IN HONOR OF RETIRING FACULTY: HERBERT D. RILEY & GARY HAFNER

FACULTY PROFILE: TIFFENIE HARRIS

FEATURED REVIEW: CLINICAL FINDINGS AND MANAGEMENT OF PSEUDOPAPILLEDEMA DUE TO OPTIC NERVE HEAD DRUSEN

BILL BALDWIN PENS BORISH

A SELECTED LITERATURE REVIEW: THE HYPEROPE – PERHAPS NOT QUITE SO NEGLECTED
Two Indiana University faculty members, who have each taught at IU for 30 years or more, are retiring at the end of the current academic year. They are Herb Riley and Gary Hafner. We are honoring their commitment to the School of Optometry with short biographical sketches.

The faculty member profiled in this issue is Tiffenie Harris, who joined the faculty in 2004. For the featured review, she wrote about pseudopapilledema due to optic nerve drusen, a sometimes difficult diagnosis.

Information about the new biography of Irvin M. Borish by Bill Baldwin is presented. Directions for ordering the book are included.

This issue also contains a selected review of recent literature on hyperopia. A 1971 article by Ted Grosvenor noted that hyperopia was neglected in books and journals compared to myopia. There has been somewhat of an increase in publications on hyperopia in the last seven or eight years, suggesting that the hyperope may not be quite so neglected anymore. Some of those articles are reviewed here.

David A. Goss
Editor

ON THE COVER: Figures 2 (upper left), 4 (middle left), 5 (lower left), and 8 (upper right), from the article by Tiffenie Harris. See her article on page 6 for further explanation.

Correspondence and manuscripts submitted for publication should be sent to the Editor: David A. Goss, School of Optometry, Indiana University, Bloomington, IN 47405 USA (or dgoss@indiana.edu). Business correspondence should be addressed to the Production Manager: J. Craig Combs, School of Optometry, Indiana University, Bloomington, IN 47405 USA (or jocombs@indiana.edu). Address changes or subscription requests should be sent to Sue Gilmore, School of Optometry, Indiana University, Bloomington, IN 47405 USA (or sgilmore@indiana.edu).

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Statement of Purpose: The Indiana Journal of Optometry is published by the Indiana University School of Optometry to provide members of the Indiana Optometric Association, Alumni of the Indiana University School of Optometry, and other interested persons with information on the research and clinical expertise at the Indiana University School of Optometry, and on new developments in optometry/vision care.

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Herbert D. Riley

Herb Riley is retiring in the Spring of 2006, at the completion of his 35th year as a faculty member in the Indiana University School of Optometry. He leaves behind a record of dedication to teaching students the rudiments of optometric procedure and clinical care. Herb was born October 28, 1943 in Delano, California. Herb’s father died when he was three, and his mother moved the family to Maquoketa, Iowa, where he lived for the rest of his childhood. His undergraduate education was undertaken in Iowa, and he earned the Doctor of Optometry (O.D.) degree from Indiana University in 1971. Health problems dating from his student days didn’t stop him from completing his education or from having a career in which he helped educate well over two thousand optometry students.

When Herb started optometry school at IU, classes, labs, and clinics were in various buildings scattered around the campus. Construction of the current optometry building was completed in late 1967. Classes began in the new building in January of 1968. Herb recalls how proud students and faculty were of the new building.

After completion of optometry school, Herb joined the Indiana University optometry faculty. In his first several years on the faculty, he served as a full-time clinical instructor in the general optometry clinic. He also was an instructor in the contact lens clinic. He developed a reputation as a well-rounded and skilled clinician. During this period of time, through the 1970s, optometry was undergoing an expansion of scope. Herb readily embraced that expansion and helped facilitate the necessary enhancement of training in ocular disease detection methods.

Later Herb took on responsibility for teaching in the diagnostic procedures series of courses, a role for which he is known by two decades of optometry classes. His work in the reorganization of these courses has been instrumental in the high ranking of Indiana University optometry students on the Clinical Skills portion of the National Board Examinations.

When personal computers became popular, Herb rapidly became adept in their usage. Integral with his teaching, he developed a website which contains syllabi, instructional materials, and photographs of ocular disease conditions. The images are of high quality and readily illustrate the conditions and procedures being shown. The high caliber of these pictures and materials is evidenced by their being used and cited by other optometry schools and by medical programs in the United States and across the globe from the United Kingdom to Thailand.

Appreciation of Herb’s teaching skill and dedication has earned him numerous teaching awards from students and peers. He has received awards for teaching both in the clinic...
and in the classroom. A remarkable consistency of fine teaching is evidenced by the fact that his first teaching recognition came in 1975 and the most recent in 2007, a span of 32 years.

Over the years, Herb has served the School of Optometry in a variety of capacities, such as Clinic Director in the late 1980s and Chairman of the busy Admissions Committee in the late 1990s. He has been characterized as a quiet man who is very capable and who hasn’t felt compelled to engage in self-promotion. Professor Emeritus Paul Pietsch, a long-time colleague, referred to Herb as “a good human being whom I admire as a person.” Another faculty member appreciated Herb’s “deliberate approach” to problems and noted that in cases of disagreement, Herb would almost apologetically say that he “wouldn’t do it that way,” rather than openly criticize.

Herb says that he will miss a lot of “great people” that he has gotten to know in the School of Optometry. He notes that he has taught sons and daughters of former students. He recalls mentioning that fact to Henry Hofstetter and saying that it was making him feel old. Hofstetter replied, “Wait until you teach their grandchildren.” Herb is retiring before that happens.

