-89 academic year.

## Evolution of the Computer-Assisted Learning Package

Personal computers are now so powerful, so reliable, and so inexpensive that the question for optometric educators and students has changed from, "Can I afford to own one?" to "Can I afford not to own one?" Based on the very large number of requests for an ocular pharmacology software program offered to alumni of the Pacific University College of Optometry approximately two years

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ago,<sup>1</sup> it was obvious that many practicing optometrists had already acquired computers for their offices. Academic optometry also has moved significantly in this direction; there are approximately 50 Macintosh™ computers owned by the Pacific University College of Optometry, about evenly distributed among administrative, faculty, and student facilities.

It is apparent that the major use of computers by practitioners is in combination with office management software.<sup>2</sup> Within the colleges, the major software uses appear to be word processing, spreadsheet, and statistics programs. I believe that another, largely untapped, type of software has great potential for both academic and practicing optometrists: computer-based educational programs.<sup>3</sup> Such programs, if well done, can play a very significant role in (a) supplementing traditional classroom and laboratory methods, (b) facilitating reviews for national and state board examinations, (c) delivery of continuing education instructional packages, and (d) making possible collaborative research projects between educators and practitioners.

As a first step in this direction, I have developed some educational software to supplement a course in Optometric Neurology taught to first-year professional students. The programs comprise a series of study modules for use on the Macintosh™ computer, which I have termed "Neural Sciences Computer-Assisted Learning Package." The remainder of this article is devoted to a description of the types of files found in this "Neuro Package."

In designing and constructing the files that make up the Neuro Package, I have tried to integrate Skinnerian principles of learning,<sup>4</sup> practical guidelines for programmed instruction,<sup>5,6</sup> and computer-based instruction theory<sup>7</sup> with my personal teaching and computer experience. This integration of theory and practice led to the use of the following criteria in constructing the Neuro Package.

- a logical and clear outline of the subject to be taught,
- presentation of subject in small, interesting items,
- user recognition of contents as meaningful,
- fast, user-friendly design,
- provision for self-paced user interaction,
- delivery of immediate feedback and positive reinforcement,
- easy review and repetition, and
- computerized approach superior to conventional study methods.

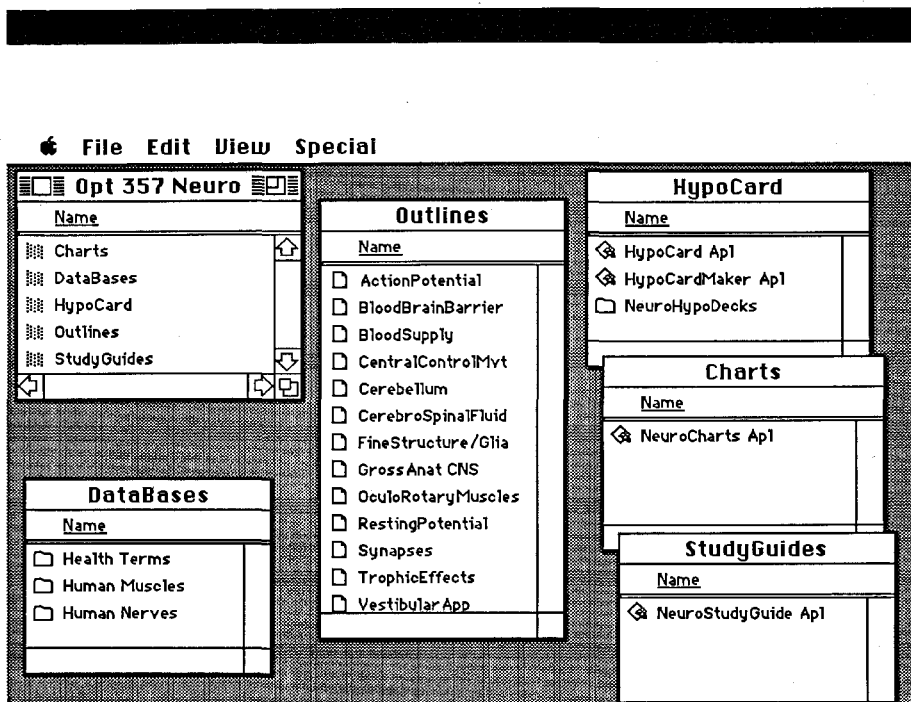


FIGURE 1.

The appearance of the Macintosh desktop when the folder, Opt 357, is opened to show the names of the five subfolders it contains (top, left window). These five subfolders also have been opened, and each appears on screen as a separate window with a list of its contents, and a heading corresponding to one of the subfolders in the Opt 357 window.

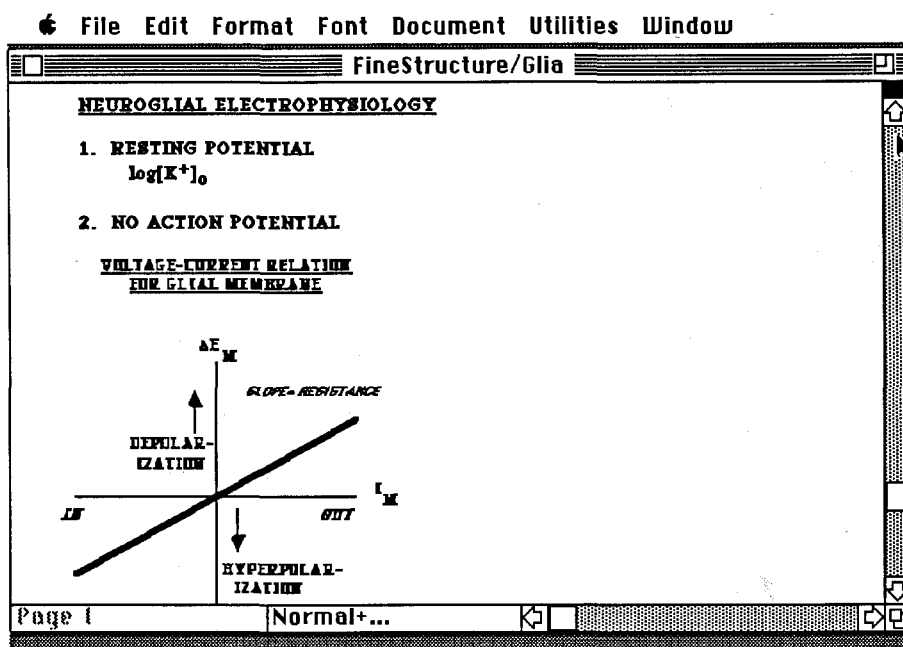


FIGURE 2.

One of the 13 screens from the Outline file, "Fine Structure/Glia," to illustrate the general appearance of these Microsoft Word™ documents. The graph at the bottom of the screen was prepared using MacDraw™ and then imported into the Outline with Word's Insert Graphics command. The righthand half of these Outlines has been left blank for students to enter their own notes and comments.

