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From the Editor

This issue features an interview with Henry Hofstetter, first director of Indiana University’s optometry school. Dr. Hofstetter shares some of his memories of the beginnings of the optometry program.

Profiled in this issue is Clifford W. Brooks, who next fall will start his 25th year as an Indiana University School of Optometry faculty member. Accompanying his profile are his thoughts on what spectacles may be like in the near future.

The advent of contact lenses brought predictions of the demise of spectacles. The development of refractive surgery has renewed those predictions. Despite such prognostications, spectacles are still the most common ophthalmic treatment, and the spectacle lens and frame industry does business in the neighborhood of fifteen billion dollars annually. In recent years there have been improvements in the comfort, cosmesis, weight, and impact resistance of spectacle lenses and frames. What will the future hold? For this issue, we asked Cliff Brooks to describe what he thinks spectacles may be like in ten years. In the next issue, Larry Thibos and Don Miller will speculate about the nature of spectacle lenses 25 to 50 years from now, based on their research.

Also in this issue are a summary of a survey of IU Optometry alumni, an overview of two journal articles that may be of interest to practitioners, and some news items from the IU School of Optometry. We are anxious to find out whether you, the readers, feel that we are achieving our stated purpose of providing information on the School and on new developments in optometry and vision care. Please give us your feedback and suggestions.

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The I.U. Optometry Heritage
Interview with Dr. Henry Hofstetter

The Indiana University optometry program was exceedingly fortunate to have Dr. Henry Hofstetter as its first director, serving in that capacity from 1952 to 1970. Dr. Hofstetter has had a long and very distinguished career in optometric education, research, and service. His wisdom and dedication helped to establish the Indiana University optometry program as a preeminent school. Known for his contributions to the clinical analysis of accommodation and convergence, optometric education, international optometry, optometric terminology, optometric history, and industrial vision, Henry Hofstetter is the author of over 400 publications and has received numerous prestigious awards from regional, national, and international organizations.

Although a short interview cannot possibly do justice to Dr. Hofstetter’s achievements, the journal editorial staff thought the readers would want to hear some of his remembrances. On September 28, 1998, the Editor interviewed Dr. Hofstetter at his apartment at the Meadowood Retirement Community to learn of his recollections of the beginnings of the optometry program at IU. Dr. Hofstetter responded based on memory without the benefit of files or reference materials.

IJO: How were you chosen to be the first Head of the Division of Optometry at Indiana University?

Hofstetter: I first became aware of the attempt of Indiana optometrists to start an optometry school in 1939. At the time I was in my last year of optometry school at The Ohio State University. I knew Don Bixler, whose father, Noah Bixler, was on the Indiana Optometry Board of Examiners. The board was talking about starting an optometry school at least as early as 1939. John Davey suggested having the school in Bloomington at Indiana University. That was the preference of most optometrists. In response to the optometrists’ negotiations, the IU Board of Trustees drafted a resolution to start an optometry school. With almost immediate objection from medical quarte rs, the draft was rescinded. That opposition strengthened the resolve of the optometrists to establish the school. The optometrists started a lobbying campaign in the Legislature, and included an add-on to the optometry licensure fees that would go toward the expenses of starting the school.

Meanwhile, I completed my Ph.D. at Ohio State, the first one ever granted in physiological optics I believe, in 1942. I served on the faculty at Ohio State for the next six years, and then went to the Los Angeles College of Optometry (now the Southern California College of Optometry) to serve as their Dean.

Indiana University Dean of Faculties Herman Briscoe was authorized in 1951 to start the optometry program. One of his first objectives was to find a person to head the school. I arranged for him to meet with members of the faculty at LACO. I hadn’t been at Los Angeles long and was happy there, so I wasn’t seeking the position. Briscoe later told me that if I was going to be in the Midwest for any reason to contact him about a visit to Bloomington. Later when I was invited to attend a conference of lighting engineers in Cleveland, I contacted him and a stop-over in Bloomington was arranged. Before I left Bloomington, he offered me the job. When I returned home, my wife Jane said that she could tell by the smile on my face that we were moving to Bloomington.

IJO: I have heard stories about the closeness of the optometry students and their families to you and Mrs. Hofstetter. Could you tell us about the early student interactions with you and the faculty?

Hofstetter: There were 18 students in the first entering class, and 13 in the next class. We got to know all of the students on a first name basis. The students were very active in all the activities of the program. Sometimes they helped unpack equipment that they were going to use the same day in a laboratory. At that time, all the students were men. Jane [Mrs. Hofstetter] and Joan Allen [Mrs. Merrill Allen] helped to start an organization of the wives called the Dames Club. They raised money by making tangent screens in our basement and selling them to optometrists.