Herb met his wife Phyllis at the School of Optometry. She worked for many years in the clinic and in the ophthalmic lens laboratory. They hope to do some traveling during his retirement and spend some time in Florida. They enjoy traveling through the United States by automobile. Herb says that he also wants to do some fishing, which he hasn’t had time for in several years.

(Historical note: Dr. Riley’s first name has been spelled Hurbert for many years in the IU catalogues, but he learned lately that the spelling on his birth certificate is actually Herbert, which he prefers.)

Gary Hafner

Gary Stuart Hafner, Ph.D., Professor of Optometry and Adjunct Professor of Anatomy at Indiana University, is in the words of medical educator Louis Flexner, an “anatomist’s anatomist.” Gary’s teaching, research and service ran the scope of structural biology from macromolecules in visual cells to the whole human body. He is among the world’s authorities on the evolution and development of the crayfish eye. Indeed, his most recent publication (in Arthropod Structure and Development, in press), coauthored with the German zoologist, Steffen Harzsch, examines a pivotal issue in the evolution of invertebrates.

In Optometry, his main courses were Ocular Anatomy and Gross Anatomy. Along with other major innovations, he introduced human cadavers into instruction for optometry students. During the past three years his teaching included one-third of the neuroscience course for medical students in the Medical Sciences Program.

Gary was born in Greensboro, North Carolina in 1943. His family moved to Illinois where he “grew up on the north shore of Chicago.” The Hafners moved again, to Indianapolis, where Gary completed the 8th grade and went on to pitch baseball for and graduate from Broad Ripple High School. He earned an A.B. from Hanover College in 1965, majoring in biology and chemistry and winning a letter in, of course, baseball. (Years later, he would occasionally enjoy playing catch on Sunday mornings with friend and academic role model, Professor Emeritus Conrad Mueller)

After receiving an M.A. in biology at Drake University in 1967, Gary pursued a Ph.D. at IU in what was then the Department of Anatomy and Physiology. Concentrating on cytology and neuroanatomy, and assisting in various basic medical science courses, he earned his doctorate in 1972. He’d conducted his dissertation research under C. B. G. (Boyd) Campbell and H. D. (Dave) Potter. Before undertaking postdoctoral training, Gary returned to Hanover College during the fall of 1972 as an assistant professor. In his
semester there the newly minted cytologist and neuroanatomist taught not his specialties, but comparative anatomy and general biology (again, Flexner's anatomist's anatomist).

Gary initiated postdoctoral research at IU in January of 1973 with five-months in Ray Murray's lab. In May 1973, he "went west" for 18 months in UCLA's Jules Stein Eye Institute, where he collaborated with one of neurobiology's luminaries, Dean Bok. Gary returned to IU in 1974 for an associateship with his former mentor, Dave Potter.

In 1976 an outstanding lecture to the Optometry faculty on the ultra-structure of the crayfish eye contributed significantly to Gary's successful competition to fill a vacancy created by the retirement of Stanley Rafalko. Rafalko had taught ocular and general anatomy from early in the history of the optometric curriculum at IU.

Gary was expected to modernize and offer those courses, as well as develop instruction for graduate students. In addition, he was charged with renovating Optometry's barely functional electron microscope laboratory and maintaining a 'high–tech' microscopy facility to support the research and teaching of others in the school. To operate the new lab, Gary brought in Tom Tokarski, whom he'd known since graduate school. Although Tom did not hold a doctorate, Gary treated him as a colleague. They coauthored 11 papers. At Gary's encouraging, Tom also undertook projects of his own and even published with others. Tom is now retired.

Gary was tenured on schedule; voted teacher of the year for 1976-77; and promoted to full professor in 1993.

How did he treat students? Consider words of Tiffenie Harris: "I first met Dr. Hafner in 1987 [in] a summer program for undergraduate minority students ... Dr. Hafner was very patient ... and taught me how to make frozen sections ... of the crayfish retina." Tiffenie would eventually earn an OD degree. Now a member of the Optometry faculty herself, she adds, "His anatomy courses laid the foundation for us to become competent optometrists, well-versed in ocular disease and its systemic associations."

David Goss, Professor of Optometry and a colleague of Gary's, sat in on Ocular Anatomy while was pursuing a Ph.D. Goss still remembers the course as, "well done, well organized and authoritative."

Douglas Freeman, Head Optometry Librarian and Optometry's Director of Technology volunteers, "Dr. Hafner was one of the first people in the School to embrace electronic technologies for instructional purposes. He introduced specialized software for teaching ... and revolutionized the learning experience for optometry students."

Gary married Jane Gray in 1978. They'd both attended Broad Ripple High but only got to know each other while she was completing a Ph.D. at IU. Jane is now a retired plant scientist.

In 1994, while helping with a neighbor's renovation project, Gary sustained a major injury to his right leg. After a prolonged but futile battle against infection, his lower leg had to be amputated. Fitted with a prosthetic foot, and able to walk without a cane, he soon was back on the job cheerfully, teaching, doing research and performing service.

Service to the university as well as the community represented an essential obligation for Gary. Among other things, he was on the Monroe County's Plan Commission. In addition to several significant school and university assignments, he chaired Optometry's tenure and promotions committee for several years. Dave Goss, who served with Gary, said "He approached the work of the committee with objectivity and common sense."

In retirement, would he and Jane travel? "Some," he replied. But he intends to put his ocular anatomy teaching materials into electronic form. He also has an interest in woodworking and collecting old hand tools. But, given the free time, he especially wants "to restore a 1949 Chevy pickup truck."