Preliminary versions of the "HypoCard" and "DataBase" programs have been presented earlier.<sup>8</sup>

## Contents of the Neuro Package

My lecturing practice for several years has been to outline the main points of my presentations on overhead transparencies. In time these have evolved, collectively, into a highly organized, comprehensive statement of the course contents, encapsulated in a series of short phrases and diagrams.

These overhead transparencies served as the basis for the 13 "Outlines" files of the Neuro Package. Each of the files, corresponding to one of the major themes of the course, was edited using Microsoft Word™ version 3.02 for text and, for

figures, MacDraw™ version 1.96, MacPaint™ version 2, and SmartScrap™/The Clipper™.

All of the other parts of the Neuro Package consist of free-standing applications which were written and compiled in QuickBasic™ for the Macintosh™ (Microsoft) and which may be executed simply by double-clicking the file icon.

## Outlines

The contents of the Outlines folder are shown in figure 1, a replica of the screen which appears when the Opt 357 folder and the five included folders are opened (Outlines, HypoCard, DataBases, Study Guides, and Charts).

As a sample of the Outlines files, figure 2 shows 1 of the 13 screens from the "Fine Structure/Glia" file.

Since a copy of Microsoft Word™ is present on the student computer network, any Outlines file may be loaded simply by double-clicking its icon. Loaded files may then be read, scrolled, edited, printed, and saved to the student's own floppy disk. (The original Outline files cannot be changed by students; they can only save the versions which they edited to their own floppy disks, not back to the Outlines folder.) Students may thus individualize the outlines by (1) transferring their classroom notes, notes from assigned outside reading, etc. to the outlines, (2) rearranging the order, (3) changing character, paragraph and other formats, or (4) concatenating the individual outlines into a single file.

This last option makes possible several additional processing features, easily done by this computer approach but difficult or impossible by conventional means. These features include preparation of a table of contents, an index, and a glossary, all of which would increase the future utility and value of the Outlines, particularly for review purposes after completion of the course. If this were done for several courses, for example, a student could then use the "Find . . ." menu choice to locate quickly and with certainty all references to a particular topic, such as glaucoma or papilledema, whose coverage extends over several courses.

If such outlines existed for all courses, it would make possible—quickly and easily—a curriculum content analysis, writing and revising course catalog descriptions, preparation of a comprehensive study guide for State and National Board examinations, and development of outlines and updates for continuing education.

## Large Dual-Mode (Study/Reference) Databases

As shown in Figure 1, the Opt 357 folder includes a subfolder labelled "DataBases," within which are three subfolders: "Health Terms," "Human Muscles," and "Human Nerves." Each contains a QuickBasic™ program, a large, random-access data file, and an index file. The data file contains records which may be called from a scrollable, alphabetical listing produced by the program from the index file.

Any item in the list can be selected by locating the cursor arrow over it and clicking the mouse button. The program returns the number of the selected item in the list, and this is then used by the index file to locate the record, which the pro-

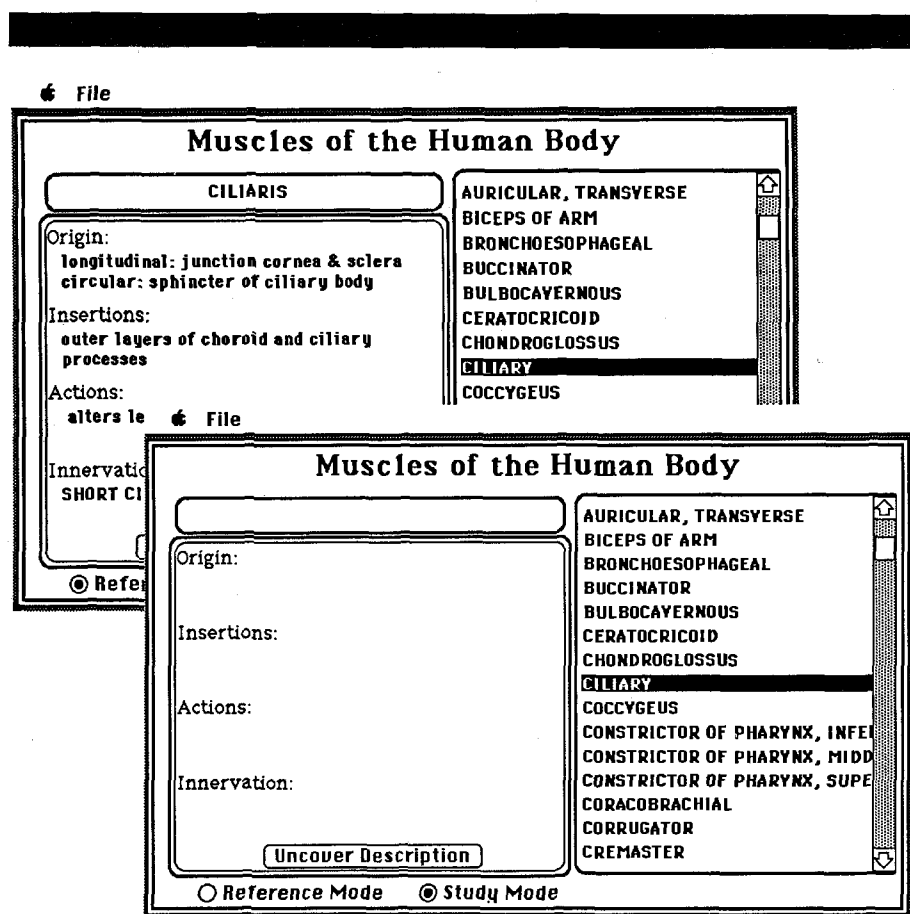


FIGURE 3.

Two superimposed screens from the application, "Muscle.apl," one of the large, dual-mode database programs found inside the Database subfolder of Figure 1. The front screen illustrates Study Mode, in which the details of the Ciliary muscle (selected in the alphabetical listing on the right) are not visible until the Uncover Description button is clicked. The back screen illustrates Reference Mode, where the details are filled in as soon as the selection is made. Students may switch between Study and Reference Modes at any time. These screens have been manually superimposed for this figure; they appear individually when the program runs.

gram then retrieves from the database file.

Figure 3 (back) shows the screen for the Human Muscles program with "Ciliary Muscle" selected.

As may be seen, a window on the left side of the screen displays headings corresponding to the fields in each record. Under this window are two "radio buttons" labeled "Study Mode" and "Reference Mode." When in Reference Mode (the default mode), the record contents are displayed as soon as the selection is made.

In Study Mode, the window shows only the headings until a pushbutton labeled "Uncover Description" is clicked, as illustrated in Figure 3 (front). This permits the student to fill in the information mentally and then confirm that his/her responses are correct. The student may switch between Study Mode and Reference Mode at any time.