IJO: Why was the optometry program started as a Division within the College of Arts and Sciences?

Hofstetter: The university had a guideline that a School had to have a certain minimum number of faculty members.

IJO: I have heard you speak in glowing terms about Chancellor Herman Wells. What are the reasons for your admiration for him?

Hofstetter: Several years ago, I visited a museum in Nagoya, Japan. It had a large display about the Japanese emperors. It emphasized one emperor, whose reign outshone all the rest. That emperor had the greatest accomplishments because he supported the people who worked for him. The same could be said of Herman Wells. He supported his faculty. I’ll give one example. Not long after I came to Indiana, a suit was brought against the state optometric association, the
state optometry board, and me as head of the optometry school, by an optometrist who claimed prejudice against commercial optometry. The suit was groundless and was thrown out, but I thought that I should immediately contact President Wells. He showed his support by telling me thanks for calling him so that if anyone told him that the head of his optometry program was being sued, he could respond that he knew all about it.

**IJO:** What was the first IU optometry clinic like?

**Hofstetter:** Space was assigned to us in Jordan Hall, a new science building. We had four or five rooms on three different floors in Jordan Hall. We had a reception area and three or four clinical rooms. We charged a $1 registration fee to each patient. Glasses were provided at laboratory cost plus a handling fee. The receptionist was a work-study student. The optometry students did the clerical work as part of their clinic requirement. Local optometrists, three from Bloomington and one from Columbus, served as check doctors. Gordon Heath served as administrator of the clinic.

**IJO:** How did the Indiana optometrists support the optometry school in its early years?

**Hofstetter:** The optometrists were very pleased to have the school at IU, because IU has a good standing among the citizens of the state. The graduates were proud to have a degree from Indiana University. There was some concern about overcrowding of optometrists. In response, I did calculations of the number of optometrists needed based on population, population growth, age distribution of Indiana citizens, retirement patterns of optometrists, and other factors, and found that we were producing approximately the right number of optometrists. One way that the optometrists supported the program in its early stages was that they organized a fund drive, and collected about $100,000 in pledges for the school.

**IJO:** Was there any opposition to the development of the optometry school within the University?

**Hofstetter:** I was not aware of any formal opposition. Some faculty did not think that it was a highly academic program, because it was preparing graduates for a specific occupation. Those faculty members were not aware of the grounding that optometry had in so many different disciplines, and they viewed it as having primarily a vocational flavor. To combat that bias, we were careful to use course titles and course descriptions that emphasized the academic nature of the courses. For example, instead of calling a course Practice Management, we called it Socioeconomic Aspects of Optometry.

**IJO:** What did you do to establish the optometry program as a legitimate academic discipline within the University?

**Hofstetter:** The most important thing was having the optometry degree given through the Graduate School. At the time the optometry school was started, it was possible to obtain an optometry degree in five years of university study. Some private optometry schools awarded Doctor of Optometry degrees at the time, but the state universities with optometry programs generally awarded a Baccalaureate or Masters in Optometry. We were able to award a Masters degree through the Graduate School by designing a curriculum that fit the criteria of academic scientists.

Another effort was to work to recruit only the best students. I talked with practicing optometrists to ask them to recommend good students to apply. After a while, people on campus recognized that some of the very best students here were optometry students.

**IJO:** How did you find and attract optometry faculty here?

**Hofstetter:** There were many attractions for faculty: a good salary schedule, an excellent retirement program, and a beautiful campus. In some cases I knew faculty beforehand. For example, I knew Merrill Allen from graduate school at Ohio State. In the first year, the faculty consisted of Merrill Allen, Stanley Rafalko, and me.

**IJO:** What can you tell us about the design of the optometry building?

**Hofstetter:** The current Optometry Building was first occupied in 1967. There were many people involved in the design of the building. I drew up a plan of general needs and areas, and approximate space needed for each topical area of the program. I also indicated a need for some laboratory rooms with no windows for darkness for vision experiments. That schematic plan was turned over to the architects. The
architects' plan was presented to the faculty who offered comments and criticisms. The architects' plans went through several drafts. I then assigned Gordon Hean to be in charge of building development.

IJO: What do you consider to be some of your most important accomplishments as head of the optometry program?

Hofstetter: My major accomplishment may have been the establishment of the physiological optics graduate program. Most other optometry schools at that time just hired their own graduates as faculty, so there was a need for Ph.D. faculty and diversity of faculty at many schools. The only other graduate programs in physiological optics at the time were at Ohio State and Berkeley. They accepted only students with baccalaureate degrees from state universities, so optometry graduates from private schools could not go to either of those graduate programs. In our petition to the Graduate School, we pointed out the need to accept students from private optometry schools. The experience of the School of Music was that they had many successful graduate students who had attended private schools, so that helped us make our point. Some of our early applicants to the graduate program were military optometrists who had attended private optometry schools. This started a long association of our graduate program with military optometrists who wished to pursue graduate studies.