The Hafner Era now closes in Optometry, in tangible ways. Of course, Gary Hafner will be missed, day-to-day. But his impact will always exist in the character and conduct of his students, his colleagues and their intellectual descendants.
Faculty Profile: Tiffenie Harris, O.D.

by Victor Malinovsky

Dr. Tiffenie Harris attended Indiana University, receiving her Bachelors of Arts in Chemistry in 1989, and graduating from Indiana University School of Optometry in 1993. While attending optometry school, she taught as an associate instructor for Gross Anatomy, Ocular Anatomy, Neuroanatomy, and Ocular Pharmacology in the IU School of Optometry. In addition, she taught as an associate instructor for Gross Anatomy in the Indiana University School of Medicine, Medical Sciences Department. After graduation, she moved to Southeastern Michigan and practiced primary care for over ten years. Her clinical experience includes working in a variety of urban practice settings, including a multi-discipline medical center. The demographics of this community provided a wide diversity of challenging cases and a large amount of pathology to diagnose, treat, and manage. She has cared for patients of all ages; the majority have been in the young adult to mature adult (>50) populations, including those with physical and mental disabilities.

In 2004, Dr. Harris joined the IU School of Optometry faculty as an Assistant Clinical Professor and became the Chief of Primary Care. In addition to administrative duties, her responsibilities include the clinical training and teaching of third year optometry interns, emphasizing treatment and management of ocular pathology, contact lenses, as well as refractive anomalies. Dr. Harris has served as an examiner for the clinical skills portion of the National Boards and serves on the school’s Admissions Committee as well as the Clinical Care Quality Assurance Committee. Recently, she was elected to serve as the Faculty Presider for the school’s faculty meetings. She attended the American Optometric Association/American Academy of Optometry Summer Research Institute in 2006. As a result of this experience, she has been actively involved in developing a community based research project. Since joining the faculty, Dr. Harris was voted the Consultant of the Year by the Classes of 2006 and 2007. She was also awarded the IU Trustees Award in 2006. Dr. Harris is currently submitting posters and case reports, with a special interest in neuro-ophthalmology, in order to gain the post-graduate distinction of fellowship in the American Academy of Optometry.

Dr. Harris finds the most rewarding aspect of the educational experience at IU to be the diversity of students and faculty on the Bloomington Campus. She says studying and practicing optometry have prepared her to become a conscientious, goal-oriented individual both professionally and personally. Academia in optometry has allowed her to have a positive impact not only on patients, but also on the next generation of optometrists. Her new faculty position has allowed her to fulfill her passion for teaching and continue her patient care.

Fellow faculty members appreciate the excellent rapport that Dr. Harris consistently demonstrates with her peers, students and patients. She is also well known for her dedicated follow-up in patient care.

Tiffenie is married to Walt Harris, who is a dedicated police officer in Bloomington and a former IU football player. They enjoy spending time and traveling in their van with their three children: Walter, 9; Joshua, 6; and Victoria, 4.
Diagnostic Dilemma
Optic nerve head (ONH) elevation tends to be an intimidating ocular finding especially when it is bilateral. In every case of ONH elevation, an evaluation of signs and symptoms will help the practitioner determine effectively if the nerve is in fact “swollen” or “elevated”. This will provide an organized approach to the case with logical differential diagnoses. The optometrist’s role includes detection, timely and appropriate referral to specialists, and co-management (monitoring) once under the care of a physician. A clinical case in which the optic nerves are moderate to severely swollen is easy to diagnose. A case in which the patient presents with symptoms of headaches and the nerves appear only mildly elevated makes the diagnosis very challenging. The diagnostic dilemma begins with making the clinical decision and answering the question, “is it or is it not swollen?”

The foremost clinical goal is to differentiate congenital causes of disc elevation from acquired disc edema. Papilledema (PE) is acquired bilateral optic disc swelling due to increased intracranial pressure (ICP). Pseudopapilledema (PPE) is the appearance and false impression of bilateral disc swelling that is associated with an underlying anomalous condition. (Table 1) The most common cause of pseudopapilledema is optic nerve head drusen (ONHD) which is a congenital anomaly characterized by disc elevation and blurred margins, which is 75% bilateral.1,2 It is critical for clinicians to differentiate papilledema from ONHD in order to avoid unnecessary and expensive neurological testing. It is equally important to avoid overlooking true, neurological disorders.

Background on ONHD
ONHD are congenital, inherited as an autosomal dominant trait occurring in approximately 1% of the population.1-5 The scleral canal and optic disc of eyes with drusen are much smaller than average. This is seen clinically where ONHD predominately occurs in Caucasians and rarely in African Americans, whose scleral canal size is often larger.2 There are two types of ONHD, visible and buried. (Figures 1 and 2) Visible ONHD protrude from the surface of the disc. They are particularly prominent at the margins causing irregular borders and elevation. Buried ONHD are located beneath the disc surface and are not directly visible. They can cause elevation of the optic disc with or without blurred margins. ONHD is associated with peripapillary retinal pigment epithelial changes (33%) and an absent to very small cup-to-disc ratio.1-3 Anomalous disc vasculature (10%), including early branching of the retinal vessels and secondary tortuosity, is also associated with ONHD.1-5 The pathogenesis of ONHD is not yet fully understood. Current research suggests an abnormally narrow opening of the scleral canal can cause a stasis of axoplasmic flow.1-6 This leads to abnormal axonal metabolism and mitochondrial calcifications creating calcium-like globular deposits within the papilla.

Clinical Findings and Management of Pseudopapilledema due to Optic Nerve Head Drusen
by Tiffenie Harris, O.D.