## HypoCard (Double-Sided Computer Flashcards)

The folder labeled "HypoCard" in Figure 1 contains a program of that name which, when run, permits the student to "play" any flashcard deck contained in the folder "NeuroHypoCardDecks." A second program, "HypoCardMaker," allows the student to develop his/her own flashcard decks, which may then be run with HypoCard.

Figure 4 (top) shows the opening screen when HypoCard is started.

Clicking on the mouse then presents the student with a menu of all available flashcard decks (Figure 4, bottom).

The student makes his/her selection, and the program retrieves that deck and displays the obverse of one of the cards, selected at random. The student may then see the reverse by clicking on the button labeled "Flip Card." When this is done, the screen changes to that shown in Figure 5 (bottom).

The expression on the obverse now shifts to a location above the card and becomes italicized. The reverse side appears in inverse video and contains the matching expression for that on the obverse. The top righthand corner of the screen shows the number of cards left to "play" in this "hand."

When finished with this card, the student has two options before proceeding to the next card: (1) drop the present card from the deck, or (2) retain the present card in the deck. If the first option is chosen, the present card is not seen again until a new hand is played. Alternatively, the second option keeps the present card in the deck for displaying again, in ran-

dom order, during the present hand.

When the last card in any deck has been played, the student is so advised and offered the option of replaying that deck or selecting a new deck. The top menu bar always has a Quit option available (under File), to end the program.

The second application found in the HypoCard folder is HypoCardMaker, and it provides a fast, simple way for the student to construct his/her own flashcard decks. Such decks will have their names appear on the menu when HypoCard is run, and will be accessible in exactly the same manner as those supplied in the package.

Figure 6 (top) shows the input screen when HypoCardMaker is run.

This display contains instructions and five "edit fields" which the student fills in with the text that he/she wishes to appear above and below the obverse of each card, and the name of the deck. When finished, the student presses the Return key and the screen shown in the bottom of Figure 6 appears.

This display contains instructions and four edit fields, which the student may use to specify, for each card, what he/she wants to appear on the two sides. When one card is finished, pressing the Return key will record it and bring up the forms for making another card. The program counts and displays, on the top line, how many cards are in the deck. When the student is finished composing

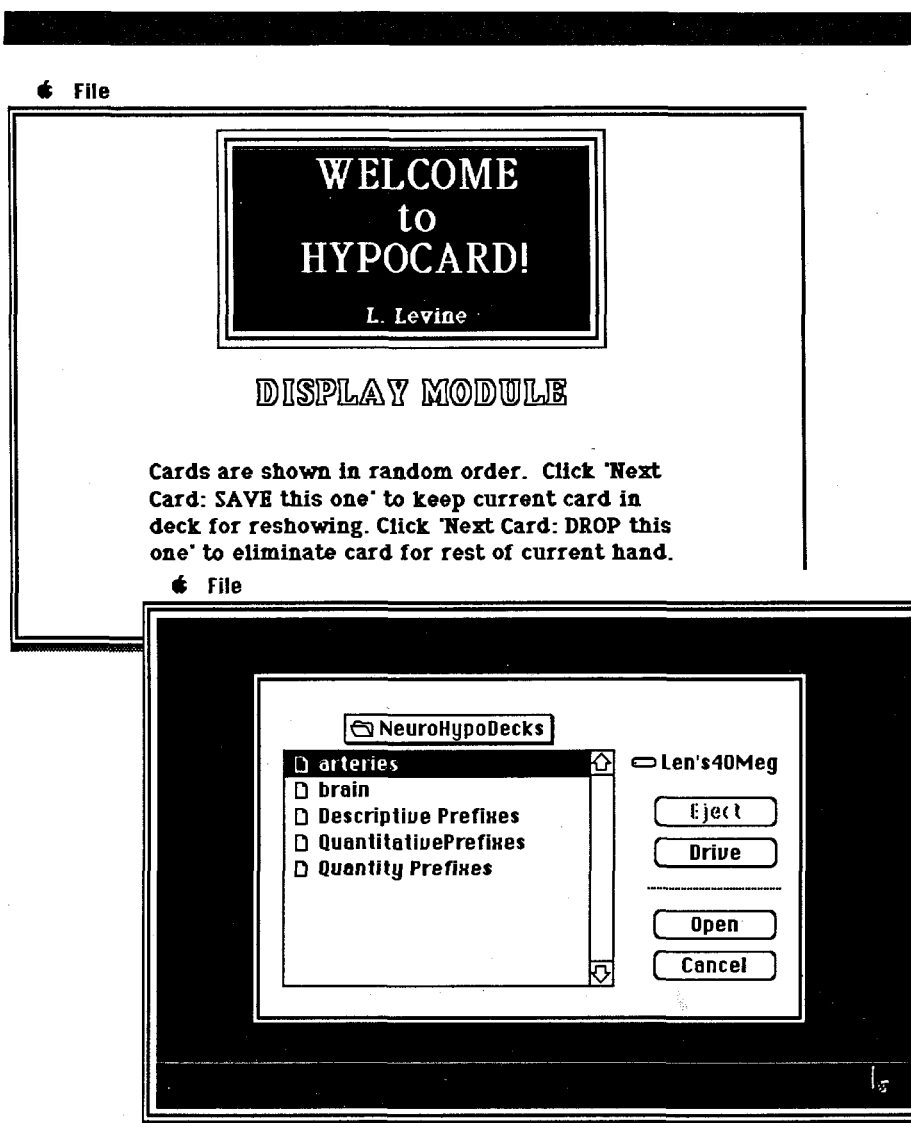
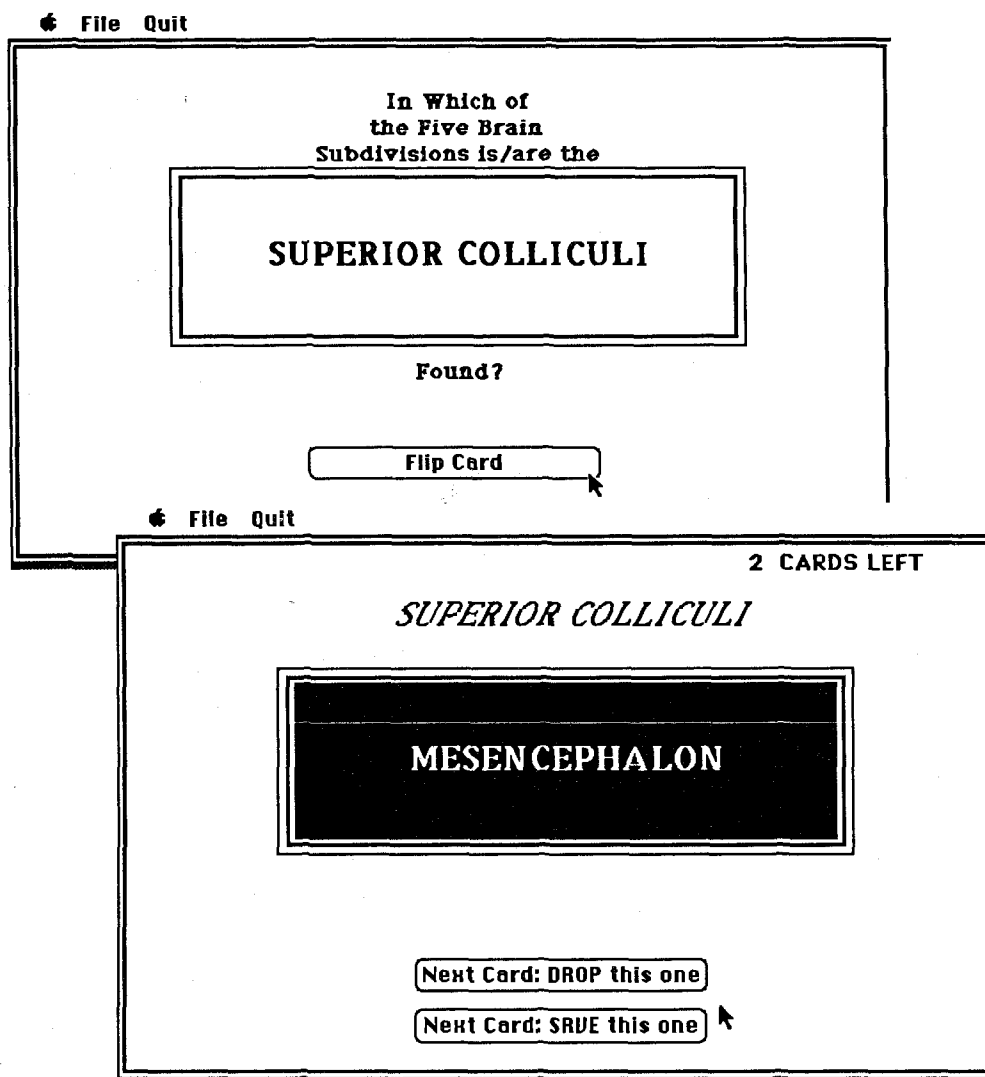