Another accomplishment was my work in international aspects of optometry. My three Sabbatical leaves were spent overseas: the first in South Africa, the second in Australia, and the third in Europe. I wrote many articles and reports on optometry in countries around the world, and I was the principal author of material on education for the International Optical and Optometric League.

The establishment of the optometry library was another accomplishment. When I was hired, one of my conditions agreed upon with Dean Briscoe was that we have a branch library at some time in the future. We planned for one in the new building. There was initially some resistance in the library administration, because there had not been a new branch library started in 32 years. When we prepared the application for a branch library, it was approved.

After a few years of teaching a course on introduction to optometry, I developed an interest in optometric history. Many of my publications have been on historical topics. I think that starting the Newsletter of the Optometric Historical Society was important because it serves as a repository of information on the history of optometry and vision science. Next year will be the 30th year of the Newsletter, and I am working now on keeping the indexing of the Newsletter up to date.

IJO: Is there anything else that our readers should know about the beginnings of the optometry program at IU?

Hofstetter: No, I think that we have covered many of the aspects pretty well. If anyone wishes documentation about the early years of the program, I have turned over my files to the Indiana University Archives in Bloomington and to the International Library, Archives, and Museum of Optometry at the American Optometric Association office in St. Louis. In addition, each year I produced a report on the state of the optometry school which was distributed to Indiana optometrists, all state optometry boards, and heads of state optometric associations across the country. Copies of these reports are bound in two volumes, and can be found in the IU Optometry Library.

Plan to attend
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Profile: Clifford W. Brooks, O.D. by David A. Goss, O.D., Ph.D.

Indiana University’s Clifford Brooks can remember being fascinated by spectacles and lenses since getting his first pair of glasses in fifth grade. Today he stands as the leading educator in ophthalmic dispensing in North America.

Cliff was born in Cincinnati, Ohio, and was raised in the Cincinnati area. He attended both undergraduate school and optometry school at Indiana University in Bloomington. Following his graduation from optometry school in 1971, Cliff practiced optometry for a year in Orleans and Salem, Indiana.

From 1972 to 1974, Cliff was a Guest Lecturer at Höhere Fachschule für Augenoptik in Cologne, Germany. He taught a number of topics to persons studying to be Augenoptiker (opticians). A summer spent in Germany a few years before had given him the language skills to teach his courses in German.

In 1974, Cliff returned to the United States and joined the faculty of the IU School of Optometry. The first course to which he was assigned was the Ophthalmic Dispensing course in the Optometric Technology program. Two years later he began teaching Ophthalmic Optics to the optometry students and Ophthalmic Lens Finishing to optometric technology students. In each course, Cliff found that there was little suitable written instructional material. The written materials that he put together for his students developed into textbooks.

Cliff’s most significant contribution to the optometry and opticianry professions is probably the six books that he has written. He has authored or co-authored three major textbooks dealing with the optics and dispensing of ophthalmic lenses. System of Ophthalmic Dispensing by Brooks and Botish, now in its second edition, is used in most optometry schools. It is also the main source of questions for the American Board of Opticianry’s national certification examinations and is the primary text recommended to prepare for those exams. A book on lens finishing, Essentials for Ophthalmic Lens Work, and another on lens surfacing, Understanding Lens Surfacing, are the only available textbooks for those subject areas. Cliff has also published a reference handbook for use in optical laboratories and a manual of laboratory exercises to learn to use lens surfacing equipment.

Cliff has also made contributions in the research arena. He has studied the use of low-powered progressive addition lenses in non-presbyopes (with Dr. Bill Rainey), wearer acceptance of multifocal lenses manufactured with non-traditional methods, how the vertical position of a progressive addition lens affects near point vision satisfaction, effect of prescribed prism on monocular interpupillary distances and fitting heights for progressive addition lenses (with Dr. Hurb Riley), and distance power verification procedures for progressive addition lenses.

Cliff has had numerous service, committee, and administrative positions. He has been Director of IU Optometry’s optometric technology programs since 1977. This has been a highly successful program, with a very high percentage of its graduates being employed by optometrists or other segments of the ophthalmic industry. In 1986, Cliff founded the Fellowship of Christian Optometrists International, Inc., and has served as its president since that time. Their primary activity is to provide vision care to persons in Third World countries.