Optic nerve head drusen (ONHD)
Congenitally full disc (CFD)
Malinserted oblique insertion
Tilted disc syndrome
Optic nerve hypoplasia
(differential diagnosis for bilateral presentation)

Table 1. Differential diagnosis of pseudopapilledema.
Drusen of the optic nerve head have no histopathologic connection to retinal drusen and are not considered age-related, but have a tendency to become more visible as the patient ages. In early life, ONHD remain deep in the nerve and always anterior to the lamina cribosa. They become more visible at the disc surface in the second to third decades. In childhood, the disc may appear papilledema-like with no physiological cupping, accounting for 75% of diagnostically challenging disc anomalies. In adulthood, ONHD appear as spherical nodules on the disc surface that are highly reflective by the ophthalmoscope light and give the disc a scalloped margin. When illuminated with a red-free light these refractile bodies will auto fluoresce.

Most patients with ONHD are asymptomatic. However, many can present with visual field defects and rarely with decreased visual acuities. ONHD can shear and damage the nerve fibers and vascular supply as they move to the disc surface. The reduction of retinal nerve fiber layer (RNFL) thickness results in visual field defects including enlarged blind spots, localized depressions, arcuate nerve fiber bundle defects, or constrictions. Visual field defects are present in 73% of visible drusen and 36% of buried disc drusen with no significant difference in the severity. Spontaneous disc hemorrhages can occur in, around, and over the optic nerve head if progression of the drusen interferes with the nerve's blood supply. The incidence of retinal hemorrhage is between 2% and 10%. Visible disc drusen may cause peripapillary atrophy and a break in Bruch’s membrane. As a result, the patient is at risk of the development of peripapillary choroidal neovascular membranes, which may extend to the macular or subfoveal area and compromise vision.

Conditions known to be associated with ONHD include Retinitis Pigmentosa (RP) and Angioid Streaks with or without Pseudoxanthoma Elasticum (PXE). The ONHD in PXE are similar but in RP they do not have the same appearance. They tend to be more visible adjacent to a normal-sized nerve. In addition, there have been reports of non-arteritic anterior ischemic optic neuropathy (NAION) associated with ONHD.

Diagnostic Testing

Differential diagnosis of ONHD includes any entity that can cause bilateral optic disc elevation. This includes increased intracranial pressure and congenital disc anomalies. Special investigations for the definitive diagnosis of bilateral disc elevation include the following: Magnetic Resonance Imaging (MRI) and/or Computerized Tomography (CT) scans of the orbit and brain, Fluorescein Angiography, B-scan ultrasonography, and Optical Coherence Technology (OCT). The CT scan can detect intracranial tumors as well as ONHD. However, it is not sensitive enough to pick up subtle calcific drusen in the disc and is not reliable for ONHD diagnosis. The MRI is superior to CT scan for soft tissue structures and is the preferred imaging test to rule out the etiology of ICP.

Fluorescein Angiography (FA) can be helpful. With papilledema the optic nerve head will show hyperfluorescence and peripapillary leakage of the dye. In ONHD there is no peripapillary leakage of the dye, especially in the late phase. In addition, the red-free barrier used in the pre-injection phase illuminates the autofluorescent property of disc drusen. Buried ONHD with both of these techniques can be missed. Less invasive diagnostic investigations are available to differentiate disc edema and buried disc drusen.

B-Scan ultrasonography has been shown to be the most sensitive and diagnostically relevant test to aid in the differential diagnoses. B-scan ultrasonography uses high-frequency sound waves. The sound waves are reflected back to the probe, converted into an image, which is used to make a dynamic evaluation of the optic disc. When calcification of tissue is present, there is a very strong reflection of the echo back to the probe. Therefore, B-scan ultrasonography is the single most important ancillary test to perform in the diagnosis of ONHD. The results for ONHD will show a highly reflective nodule within the optic nerve even at a
low gain level. (Figure 3) In the presence of acquired disc edema, the B-scan will demonstrate a circle within the optic nerve sheath, separating the sheath from the optic nerve at a standard gain level. This is called a “crescent sign” produced by the increased cerebral spinal fluid transmitted along the subdural space within the optic nerve. 11

Optical Coherence Tomography (OCT) is analogous to the B-Scan except light, rather than sound, is used to provide images of the ocular structures. OCT is an objective, noninvasive alternative to analyze the optic nerve head. More importantly, it is useful in quantifying the status of the RNFL.6 In papilledema, the OCT shows an elevated nerve (Figure 4) head along with excessive thickening of the RNFL. In ONHD, the OCT shows the elevation of the disc and the underlying nodular shadows caused by the drusen. (Figure 5) The key differential between ONHD (Figure 6) and acquired disc edema (Figure 7) is that there is significant thinning with ONHD and thickening in disc edema. In cases of papilledema the RNFL curve falls above the normative, age-adjusted scale exceeding 200 microns. Many cases of early papilledema can mimic buried ONHD. (Figure 8) As seen in Figure 8 the nasal margins are blurred and the nerve appears slightly hyperemic. It also appears to be buried ONHD or CFD. The OCT results for Figure 8 are shown in Figure 7 and clearly show that the RNFL layer is significantly thickened as seen in early papilledema. In cases of Congenitally Full/Crowded Disc, the OCT will show a normal to slightly thickened RNFL curve that stays within the age-adjusted scale. Figures 6 and 7 demonstrate the application of testing RNFL to aid in differentiating early PE from PPE.

Making the Diagnosis
Making the clinical diagnosis begins with a comprehensive history. During the interview, the practitioner is listening for symptoms associated with increased intracranial pressure and any associated neurological defects. (Table 2) Visual acuities, pupils, color vision, EOMs, and visual field screening are important to determine if there is any nerve dysfunction. Always consider the patient’s age, demographics, and ocular/medical history including in-office blood pressure readings.