FIGURE 4.

The opening screen and menu dialog box of the program, "HypoCard.apl," from the HypoCard subfolder of Figure 1. The names of all flashcard decks that have been created with HypoCard appear in a scrollable list, from which any may be selected and launched by clicking on the Open button. These screens have been manually superimposed for this figure; they do not superimpose when the program runs.





**FIGURE 5.**

Two superimposed screens illustrating the obverse and reverse sides of a card from the HypoCard deck, "Brain." The upper screen shows the obverse side of one card, the text which appears above and below each card, and the Flip Card button which is clicked to reveal the reverse side. The lower screen shows the reverse side with the answer in inverse video, the text from the obverse italicized and placed above the card, and a line at the top of the screen indicating the number of cards remaining in the deck. Clicking either of the two buttons below the card reveals the next card. If the "Drop" button is clicked, the current card is not seen again until another "hand" is played. Clicking the "Save" button causes the current card to appear again, in random order, during the present hand. These screens have been manually superimposed for this figure; they appear individually when the program runs.

LINE 1 WHAT DOES  
 LINE 2 THE  
 LINE 3 PREFIX

Location and size of card.  
 For reference only at this time.

LINE 4 MEAN?

NAME of DECK PREFIXES

Enter up to 3 lines of text to appear above, and 1 line to appear below, each card. Then give an unused name for deck. Stay within boxes. T File Edit

CARD NUMBER: 1

SIDE A:

1st line  
 2nd line

SIDE B:

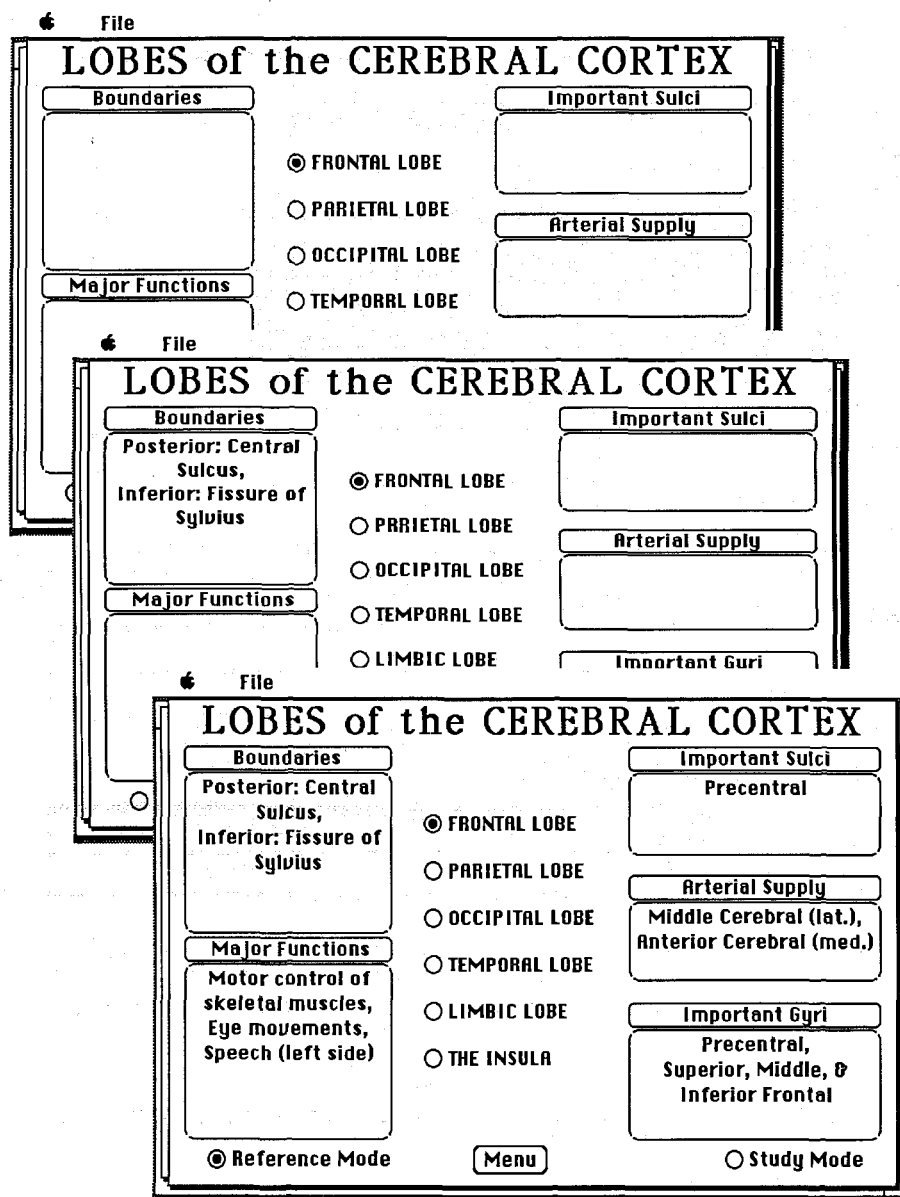
1st line  
 2nd line

INSTRUCTIONS: Enter 1 or 2 lines of text for Side A, starting on 1st line, and 1 or 2 lines of text for Side B, starting on 1st Line. TAB moves between fields. Editing features work. Press RETURN to add another card or DONE to complete this deck.