The goals for which Cliff has strived in his professional career are: to raise the standard of care relating ophthalmic optics throughout the ophthalmic professions, to introduce new concepts into ophthalmic optics and dispensing, and to provide educational materials that are applicable for both traditional classroom teaching and in-office training of ancillary personnel. His success in meeting those goals has resulted in some prestigious awards. In 1995, he was inducted into the Hall of Fame of the National Academy of Opticianry. The following year opticianry educators in the National Federation of Opticianry Schools voted him the Educator of the Year.

Cliff lives with his wife and four children on 28 acres west of Bloomington. Those who know Cliff can attest that he is not only a dedicated educator, but also a fine gentleman. His dedication, skills, and demeanor make him a valuable asset to the School of Optometry and Indiana University.
What Will Spectacle Lenses Be Like in Ten Years? A Speculative Look at Spectacle Lenses

by Clifford W. Brooks, O.D.

Attitudes toward eyeglasses are contradictory. Nobody wants to appear dependent upon eyeglasses. But at the same time, eyeglasses are no longer an objectionable necessity. In other words, it’s OK to wear glasses, as long as you don’t have to wear glasses! Eyewear is acceptable as a fashion item, but not as a prosthesis. What differentiates a fashion item from a prosthetic device? Uncommonly plain frames will differentiate fashion from prosthetics, of course. But a very strong defining point is the way the lenses look. There are certain key aspects that make lenses look like prosthetic devices. Here are a few:

1. Obviously thick edges
2. A bulbous front surface
3. Magnifying effect that enlarge the eyes
4. Internal concentric ring reflections and/or highly reflective front surfaces

By minimizing these factors, lens manufacturers will do everything possible to make prescription lenses look more non-prescription. What can be done? At present, the best possibilities include small eyesizes, high index lens materials, aspheric designs, and antireflection coatings. (See Figure 1.)

Lens Designs Today

The higher the index of refraction, the less a lens surface needs to be curved to create the same dioptic power. Thus using higher index lenses reduces center thickness for plus lenses and thins edge thickness for minus lenses. Unfortunately, the higher the index of refraction, the more reflective the surfaces. Unless combined with an antireflection coating, some of the cosmetic advantages of high index lenses are offset by higher reflection and lower transmission.

Although most think of an aspheric design as being optically superior, a regular spherically-based lens with correctly selected curves compares well in correcting peripheral lens aberrations. (Sphere powers beyond +7.00 D and -22.00 D cannot be corrected for peripheral aberration unless an aspheric design is used.) In fact, because of the concentrically changing surface power of aspherics, a poorly fit aspheric lens will perform as well as a poorly fit spherically based lens.

The greatest limitation for a regular, spherically-based ophthalmic lens is the front curve. Regular plus lenses must be made with steeper base curves. So, if a lens is to be made on a flatter base curve to avoid a bulbous look, it must be made as an aspheric to retain good peripheral optical quality.

Aspherics Have Limitations, Too.

High index lenses, aspherics and AR coated lenses are making a strong showing in the single vision lens market. Yet even a high index, AR-coated aspheric lens can’t correct peripheral aberrations for both meridians of a spherocylinder lens simultaneously. This is because aspheric lenses change surface power at an equal rate in every lens meridian. But if the surface curvature can be made to change at one rate for the sphere meridian and another rate for the cylinder meridian, a major improvement in peripheral viewing will occur. These types of lenses are termed “atorics.” Atorics are entering the market in a variety of plastic lens materials including polycarbonate and high index.

Further Changes In Lenses Are Being Limited By Current Manufacturing Methods

There have been a number of major improvements in lens manufacturing processes during the last decade. One of the biggest changes was the introduction of 3-axis lens generating by Gerber Optical (now Gerber-Coburn). Three-axis generating of lens surfaces is computer-driven and, with the right software program, is capable of grinding any type of surface on a lens. Although 3-axis generating is becoming commonplace for the surfacing of plastic lenses, it still isn’t being used to create aspherics or atorics. This is because the technology for smoothing and polishing the optics lags behind. Plastic atoric lenses can be cast molded for mass production of single vision lenses, but can’t be custom ground in a conventional wholesale optical laboratory setting.

Aspheric bifocals and progressives do not present problems for the normal surfacing lab, because asphericity is on the front and the asphericity does not vary by meridian. These multifocals are readily obtainable. Atorics do present a problem. The problem is not a design problem, it is a manufacturing problem. At this point in time only Rodenstock has been able to overcome the problem well enough to bring an atoric progressive lens onto the market. The lens is called the Rodenstock Multigressive lens. Production technology is secretive, costly, and only...
done at one location in Germany.

We already have some of the lenses available today that may dominate the lens market during the next decade. The limiting factor holding back the next phase of design development is manufacturing expense. What is needed is affordable surfacing equipment that will skip lens fining and either innovatively polish the surface directly, or allow the surface to be coated to a high polish. (This equipment is available, but costly.) By going right from generating to a polish coat, lens generators can be programmed to cut any surface, front or back.