A dilated fundus examination including stereoscopic views of the disc provides the most effective optic nerve evaluation. There are key characteristics to look for in determining disc edema from elevation. Start with the overall disc appearance looking at the size, cup, margins, neuroretinal rim tissue color, and taking note of any spontaneous venous pulsation (SVP). Then study the vasculature of the disc and surrounding tissue. In the presence of papilledema, the ONH will appear elevated and hyperemic with blurred margins that will obscure peripapillary vessels as they leave the disc. The swelling includes no SVP along with venous congestion with flame-shaped hemorrhages and cotton wool spots. Buckling or retinal folds of the temporal aspect of the disc (Paton’s lines) may be present. In contrast, ONHD will appear non-hyperemic and the peripapillary vessels are not obscured nor will there be any

| Headaches (HA)               |
| Transient visual obscurations (TVO) |
| Tinnitus – “whooshing sound”   |
| Diplopia                      |
| (HA and TVO most common)      |

Table 2. Symptoms of papilledema.
cotton wool spots (CWS). Paton’s lines are not associated with pseudopapilledema. The clinician should look for anomalous vascular patterns including tortuosity as well as a positive SVP, which may be present. Clinical diagnosis and decisions are made based on the appearance of the optic nerves and information provided by the ancillary tests.

**Now what to do about it?**

Once the clinician determines that the discs are in fact swollen, the patient must be sent for neuroimaging within 24 hours to identify the source of increased ICP. Take stereo disc photos, get a baseline threshold visual field, and order the MRI. The visual field defects associated with papilledema start as an enlarged blind spot. Depending on location and severity of a brain lesion, neurological visual field defects such as quadrantanopsia or hemianopsia can occur.

In addition to visual field testing, the OCT provides an available option for long-term follow-up of the changes in RNFL thickness. This is helpful in monitoring the resolution of papilledema as well as monitoring RNFL loss in ONHD. Patients with ONHD can develop visual field defects and RNFL loss that resembles glaucoma. Glaucoma and ONHD can coexist. The OCT cannot distinguish nerve fiber layer loss that occurs from ONHD from that which occurs as a result of glaucoma. Documentation of visual field loss and RNFL reduction provides a baseline for progression.

The lack of significant disc cupping of nerves with drusen contributes to the difficulty in managing patients who develop glaucoma. Progression of cup size is often undeterminable and the clinician can only use intraocular pressures as a guide for treatment and management. In cases with nerve fiber loss due to ONHD, established from baseline OCT and Humphrey visual fields (HVF) testing, the IOP should be lowered to protect the vulnerable optic nerve fibers. If there is a significant increase in IOP from baseline readings, the clinician needs to consider initiating glaucoma treatment, preferably with Alphagan-P. This ophthalmic drug will lower the IOP and may have neuroprotective properties potentially reducing the patient’s risk of further damage to the RNFL.

There is no existing treatment for ONHD. An annual comprehensive eye examination along with proper diagnosis and patient education is the best available modality of care. Generally, ONHD is without visual significance. However, patients need to be aware of potential complications that could affect vision. Patients with ONHD should undergo regular dilated fundus examinations along with visual field testing (HVF 24-2), stereoscopic disc photos, IOP measurement, and nerve fiber layer examinations for future monitoring. With the aid of diagnostic tests such as B-scan and OCT, clinicians can avoid unnecessary doubts and concerns along with expensive neurological investigations while making the correct diagnosis in bilateral optic nerve elevation.

**References**

Given the exceptional achievements and remarkably long career of Irvin M. Borish and the pivotal role he played in encouraging and nurturing many developments in optometric education and practice, it is appropriate that someone should attempt a book-length biography. Bill Baldwin has achieved that in fine fashion.

Borish was born in 1913 in Philadelphia. His childhood was spent in Philadelphia and in Liberty, New York under humble circumstances. He matriculated at Temple University with thoughts of a career in literature. He changed his mind, and attended Northern Illinois College of Optometry (NICO) in Chicago, where he graduated with highest honors in January of 1934. After a brief period of time in optometry practice in Chicago, he became a full-time faculty member at Northern Illinois College of Optometry in January of 1936. His teaching and administrative responsibilities increased at NICO until he started an optometry practice in Kokomo, Indiana in 1944. From 1973 to 1983, Borish was a full-time faculty member at Indiana University. In 1983, he became Benedict Professor of Optometric Practice at the University of Houston. In 1989, Borish retired from Houston, but continued to write, lecture, and work for the enhancement and advancement of the optometric profession.

Into that biographical framework Baldwin weaves details of Borish’s family and friends, colleagues, professional activities, artistic endeavors, community contributions, travels, personality, and philosophy to tell an interesting story. Baldwin captures the insight, intelligence, and drive that allowed Borish to rise to the top of his profession.


The nature of the content of each chapter can probably be guessed from the titles with the possible exception of Chapter 6, “Two Triumphs, 1945-51.” It deals with the efforts to start the optometry school at Indiana University and with the writing of the first edition of Clinical Refraction.

The book includes three appendices. Appendix A, “Borish Views His Profession,” contains excerpts of essays and articles that he wrote on the optometric profession. Appendix B,
“Borish’s Wit and Wisdom,” consists of some anecdotes that he has used to emphasize particular points made in his lectures. In Appendix C, there are tributes from four of his friends and colleagues and a listing of some of the most prestigious awards that he has received.

In researching this book, Baldwin used extensive interviews of Borish, interviews of several of Borish’s colleagues, his own personal knowledge of Borish, and information gained from a number of optometry schools and organizations. The book contains more than 170 black and white photographs of Borish, his family, friends, and colleagues, places that he worked, and places that he visited. There is an index and an eight-page color section of Borish’s paintings. Some of Borish’s paintings also adorn the back and the flaps of the dust jacket. Persons who want to learn more about Irvin M. Borish or about the history of optometry in the twentieth century will find much of interest in this book. Because Borish played a role in so many of the educational and practice developments in optometry over several decades, there is much optometry history that can be learned from the book.