DONE

FIGURE 6.

Two superimposed screens from the program, "HypoCard-Maker.Apl," which allows students to create their own flashcard decks. The upper screen shows four "edit fields" for the text to appear above and below each card, and a fifth edit field for the deck name. The lower screen shows four edit fields for the text that will appear on the two sides of a given card. When the entries are completed, pressing the "Enter" key records them, increments the card number by one, and presents a new blank card. When all cards have been completed, pressing the "Done" button creates the deck, and returns the student to the menu screen (see Figure 5). These screens have been manually superimposed for this figure; they appear individually when the program runs.



**FIGURE 7.**

Three superimposed screens from the multi-sided flashcard program, "NeuroStudy-Guides.apl," when the "Cortical Lobes" deck is run. Each screen shows the list of cortical lobes in the center, with Frontal Lobe selected. The boxes on the left and right sides of the screen have labeled buttons as headings. Whether the information in the boxes is visible depends on whether the Reference Mode or Study Mode button has been clicked. The front screen illustrates Reference Mode, in which the contents of all boxes become visible as soon as one of the cortical lobes is selected. The middle and rear screens illustrate Study Mode, in which the information in any box only becomes visible when its button is clicked. In the rear screen all boxes are empty when the selection is first made; in the middle screen the Boundaries button has been clicked and the box below it has been filled in. Students may click as many buttons, in any order, as desired, and may switch between Study and Reference Modes at any time. These screens have been manually superimposed for this figure; they appear individually when the program runs.



the deck, he/she clicks on the "Done" pushbutton. The program then closes the deck, gives it the name specified, and ends.

## Study Guides (Multi-Sided Computer Flashcards)

The program, "NeuroStudyGuides," found in the corresponding folder of Figure 1, is a flashcard program in which the entry on the obverse relates to three or more "reverse sides." Four such "decks" may be accessed when the program is run: Basal Ganglia Diseases, with four reverse sides, Blood Brain Barriers, with three, Cranial Nerves, with six, and Cortical Lobes, with five. Figure 7 illustrates the screen appearance when Cortical Lobes is run. The terms which comprise the obverses are listed in a centrally positioned window, and the corresponding reverse sides in individual windows on the left and right sides.

Figure 7 (front) shows the screen when Frontal Lobe is selected and the program is run in Reference Mode, where the contents of all reverse windows appear as soon as the selection is made.

If the radio button for Study Mode is clicked, then the reverse windows become blank and remain so (Figure 7, back) until they are individually opened. To open any of them, the student simply clicks on the pushbutton above that window. Figure 7 (middle) shows the screen in Study Mode with Frontal Lobe selected and the Boundaries pushbutton clicked. Once one or more of the reverse windows has been opened, it (they) may be closed simply by relicking on the original obverse selection. When a new obverse choice is made, the windows are automatically closed.

## Progressive Charts

The final folder shown in Figure 1 is called "Charts," and it contains a single large program (247K). NeuroCharts offers the student a scrollable menu of 15 choices, illustrated in Figure 8 (bottom).

Each choice is a separate program module with a synopsis of a major topic. All begin by presenting a few chart headings in the form of labeled pushbuttons. When one of these pushbuttons is clicked, it exposes more of the chart, providing additional detail about that heading, and may reveal more pushbutton headings. These pushbuttons may then be clicked causing the chart to reveal another layer. This process continues until all of the synopsis is uncovered. These charts vary in their complexity, with some small enough to fit on a single

screen when fully exposed, and others containing multiple layers and requiring many screens to display the entire synopsis.

As an example, Figure 9 shows four "layers" of the topic, "Brodmann Areas," superimposed from back to front, in the order in which they were uncovered.

When the "Motor" pushbutton from the back layer is clicked, the chart expands to that shown in the next to the back layer. If the pushbutton "4,6" is clicked next, then the chart expands to that shown in the layer next to the front. Finally, the front layer shows the screen when all of the pushbuttons under the "Motor" heading have been clicked.

Each chart has an "Erase" pushbutton, which will clear all layers except the first, and permit the user to redo the sequence.

## Discussion

A survey questionnaire was distributed to students at the end of the term in which the Neuro package was first made available. Results indicated that, despite usage being optional, a majority (54%) of students had made some use of the materials (of non-users, 65% gave "lack of time" as the reason). Those who used the programs rated the package, on a 5 point scale, as easy to use (4.5), having a high potential for learning (4.1), useful for review (4.2), and suitable for other courses (4.3). Most (87%) said they would have used the package with greater frequency if they owned a computer. The most popular files were Outlines (used by 67%) and HypoCard (used by 59%).