Projecting into the Future

What will the future hold for spectacle lenses? Here’s one speculative sequence of events.

1. What’s Happening Now?

At present the lenses that hold promise for adding more from both an optical and cosmetic viewpoint are the high index atorics. Single vision atorics are now obtainable, but there is only one atoric progressive addition lens available.

2. What Happens Next?

In the future, thinned and flattened atoric single vision lenses will take on a large market share. Atorics in high-end progressive lenses will become available through large wholesale lab conglomerates.

3. Small Labs, Large Labs, and Individualized Lens Designs

Affordable methods for both generating and polishing a lens on one machine will be developed. This, combined with other alternatives to lens surfacing for producing multifocals will lead to an increase in office surfacing labs.

Because of the introduction of new lens materials, coatings, and new designs in atoric progressives, large wholesale labs will hold their own. New progressives will have base curves that are matched for both right and left eyes, even in the presence of anisometropia. These base curve-matched lenses will still correct for peripheral aberration in all meridians of both lenses. Base curves will no longer be limited to one and two diopter increments, but will change gradually depending upon lens power. Each progressive lens prescription will be custom designed for add power, distance power, and distance and near PAs. The reading area will also be custom designed to conform to the type of near work done and the proportion of time spent on distance, intermediate or near work.

The spin-off from these progressive addition lens designs will allow custom lens matching for anisometropic single vision lens wearers. The question of aniseikonia will be re-examined and custom corrected using optical laboratory lens software programs.

4. Leasing of Nationally-Recognized Lens Designs

As a result of the ability of computer-driven lens generating and polishing systems to produce any surface curvature, some lens manufacturers will lease software for nationally recognized lens designs to in-house retail surfacing labs. These labs will pay a per-pair royalty and the lenses will be made from completely unfinished lens blanks in-office. Both front and back surfaces will be created in the small office surfacing lab. Some chains will buy software to produce their own "private label" designs in order to avoid paying a per-lens royalty.

5. Major Breakthroughs

As design and delivery changes are taking place for classical spectacle lenses, there will be major breakthroughs in how lens refractive power may be achieved. (Some of these aspects of spectacle lenses will be discussed in the next issue of the Indiana Journal of Optometry.)

Conclusion

In spite of contact lenses and refractive surgery, spectacle lenses have survived. They will continue to maintain a place of prominence in the next decade and for years to come. Spectacle lenses will become increasingly individualized in design. But individualized design will not replace traditional lenses, including lowly drugstore readers. The market will contain a full, rich scope of lenses obtainable through a diverse delivery system.

Figure 1: In A, it can be seen that if the plus-powered CR-39 plastic lens is decreased in size, there is a proportional decrease in lens thickness. In B, if the same plus lens is made in 1.7 index material, the thickness reduces considerably. In C, if the same CR-39 lens is left large, but made in aspheric form, again thickness decreases. Optimum results will be achieved by combining a smaller eyesize, high index material, aspheric design with an anti-reflection coating.
Eye Opener: Summary of Optometry Alumni Survey Results by David A. Goss, O.D., Ph.D and Theodore Grosvenor, O.D., Ph.D.

In 1995, a survey concerning aspects of scope of optometric practice and optometry school curriculum was mailed to all optometry alumni with known addresses. Detailed analyses of the survey have been published, but we would like to take this opportunity to give you a brief summary of the survey results.

Out of the 1,300 questionnaires that were mailed out, 780 responses were received from 44 states, the District of Columbia, and three Canadian provinces. Of the 780 replies received, 47 were from optometrists who were retired or who gave incomplete responses on the questionnaires, leaving 733 replies used in the analysis. Of the 733 in active practice, 597 were in solo practice or were in practice with other ODs, and 136 were in practices which included both ODs and MDs. The OD practice respondents were relatively evenly distributed among towns and cities of different sizes. In contrast, 65% of the respondents from OD-MD practices were located in cities with populations of 100,000 or greater.

Sources of Optometric Income

Survey recipients were asked to estimate the percentage of their income that is derived from the following sources: (a) glasses, including examination, fitting, and follow-up, (b) contact lenses, including examination, fitting, and follow-up, (c) vision therapy, (d) low vision care, (e) treatment of eye diseases, and (f) other. For the 597 OD practice respondents, the mean percentages of income from these sources were:
- glasses, 61%
- contact lenses, 30%
- treatment of eye diseases, 7%
- vision therapy, 1%
- low vision care, 1%

For the 136 OD-MD practice respondents, the mean percentages of income from the different sources were:
- glasses, 40%
- contact lenses, 20%
- treatment of eye diseases, 38%
- vision therapy, 1%
- low vision, 1%

Frequency distributions of the individual percentages are shown in Figures 1 to 4.