A copy of the book with a greeting and signed by Borish can be obtained for a contribution to the Borish Center of $100. A book signed and with a personal message from Borish can be obtained for $200. The contribution is partially tax deductible and checks should be made payable to Indiana University and sent with the order form to: Optometry Budget Office, IU School of Optometry, 800 East Atwater Avenue, Bloomington, IN 47405. The order form can be found at www.opt.indiana.edu/bcor/borishbook/BORISH.pdf

Additional information about the book and ordering a copy can be obtained at www.opt.indiana.edu/bcor/borishbook/index.htm, or by contacting Hillary Person (812-855-0351 or hlheflin@indiana.edu) at the Indiana University School of Optometry.
In 1971, Ted Grosvenor published an article entitled “The Neglected Hyperope.” In it, he noted that there were many more published articles on myopia than on hyperopia and there were more textbook pages devoted to myopia than to hyperopia. He also observed that there was evidence that hyperopia was associated with reduced reading efficiency. Since then, evidence has continued to accumulate that hyperopia is associated with reduced reading ability and poor school performance, as well as with poor performance on visual perception, visual cognitive, and visual motor tests.

Hyperopia is a risk factor for strabismus and amblyopia. Amblyopia is more likely to be found with hyperopia than with myopia. Anisometropic amblyopia is more frequent with lower amounts of hyperopic anisometropia than of myopic anisometropia. And isoametropic amblyopia can be found in high hyperopia in children. Early correction of hyperopia may reduce the risk of strabismus and amblyopia. Headaches are often thought to be associated with hyperopia, which has been confirmed in one study in 11 to 13 year old girls.

Work on myopia exploded in the 1990s, but hyperopia was still fairly neglected through the end of the twentieth century. Thirty-three years after Grosvenor wrote about the neglected hyperope, Rosner wrote about the “The Still Neglected Hyperope” and said that it was “time that our profession took a serious, thorough look at the possible long-term effects of ignoring moderate hyperopia in asymptomatic young children.”

The fact that there has been a smattering of papers on hyperopia published in the first few years of the twenty-first century and the fact that the February, 2007 issue of Optometry and Vision Science was devoted to hyperopia in infants and children suggests that the hyperope may not be quite as neglected as before. This short review will give a brief overview of some of the recent papers on hyperopia.

Association with Hypertension?

In addition to the associations with the conditions noted above, one paper has reported an association of hyperopia with hypertension. Karadayi et al. compared the refractive errors of 321 patients with hypertension in Turkey to the refractive errors of 188 controls. The mean age of the hypertension patients was 53.9 years and the mean age for the controls was 50.9 years. The mean blood pressure measurements were 150.8/90.5 for the hypertension patients and 113.6/71.2 for the controls. Refractive errors were determined by averaging the spherical equivalents of the two eyes found by autorefractor.

The mean refractive errors (+SD) were +0.88 D (+1.34) for the hypertension patients and -0.26 D (+1.12) for the controls. The difference was statistically significant by t test (p<0.0001). Mean refractive errors were also different between hypertension patients and the controls in each of three age groups, 20 to 40 years, 41 to 60 years, and 61 to 84 years.

The authors also examined the distribution of hyperopia, emmetropia, and myopia in the two groups. Emmetropia was defined as refractive errors of -0.50 to +0.50 D, inclusive. Myopia was defined as refractive errors more minus than -0.50 D, and hyperopia as refractive errors more plus than +0.50 D. Of the hypertension patients, 11% had myopia, 28% had emmetropia, and 61% had hyperopia. Of the controls, 30% had myopia, 52% had emmetropia, and 18% had hyperopia. The distributions of refractive error in the hypertension patient and control groups were statistically significant by Chi-square test (p<0.0001). Significant differences in the distributions were also found in each of the three age groupings.

Lack of Consensus on Prescribing Philosophies for Children

A number of different factors could be considered by practitioners when deciding whether to prescribe or not prescribe lenses for asymptomatic hyperopic children. We could perhaps identify two overlying two schools of thought. One would say that hyperopia should be corrected with lenses in order to reduce the risk of reading difficulties, school problems, and/or amblyopia. Another school of thought would say that lens correction for hyperopia should be delayed because it might disrupt emmetropization. It is perhaps not surprising then that Lyons et al.21 found a lack of consensus in philosophies for prescribing for children with hyperopia.
Lyons et al. surveyed pediatric optometrists and pediatric ophthalmologists concerning the amounts of hyperopia for which they would prescribe for asymptomatic children at six months, two years, and four years. The most frequent responses among optometrists were more than 5 D at six months, more than 3 D at two years, and more than 3 D at four years, although there was much variability in the responses. There was also variability among the ophthalmologists, with the most frequent responses being more than 5 D at all three ages. Optometrists were more likely to prescribe in lower amounts of hyperopia at all three ages. Most survey respondents prescribe less than the full amount of the hyperopia, with half of the full amount and two-thirds of the full amount being the most frequent answers.

The Lyons et al. survey was also translated into German and sent to a sample of German ophthalmologists. The responses from the German ophthalmologists did not differ significantly from the responses of the American optometrists in the Lyons et al. survey, but did differ significantly from the American ophthalmologists.