The QuickBasic source code for the files in the Neuro package may be easily

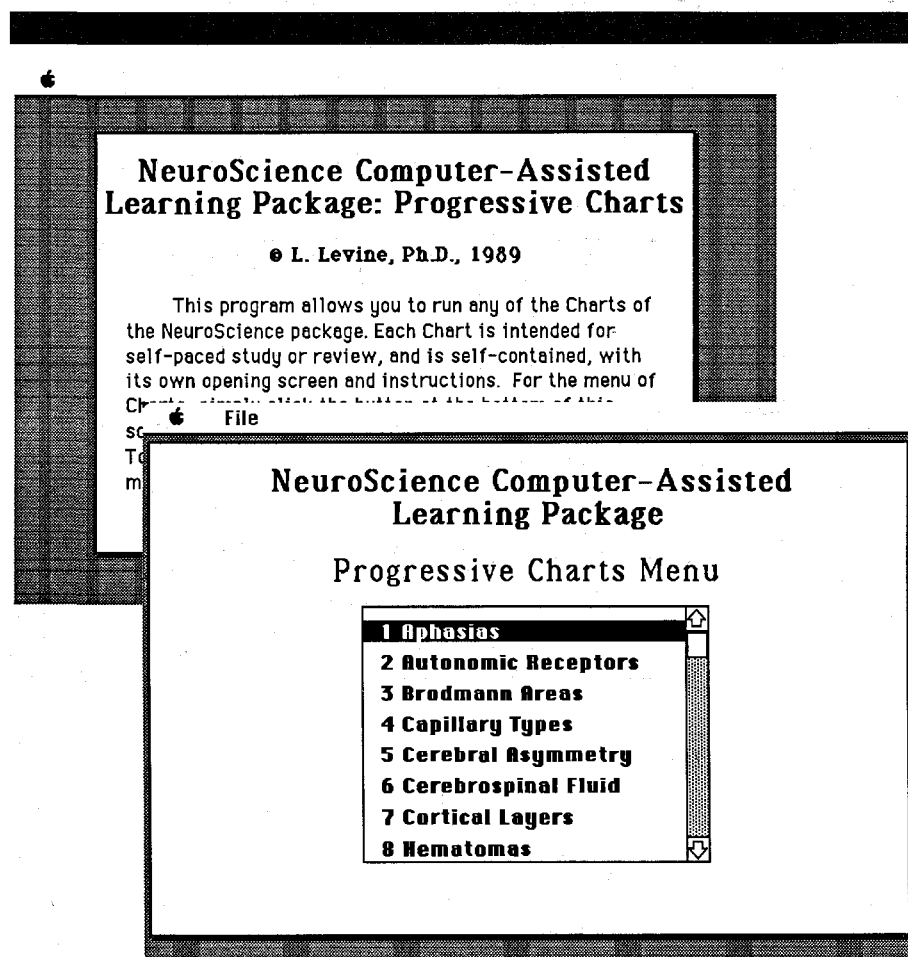
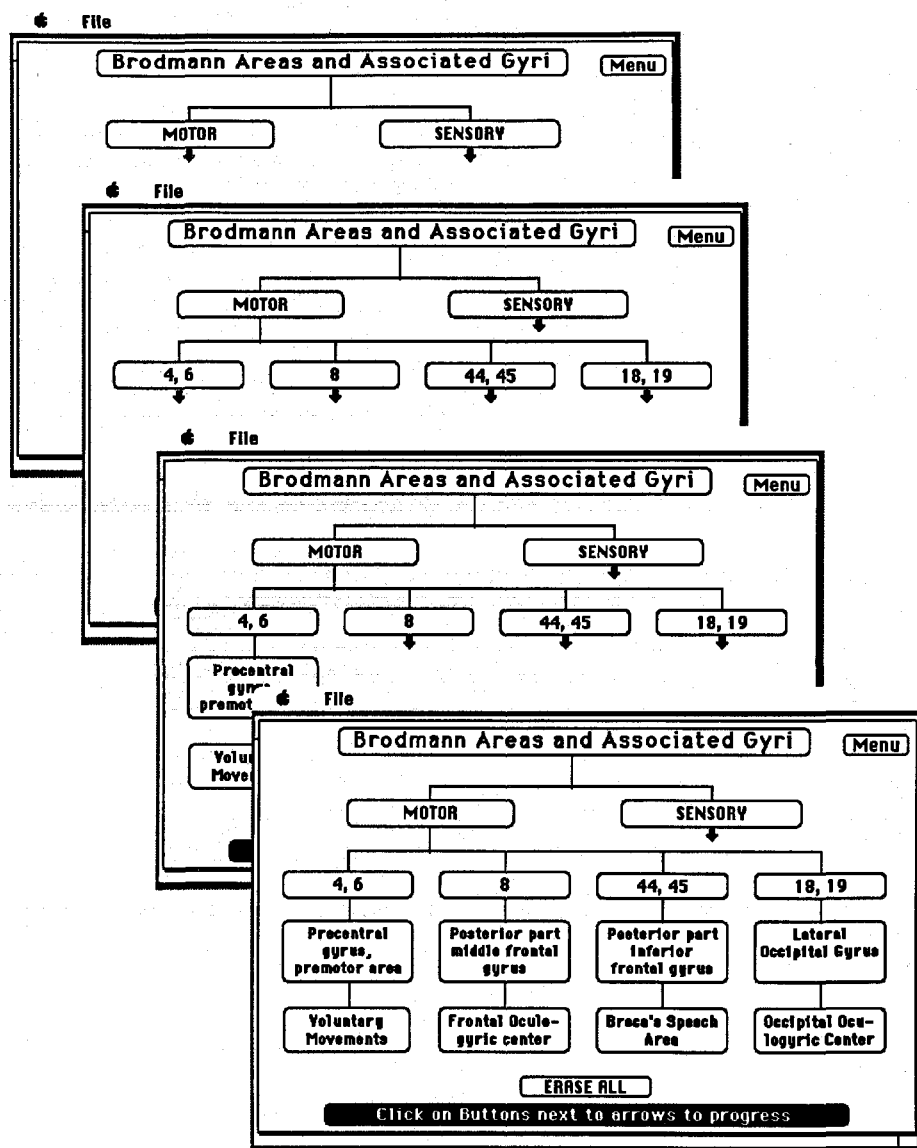


FIGURE 8.

Two superimposed screens showing the opening display (top) and the menu selection box (bottom) of the program, "NeuroCharts.apl." The menu selection box shows the names of 8 of the 15 available Progressive Charts; the remainder may be scrolled into view by means of the scroll bar. Clicking on any Progressive Chart name erases the screen and displays the top layer of that Progressive Chart. These screens have been manually superimposed for this figure; they appear individually when the program runs.



**FIGURE 9.**

Four superimposed screens of the Progressive Chart, "Brodmann Areas," from the program, "NeuroCharts.apl." The rear screen shows the opening display. Buttons with arrows immediately below are active and, when clicked, cause the Chart to "progress" to the next layer. The screen sequence from back to front illustrates the complete progression starting with the "Motor" button. At any time clicking the "Erase All" button clears the screen back to the opening display. Clicking the "Menu" button returns the student to the menu selection box of Figure 8, from which any of the other Charts may be started. These screens have been manually superimposed for this figure; only one screen appears at a time when the program runs.

modified to improve the files' usefulness by expanding and updating the contents and by incorporating student suggestions. I anticipate that the number and quality of the HypoCard decks will increase as student-created decks are culled and added to the network. In fact, the basic design of the five types of files is well-suited for use in many other subject areas, and the entire package could, with modest effort, be converted to other courses.

All files in the Neural Science Computer-Assisted Learning Package have been copyrighted by the author to protect the integrity of the contents and to prevent unauthorized modification or marketing. Interested readers may obtain, without cost, a copy of the entire Neuro Package by sending a blank, 3.5 inch floppy disk to the author. Persons interested in modifying any of the files to suit other topics and courses should request written authorization and a copy of the QuickBasic™ source code. □

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# Programmed Lecture For Improving Large Audience Teaching

Irving L. Dunsky, M.S., O.D.

A problem common to lecturers is that students are usually passive and sometimes asleep—a condition not conducive to maximum learning. In addition, the lecture is not learner-controlled; students cannot reread, slow down, or meditate a few minutes before resuming a lecture as they can with a book.

Lectures generally provide few opportunities for students to respond and little opportunity to receive feedback except through periodic tests. Lack of immediate feedback can be a major detriment if the lecturer's goal is to develop concepts or to teach problem-solving skills. With these goals, there is experimental evidence that active participation on the part of the learner is more effective than passive listening or observing.<sup>1</sup>

Yet Dubin<sup>2</sup> analyzed pooled data from many studies over a 36 year period and concluded that there is no measurable difference among methods of instruction. McKeachie<sup>3</sup> confirmed Dubin's analysis stating that there is no strong basis for preferring one teaching method over another when observing performance on course examinations.