The vast majority of the optometrists from OD practices received most of their income from the prescription and dispensing of glasses and contact lenses (Figure 1). The average percentage of income from these sources was 91% for this group of optometrists. Most optometrists in OD-MD practices derived most of their income from the examination, fitting and follow-up for glasses and contact lenses (Figure 2). However, a significant number of optometrists in OD-MD practices derived very little of their income from glasses and contact lenses.

The respondents from OD practices averaged 7% income from the treatment of eye diseases. Over half of those from OD-MD practices derive 30% or less of their annual income from the treatment of eye diseases. Forty-five of the 136 from OD-MD practices gained the majority of their income from the treatment of eye diseases. These 45 represent 6% of the total sample of the 733 survey respondents.

Vision therapy and low vision appear to be areas that are wide open for development. The overall mean percentages of income were 1% for vision therapy and 1% for low vision care. Four out of the 733 respondents reported that 30% or more of their income was derived from vision therapy. Twelve respondents reported that 10% or more of their income came from low vision care, with two reporting that 100% of their income was from low vision care.
Optometrists Should be Very Good at all Aspects of Eye and Vision Care

Questionnaire recipients were asked to indicate their agreement or disagreement with the statement that, "Optometrists should be very good at all aspects of eye and vision care, including refraction, basic binocular vision problems, contact lenses, and the diagnosis and management of eye diseases." The response was overwhelmingly in agreement with this statement. The percentages were: 97% agreed, 1% had no opinion, and 2% disagreed.

Comments from Respondents

The survey included a space for comments. Nearly 200 respondents took advantage of the opportunity to make comments. Some representative comments are given in Table 2. Some common themes emerged from the comments. Many stated that they enjoyed ocular disease management, but that it wasn’t as financially rewarding as some of the areas of traditional optometry. There were opinions that there should be continued expansion of the emphasis on eye disease. But there were also opinions that the increased emphasis on eye disease has compromised abilities in refraction and binocular vision. Although the questionnaire did not have questions about practice management, some alumni commented about the importance of good instruction in practice management.

Conclusions

1. The vast majority of alumni who replied to the survey agreed that optometrists should be good at all aspects of eye and vision care, including refraction, basic binocular vision problems, contact lens practice, and diagnosis and treatment of eye diseases.
2. Alumni from OD practices derived an average of 93% of their income from traditional optometric...
services (examination, fitting, and follow-up for glasses and contact lenses, vision therapy, and low vision). Alumni from OD-MD practices derived an average of 62% of their income from traditional optometric services. Alumni in OD-MD practices are split between those who made most of their income from glasses and contact lenses and those who made most of their income from treatment of eye diseases.

3. The mean percentages of income gained from vision therapy and low vision were very low, indicating the possibility of opportunity in these areas. A small number of practitioners derived most or all of their income from these services.

4. Many respondents commented that they were enthused about the treatment of eye diseases and the importance of the expanded scope of the profession. On the other hand, many cautioned that the interest in eye disease should not lead to a neglect of traditional optometric care. Respondents noted that traditional optometric care is important not only as the greatest source of income, but also because of the expectations and needs of patients.

5. We suggest that as the scope of optometric practice expands, traditional optometric subjects should continue to be areas of major emphasis in optometric education.

Acknowledgements

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References


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Table 2. Representative comments made by survey respondents, arranged in reverse order of year of graduation from two graduates from the class of 1994 to a graduate of the class of 1959.

- Ocular disease should be stressed even more than it is now.
- Binocular vision problems need to be stressed more.
- Optometry schools need to provide more practice management/marketing education to ensure a future success.
- ODs must be active in refractive surgery and managed care to ensure their future success.
- Optometry schools need to provide more practice management/marketing education to ensure their future success.
- ODs must be active in refractive surgery and managed care to ensure their future success.
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Articles of Interest: Reviews by Neil A. Pence, O.D.

When Smoke Gets In Your Eyes!


The role of tobacco as a leading cause of preventable disease, disability and death is well-known. Various studies have also shown its link to many ophthalmic disorders. This article reviewed the available epidemiological data and research studies pertaining to the ocular effects of smoking, and summarized the effects of tobacco on the eye.