The February, 2007 issue of Optometry and Vision Science contains articles by a leading pediatric ophthalmologist and a leading pediatric optometrist in which they present their personal perspectives on prescribing philosophies for hyperopia in children. Donahue, the ophthalmologist, noted that there are several reasons why prescribing for preschool children is different from prescribing for adults, including difficulties in accurately measuring visual acuity, closer working distance, lesser visual demands, and risk for strabismus and amblyopia. Donahue mentioned that the Preferred Practices Patterns of the American Academy of Ophthalmology suggests that for children three years of age and older, hyperopia should be corrected when it is 4.50 D or more, and that prescribing at four years and older should be based on the improvement of visual acuity or the alleviation of esotropia rather than a particular numerical threshold. However, Donahue noted that there may be consensus for prescribing when the hyperopia exceeds 3.5 D and that other factors such as family history of strabismus and amblyopia should be taken into account. Both Donahue and Cotter, the optometrist, expressed the opinion that further research is needed to justify prescribing patterns.

Cotter noted that the American Optometric Association Clinical Practice Guideline on Hyperopia “states that there is no universal approach to treating hyperopia. Rather, the patient’s age, degree of symptoms, visual acuity, magnitude of hyperopia, accommodative abilities, and efficiency with visual tasks should all be considered.” Cotter suggested that the variability in prescribing philosophies for hyperopia can be related to the level of concern of the practitioner about factors such as the strain on accommodation and vergence from uncorrected hyperopia and the effect of uncorrected hyperopia on reading ability and school performance.

Does Prescribing for Hyperopia Disrupt Emmetropization?

The Dictionary of Visual Science and Related Clinical Terms defines emmetropization as “a process presumed to be operative in producing a greater frequency of occurrence of emmetropia and near emmetropia than would be expected in terms of chance distribution, as may be explained by postulating that a mechanism coordinates the formation and development of the various components of the human eye which contribute to the total refractive power.” It has been observed that there is a wide range of refractive errors among infants, but that hyperopia and myopia decrease so that by about five years of age, emmetropia is more common and the variability in refractive error is less than at any other time in the life span. We will now consider recent papers that address whether prescribing for hyperopia could disrupt the emmetropization process.

Atkinson et al. followed hyperopic (+3.5 to +6 D) infants from nine months of age to 36 months of age. Forty-four were treated with spectacles, and 37 were not. The sphere power in the spectacle prescriptions was 1 D less than the least hyperopic meridian. The cylinder in the spectacle prescriptions was half of any astigmatism that was over 2.5 D up to two years of age, and then after two years of age, half of any amount of astigmatism. Children with strabismus or with anisometropia of more than 1.5 D in parallel meridians were not included in the study. In the children who wore spectacles, the mean refractive error decreased from +4.6 D at nine months to +3.4 D at 36 months. In those not wearing glasses, the mean refractive error decreased from +4.3 at nine months to +3.1 D at 36 months. The decreases in hyperopia were the same in both groups, indicating that the spectacles had not disrupted emmetropization. The authors performed a sub-analysis in which they considered only the infants who were compliant to lens wear, judged as wear of the spectacle at least 50% of
waking hours. The 31 compliant subjects decreased in refractive error from +4.5 D at nine months to +3.3 D at 36 months, the same amount of decrease in hyperopia as the infants who did not wear spectacles. A second study by Atkinson et al.\textsuperscript{13} showed a very similar pattern of results, neither study showing an effect of spectacles on the decrease in hyperopia. Therefore neither of the Atkinson et al. studies indicated a disruption of emmetropization from wearing of spectacles.

In a similar study, Ingram et al.\textsuperscript{31} followed infants initially six months of age for periods of time which ranged from about two to four years. Subjects with more than +5.25 D hyperopia in one meridian were randomly assigned to spectacle wear or no spectacle wear groups. The spectacles undercorrected hyperopia by 2 D in all meridians; in other words, astigmatism was fully corrected. The mean changes in refractive error in the two eyes for subjects without strabismus were -1.29 D for 89 children who did not wear spectacles, -1.24 D for 55 children who wore spectacles intermittently, and -0.94 D for 45 children who wore spectacles consistently. The children who wore glasses consistently had a significant decrease in hyperopia, but it was less than the decrease in the other groups, suggesting a slight disruption in emmetropization.

The Ingram et al.\textsuperscript{31} study also included strabismic subjects. The mean decreases in hyperopia in the fixating eyes of the subjects with strabismus were -0.16 D for 53 who did not wear spectacles, -0.38 D for 25 who wore spectacles intermittently, and -0.42 D for 22 who wore spectacles consistently. The mean changes in refractive error in the deviating eyes of the subjects with strabismus were +0.28 D for those who did not wear spectacles, +0.01 D for those who wore spectacles intermittently, and +0.02 D for those who wore spectacles consistently. In the children with strabismus the changes in refractive error were not statistically significant in either eye in any of the treatment groupings.

In another article in the February, 2007 issue of Optometry and Vision Science, Mutti\textsuperscript{32} noted that as the eye grows, axial length increases and crystalline lens power decreases. Emmetropization from hyperopia toward emmetropia occurs when the dioptric effects of increasing axial length exceed the magnitude of the decrease in refractive power of the crystalline lens. Data from his studies suggest that most emmetropization occurs between three and nine months of age and that there is less potential for emmetropization after about one year of age. Mutti\textsuperscript{32} expressed the opinion that “If emmetropization occurs during the first year and if little change in refractive error occurs in hyperopes during childhood, it seems reasonable to conclude that there is little to no emmetropization potential with which to interfere. If emmetropization is complete, refractive error is stable, and the hyperopic eye is growing at a pace equal to emmetropes yet it remains hyperopic, then correction seems unlikely to adversely affect a system that is already stable. Visual benefit perhaps should trump concern over interference with emmetropization when considering correction of the pediatric hyperope.”