The flaw in such studies has been pointed out by Lumsdaine<sup>4</sup> who reports that in order to draw sound conclusions, one must take into account the specific characteristics of the instruction as well as the method that is employed. In his words, "the so-called lecture method employed in one fashion by one lecturer may be highly effective; in the hands of another it may be quite ineffective. One must be as specific as possible about the

components of each instructional procedure being studied in order to compare fairly subsequent student performance." Lumsdaine further asserts that omitting such considerations has done more to obscure the truth than any other flaw in educational research.

Another review by Lumsdaine summarizes several studies examining instructional procedures with programmatic components, i.e., clear statements of abilities to be learned, student interaction in the form of questions to be answered and knowledge of result in the form of correct answers.<sup>5</sup>

Changes in teaching methods have occurred simultaneously with changes in teaching objectives. The programmed instruction movement, begun in the 1950s, inspired increased research into how students learn best from written, audio and visual materials. The best of these programmed materials systematically leads a student through a body of knowledge, ensuring careful attention to the content by requiring a response to questions critical to full understanding.

## Technique

A less expensive and simpler method of keeping the audience involved and informed of its own performance is described in this paper. The technique is an adaptation of programmed instruction for teaching large groups, and resembles that of Bridgman and Matzke<sup>6</sup> and Harden.<sup>7</sup> In this technique, the lecture is interspersed with a series of multiple-choice questions displayed on 35mm slides or transparencies that can be projected by the overhead projector. When the lecture is being prepared, the instructor decides

what are the important facts and principles he/she wishes the audience to learn. Instructors use these facts as the basis of eight or more multiple-choice questions of varying degrees of difficulty. The early questions can emphasize basic principles and the later ones can concentrate on applications. These are used in sequence as the lecture progresses. When a question refers to a pathological condition, ERG, or a patient, two projectors are used, one to show the illustrative material and one to display the appropriate question.

At the start of the lecture, the questions, typed on white bond paper, are distributed to the optometric student audience. The questions are typed one to a page and ample space is provided after each question for the students to make their own notes (Fig. 1).

The lecturer starts by projecting the first question and the audience is asked to answer the same question on their papers. Any notes the students may wish to make are written in the space provided on the sheets (Fig. 1). These sheets provide the optometric student audience with a permanent record of the lecture for future revision or study.

The lecture progresses by projection and full discussion of each question, with an explanation of the correct response and discussion of all the possible incorrect responses.

The technique of programmed instruction requires that the material be arranged according to certain principles. The student is led through increasing levels of accomplishment as related to the objectives of the teaching session. At each step the student is expected to formulate a response to a specific question

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and commit to an answer. If the student is correct, he/she receives immediate feedback and moves on. If the student has made a mistake, he/she learns immediately of the error and receives remedial instruction from the instructor or teaching program. Hence, the lecturer using this method must prepare lectures carefully and arrange questions to accomplish specific objectives.

## Discussion

The method described will individualize instruction, involve each student fully throughout the lecture and provide prompt feedback concerning performance. Two criticisms can be leveled at the method. The first criticism is that remedial instruction is not provided for each individual, as the questions are discussed by the lecturer speaking to the whole optometric student audience. The second criticism is that there is no feedback to the teacher: the teacher has no way of knowing how well the student or the group is responding to the questions posed. These criticisms are less valid when the educational principles underlying the method are considered. If students actively respond to the question, receive immediate feedback about the quality of responses and immediate remedial or confirming instruction from the teacher, the educational principles outlined above would seem to be satisfied. A brief but thorough discussion of all possible

responses ensures that, regardless of the student's answer, each student receives appropriate instruction from the optometric teacher.

A final summary of the principles and information basic to the lecture completes the session. The multiple-choice questions with the notes that the optometry student has added provide for easy revision at a later date.

In using this method for large student audiences several years ago, certain practical problems had to be solved. These problems were (1) a tendency to miscalculate the time required for discussion of earlier questions, thus having to shorten discussion of later questions to remain within the time specified for the lecture; and (2) an overestimation of the knowledge already possessed by the students in relation to the topic being taught. These problems are easily solved by more careful allocation of time for each question and a general decrease in the difficulty of the questions relating to the topic.

In general, the reaction and comments of students have been very favorable. Indirect feedback from other instructors has been excellent.

Additionally, optometric instructors who program the teaching sessions often find that they are better teachers. Designing the program demands that they apply sound educational principles. The experience of having once applied and witnessed the results of this method is a most

effective learning experience for the optometric teacher.

## Summary

The programmed lecture, incorporating fundamental educational principles, i.e., defining objectives and goals in advance, organizing and placing into sequence the subject content to be taught, demanding that students actively participate, and providing immediate feedback of their performance, provides an approach to teaching large groups that is simple, stimulating, and educationally sound both for the optometric teacher and the student.

**FIGURE 1.**  
Layout of a Typical Question

When using the Van Herick technique for estimation of a grade 2 anterior chamber angle, the width of the shadow on the iris compared with the width of the corneal beam should be

1. less than one-fourth
2. one-fourth
3. between one-fourth and one-half
4. more than one-half

**Student Notes:** The risk of closure can be minimized if the practitioner makes use of the Van Herick slit lamp technique to estimate the anterior chamber angle prior to instilling a mydriatic and if only grades 3 or 4 angles are dilated. Van Herick reports that only 1.84 percent of a group of 2,185 unselected patients had angle widths of grade 1 or 2. A more conservative criterion is to consider an angle as significantly narrow if the shadow width using the Van Herick is 0.3 or less as compared with the width of the corneal beam. An alternating technique for estimating the angle width is the penlight technique. The examiner directs a penlight from the temporal side of the cornea so that the beam is parallel to the iris. If the nasal portion of the iris is illuminated, the anterior chamber angle is normal. However, if the nasal portion of the iris is in a shadow, the angle is considered to be narrow. As reported by Van Herick, this technique has the disadvantage of failing to detect narrow angles in the presence of "plateau iris."

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**Myopia: Prevalence and Progression**, Working Group on Myopia Prevalence and Progression, National Research Council, National Academy Press, Washington, DC, 1989, 113 pp, 22 tables, 11 figures, unbound, \$15.00.

Qualifications for United States Air Force pilots currently specify a refractive error no greater than -0.25 D in any meridian. The Air Force has been concerned about the large proportion of academy cadets who are emmetropic at admittance to the four-year training program but develop myopia prior to completing the program. As a result of this concern, the Air Force asked the National Research Council's Committee on Vision to determine whether there have been significant changes, over the years, in the prevalence of myopia among adults who are eligible for academy training, and to identify the variables which might predict refractive error in adults. In order to accomplish its task, the Committee on Vision formed a working group, chaired by Anthony Adams, O.D., Ph.D., which reviewed more than 500 articles on myopia. This monograph is the working group's report.