Over 4,000 active ingredients have been identified in tobacco smoke, most of which have potentially harmful effects. Over 40 of these chemicals are carcinogenic, and many have pronounced effects on the pulmonary and circulatory systems. Others act as toxins to neurological systems, and some serve simply as environmental irritants. The most significant ocular effects identified were:

**Ocular Ischemia:** A strong relationship exists between tobacco use and ischemic disease. Smokers have elevated erythrocyte, leukocyte, and fibrinogen levels, and increased platelet activity. This results in increased risk for hyperviscosity and thrombosis. Nicotine also acts as a vasoconstrictor, further contributing to tissue hypoxia. Atherosclerosis is accelerated in smokers as well. These combined effects make smokers at much greater risk for such ocular disorders as ischemic optic neuropathy, retinal vascular occlusions and retinal ischemia.

**Age Related Macular Degeneration (AMD):** Smoking increases the risk of suffering AMD anywhere from 2.6 to 3.3 times for men, and just slightly less in women. The advanced stages of AMD, which have greater effects on visual acuity are even more strongly correlated to smoking. The risk for AMD increases with the number of packs of cigarettes smoked per day. Also, the risk of recurrence after laser treatment for exudative forms of AMD is higher in smokers than in non-smokers. One encouraging note was that the risk decreases, but does not disappear, when a person stops smoking (overall 2.4 x for risk for smokers; 2.0 x for past smokers).

**Cataract:** The frequency and earlier age of onset of nuclear sclerosis is correlated to tobacco use, and the risk is increased more in heavy smokers. The rate of progression of the nuclear sclerosis was faster in smokers. The risk of development of posterior subcapsular cataract is increased for heavy smokers.

**Ocular Irritation:** The fume particles and noxious gases in tobacco smoke are a well recognized irritant to the conjunctival membranes. This can result in mild conjunctival injection, excess tearing, burning, foreign body sensations, and increased problems for contact lens wearers. These effects occur not only for the smoker, but also those around them exposed to second hand smoke.

**Graves Ophthalmopathy:** The exact cause of Graves disease may be unknown, but it appears that both genetic and environmental factors play a role in developing this disorder. It is believed that smoking is one of the factors capable of inducing Graves disease in genetically predisposed individuals. For those persons who have Graves disease, smoking is an important risk factor in the presence and severity of ophthalmic complications.

**Strabismus:** Smoking by an expectant mother is associated with a higher incidence of esotropia in their offspring, according to the results of several studies. Some studies have also shown a relationship to exotropia, but not as strong as the risk of esotropia. This esotropia seems to be related to an increased risk of lower birth weight babies for mothers who smoke. Babies of mothers who had quit smoking before pregnancy, however, do not show an increased risk for esotropia, regardless of how heavy their previous smoking.

**Tobacco Alcohol Amblyopia:** Tobacco, but mainly alcohol in conjunction with alcohol, can cause a bilateral optic neuropathy. Mainly this occurs in middle-aged males, and occurs mainly when the toxic effect of the tobacco and alcohol accompany malnutrition, typically in alcoholics or indigent persons. The typical visual defect is a bilateral centrocaecal field defect with usually severe visual acuity loss.

**Miscellaneous:** Other ocular disorders such as uveal melanoma, conjunctival neoplasia, ocular sarcoidosis, and Leber's hereditary optic neuropathy all bear some positive correlation to smoking. The ischemic effects of tobacco are suspected to be an increased risk factor for patients with primary open angle glaucoma, but this has not been conclusively proven.

There is a trend toward smoking increasing the risk of more complications with diabetic retinopathy in some studies, but not in others. It is possible that the correlation with diabetic retinopathy has been more difficult to uncover due to the smokers increased mortality rate, thus having less diabetic smokers surviving long enough to reach the more severe stages of diabetic retinopathy.
Only one ocular finding has a negative correlation with smoking. It appears that smokers may have a very slightly decreased incidence of retinal detachment. No explanation for this effect is known.

Commentary

While the association of smoking to such health risks as cancer and respiratory problems has received widespread attention, much of the public may not be aware of the many other deleterious effects of smoking. For that matter, many eyecare practitioners may not be aware of all of the effects mentioned above.

Age-related macular degeneration and the various manifestations of ophthalmic ischemia are certainly leading causes of visual loss in older patients. Patients who smoke deserve to know that they are increasing their risks of suffering such losses. Further, if they do begin to develop macular degeneration, or have a transient ischemic attack, they are greatly increasing their risks of faster, more severe progression and of subsequent attacks and damage if they continue to smoke.

All patients with thyroid disjunction need to be strongly urged to cease smoking. If a genetic risk factor for Graves disease can be identified, these patients need to know that they increase their risks of the disease if they smoke. All expectant mothers need to be educated to the risk of strabismus in their babies, and strongly urged to stop smoking as well. Patients should also be aware that smoking increases their risk of cataract. When monitoring cataract progression, optometrists need to consider that the progression may be faster in smokers. Finally, while the effects may not be clearly documented, primary open angle glaucoma and diabetes mellitus patients who smoke should be advised that the ischemic effects of tobacco may compromise the stability of their diseases, and may cause increased likelihood of progression.