**Does Prescribing for Hyperopia Prevent Strabismus and Amblyopia?**

The studies by Atkinson et al.\textsuperscript{13} have addressed this question. In the first study, children with hyperopia of 3.5 D or more who did not wear spectacles had a prevalence of strabismus of 21% by four years of age. Amblyopia, which they defined as failure on the Cambridge Crowding Cards acuity test, was found in 68% at four years of age. In those who wore the undercorrection of their hyperopia, the prevalences were significantly less at the same age: 6.3% had strabismus and 28.6% had amblyopia.\textsuperscript{13}

In the second study,\textsuperscript{33} when hyperopia of more than 4 D was not corrected, 17% developed strabismus and 68% later had amblyopia. In comparison, only 0.5% of emmetropic controls developed strabismus and only 0.5% of emmetropic controls showed amblyopia. The hyperopic infants who wore spectacles did not subsequently have a significantly lower prevalence of strabismus than those who did not wear glasses, but the prevalence of amblyopia was significantly lower at 17.1%. So both studies answered this question yes for amblyopia. For strabismus, the answer was yes from the first study and no from the second study.

**Prevalence and Ethnicity**

Kleinstein et al.\textsuperscript{34} reported on a multicenter study of the effect of ethnicity on the prevalence of refractive error in first to eighth grade children. The study population was 534 African American, 491 Asian, 463 Hispanic, and 1035 white children, a total of 2523. The African Americans were primarily from Eutaw, Alabama, the Asians primarily from Irvine, California, the Hispanics primarily from Houston, Texas, and the whites primarily from Orinda, California. Ethnicity was established by parent report. Refractive error was determined by autorefraction of the right eye after instillation of either two drops of 1% tropicamide or...
a combination of one drop of 1% tropicamide and one drop of 1% cyclopentolate. Hyperopia was defined as +1.25 D or more plus in both principal meridians. Myopia was defined as -0.75 D or more minus in both principal meridians. Astigmatism was defined as at least 1.00 D cylinder measurement.

The overall prevalence of hyperopia reported by Kleinstein et al. was 12.8%. Whites had the highest prevalence of hyperopia (19.3%), followed by Hispanics (12.7%) with African Americans (6.4%) and Asians (6.3%) having the lowest. The myopia prevalences were Asians, 18.5%; Hispanic, 13.2%; African American, 6.6%; and White, 4.4%. The prevalences of astigmatism were Hispanic, 20.5%; Asian, 18.5%; White, 13.1%; and African American, 11.1%. The authors concluded that “…there are a large number of children who are handicapped visually in their everyday classroom, recreational, and other activities….uncorrected refractive errors have the potential to make learning more difficult and to reduce or self-limit the choices that children make in their daily activities.”

References
24. Cotter S. Management of childhood hyperopia:
Optometric Historical Society Launches a New Publication

The Optometric Historical Society has launched a new quarterly publication, *Hindsight: Journal of Optometry History*. It continues from the society’s previous publication, *Hindsight: Newsletter of the Optometric Historical Society*.

*Hindsight: Journal of Optometry History* supports the purposes of the Optometric Historical Society, which are: (1) to encourage the collection and preservation of materials relating to the history of optometry, (2) to assist in securing and documenting the recollections of those who participated in the development of optometry, (3) to encourage and assist in the care of archives of optometric interest, (4) to identify and mark sites, landmarks, monuments, and structures of significance in optometric development, and (5) to shed honor and recognition on persons, groups, and agencies making notable contributions toward the goals of the society.

The Optometric Historical Society was formed in 1969 with 33 charter members. The society’s newsletter was first published in 1970. Editors of the newsletter in its first few years were Indiana University faculty members Henry Hofstetter and John Levene.

*Hindsight: Journal of Optometry History* features a regular column by noted optometrist and vision scientist Jay Enoch. Other articles in *Hindsight* explore various aspects of optometry history. For example, the January, 2007, issue includes an article on Hans Goldmann by Jay Enoch; description of the development of Optometric Management magazine by its long-time publisher, Irving Bennett; a paper on the status of the study of optometry history; a narrative on an interesting document, the 1921 Rochester School of Optometry yearbook; and a review of a biography of Thomas Young.

Annual dues for membership in the Optometric Historical Society are $25 for regular membership or $50 for patron membership. Lifetime membership is $250. Membership in the Optometric Historical Society can be secured by sending name, address, and dues payment to: Bridget Kowalczyk; Secretary-Treasurer, Optometric Historical Society; International Library, Archives, and Museum of Optometry; 243 North Lindbergh Boulevard; St. Louis, MO 63141. Checks should be made out to the Optometric Historical Society.

Manuscripts submitted for publication in *Hindsight: Journal of Optometry History* should be sent to the Editor: David A. Goss, Hindsight Editor, School of Optometry, Indiana University, Bloomington, IN 47405; email: dgoss@indiana.edu. The Optometric Historical Society is also seeking Contributing Editors who will commit to contributing at least one publication per year to Hindsight. Persons wishing to serve as Contributing Editors should submit a letter of intent to the Editor at the address noted above. Membership in the society is required to serve as a Contributing Editor.

Melvin Wolfberg, former president of the American Optometric Association, is serving as president of the Optometric Historical Society in 2007. Additional information about the Optometric Historical Society can be obtained by visiting its website, www.opt.indiana.edu/ohs/optohiso.html.

Institutional or library subscriptions to *Hindsight: Journal of Optometry History* can be obtained by registering membership in the Optometric Historical Society. Sample copies of the journal can be obtained by writing to the Editor David Goss at the address above or by download from www.opt.indiana.edu/ohs/hindsightJan07.pdf.