The information presented in *Myopia: Prevalence and Progression* is of particular interest to practitioners because of the current attention being given to "late-onset" or "young-adult-onset" myopia. The authors expressed concern that whereas virtually all candidates for military academies having hyperopia of 1.00 D or more remain emmetropic during the 4-year training program, more than 20 percent of candidates having less than 1.00 D of hyperopia will become myopic during their four years of study.

Even a casual reading of this monograph will cause the reader to ask, "Where have all the hyperopes gone?" Although it has been reported that more than 10 percent of adults have refractive errors of +1.00 D or more, statistics cited by the authors show that among young males who are eligible for military academy training, *less than one percent* have refractive errors of +1.00 D or more.

The monograph consists of four chapters that serve mainly to sum up, and to put into perspective, the information gleaned by the working group; these four chapters are followed by an appendix that presents more detailed reviews of the prevalence and progression literature,

together with discussions of the biological basis and the etiology of myopia. This monograph is recommended reading for all serious students of refractive error.

*Guest Reviewer:*

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**Computer Applications in Optometry**, J.H. Maino, D.M. Maino and D.W. Davidson, Butterworth Publishers, Stoneham, MA, 1989, 224 pp., \$29.95.

Computerization has already touched many elements in the practice of optometry. Some optometrists make use of this technology in contact lens design, low vision, binocular vision, and pediatrics. Many more optometrists use the computer for practice management, and a few use the computer to replace the paper files where clinical data is recorded and stored. However, a comprehensive guide to instruct practitioners to realize the potential of this new wave of technology in their office system has not been available. *Computer Applications in Optometry* offers a timely guide for development of the total (clinical, office and marketing) system for the optometric practice. The authors' goal is "Helping you select the best computer system for your practice. . . ."

These authors have been quite successful in their goal. The book is broken into four parts which include: Introduction to Computers, Clinical Applications, Advanced Applications, and Optometric Considerations. The introduction gives a short but very adequate overview of hardware considerations and a complete overview of practice management applications with this book's characteristic appended resource list after each chapter. The Clinical Applications section shows Low Vision, Contact Lens, Pediatric, and Binocular Vision computer uses. The third part discusses telecommunications with special considerations for education and Local Area Networks. The fourth section deals with marketing, legal considerations, and what the future might bring.

Optometrists considering implementation of computers or expanding computer capabilities in their practice must read this book. The book's appendixes, while not exhaustive, are very helpful. The book is slightly outdated with the on-

going developments in Mac Ilcx, Mac Ilx and Macintosh networking, but any book on computers will inevitably suffer from this problem. Nonetheless, I would highly recommend this book for any optometrist who will be practicing in the next decade.

*Guest Reviewer:*

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**Clinical Ocular Pharmacology, 2nd ed.** Jimmy D. Bartlett, O.D., D.O.S., editor, Siret D. Jaanus, Ph.D., associate editor, Butterworths, Boston, 1989, 929 pp., hardbound, illus., 20 color plates, \$85.00.

Those who passed up the first edition of Bartlett and Jaanus won't want to repeat that mistake—the second edition is excellent. Thirty-five chapters arranged into five sections comprehensively present material covering the actions of ophthalmic drugs (Part I, Fundamental Concepts in Ocular Pharmacology; Part II, Pharmacology of Ocular Drugs), drug use in clinical practice (Part III, Ocular Drugs in Clinical Practice), and toxicology (Part IV). Part V, Legal Aspects of Drug Utilization, is new to the second edition.

Each chapter has been revised, sometimes extensively, to "reflect the rapid development of the science of ocular pharmacology as well as the art of ocular drug use in clinical practice," and to include information on "new commercially available drugs and ocular devices." Five new authors are found in the list of 24 contributors.

The material contained within each chapter is readable, extensively illustrated, well indexed, and clinically applicable. Twenty color plates have been added "to enhance both the quality and accuracy of represented clinical conditions and drug therapies." The larger page size and improved paper quality enhance the book's presentation and layout.

In short, the second edition of *Clinical Ocular Pharmacology* should be a required text for the ocular pharmacology courses of every school and college of optometry.

*Guest Reviewer:*

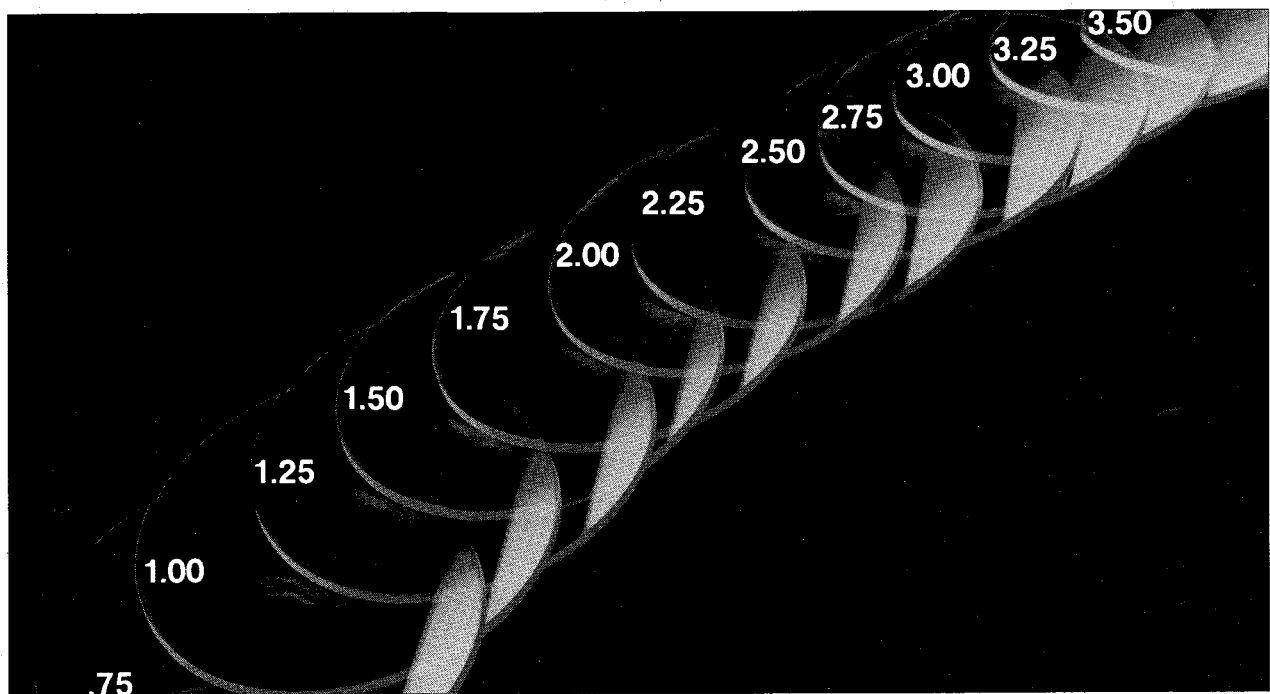
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