As primary eyecare providers, it is important that we are educating our patients as to the harmful effects of smoking on their eyes, on the eyes of those around them, and potentially on their offspring. We need to strongly urge our patients to stop smoking, with a hope toward limiting the untoward effects of smoking on the eyes.

Disposable Contact Lenses: Is It Really a Safer Modality?


A large, multicenter study was conducted to measure the prevalence of focal stromal infiltrates in contact lens wearers. An incident event met the study criteria when a corneal infiltrate was detected with overlying fluorescein staining. Such events are significant due to the increased risk of corneal infection and ulceration which they represent.

Of 2,324 contact lens wearing patients seen in the various practices, 38 instances of corneal infiltrates with overlying stain were found, for an incidence rate of 1.6%. The location was nearly evenly divided between peripheral and central, and no event caused any permanent significant loss of acuity. The majority of cases presented with accompanying symptoms such as redness, pain, or photophobia. In fact, in the patients who reported for unscheduled visits, one in six had at least one infiltrate. The infiltrate was found to be 3-4 times more likely to occur in symptomatic patients.

As other studies have shown, extended wear of contact lenses is a key factor related to infiltrates, finding such events 1.88 times more likely compared to daily wear of lenses in this study. Interestingly, smoking correlated to a 2.0 prevalence ratio for infiltrates, compared to non-smokers.

The third significant risk factor identified was lens modality. Disposable lens wearers suffered infiltrates at 2.1 times the rate of non-disposable wearers. As might be expected, extended wear was a contributing factor for many of these cases. Eliminating extended wear, however, did not eliminate all cases of infiltrates found in contact lens wearers. Sixty-one percent of the cases were not related to overnight wear, and in these cases, there was still a correlation to disposable lens wearers. Therefore, the disposable lens modality represents an increased risk factor for infiltrates.

Commentary

This publication warrants more widespread attention for several reasons. While extended wear accounts for much of the risk for infiltrates, the fact remains that disposable lenses themselves are related to increased inflammatory events. Also, the findings
suggest that patients have a good chance of self-referral when such events occur. As long as contact lens wearers are well educated to be alert to certain symptoms, they should be able to report complications at an early stage, since most events were symptomatic.

Overnight wear of contact lenses is a well known and recognized risk factor for corneal infiltrates and ulceration. This paper identifies two other very interesting risk factors: smoking and disposable contact lenses. It is not known why smoking increases the risk of infiltrates. The ocular irritant effect of the smoke, the hypoxic effects of tobacco, or possible other associated higher risk behavior on the part of smokers such as less compliant lens care could all be postulated. Whatever the cause, eyecare practitioners need to consider its possible role in corneal infiltrates.

Even more intriguing is the finding that lens modality correlates to increased risk of infiltrates. This agrees with the highly publicized study by Schein, et al. in Archives of Ophthalmology in 1992. Just as was noted in this study, much of the increased risk occurs because most extended wear patients are in disposable lenses. In a re-analysis reported in Archives of Ophthalmology in 1994, Schein also noted that while extended wear was the greatest risk factor for ulceration, disposable lenses carried a higher risk than non-disposable contact lenses, even when extended wear was factored out.

What factors can explain disposable lenses being associated more frequently with this contact lens complication? While we can only guess, it does seem worthwhile to consider the possibilities. The one perhaps most often suggested is poorer compliance with proper disinfection procedures. Since their lens will not be getting very old, even daily wear disposable patients may be more likely to skip the in hand rubbing of their lenses, i.e., not clean their lenses. When using any multipurpose system, this also means they are not adequately disinfecting their lenses either, since removing some of the bio-load by rubbing and rinsing is an important part of the system's ability to successfully meet the challenge of killing all organisms. Worse yet, we continue to find patients simply using saline to store their lenses, and this seems to happen more frequently in disposable wearers.

Other factors might be the material of the lens. In many cases disposable lenses are medium water content lenses with an ionic surface which may deposit more or differently. Many are thin lenses as well. This may contribute to different rates of drying of the lens and cornea.

The lens design and materials also combine to produce lenses that do not move as much on the eye as most non-disposable lenses, or certainly less than conventional soft contact lenses which pre-dated disposable lenses. This has come to be an accepted or standard fitting performance in disposables, but the lesser movement may increase the debris trapped behind the lens, thus contributing to a greater likelihood of an inflammatory event such as a focal infiltrate.

While many of the causes of corneal infiltrates are yet to be determined, there are a number of facts which this study can alert us to. It is encouraging that more often than not, the infiltrate formation was accompanied by symptoms which the patient could detect. The authors wisely point out that this emphasizes even more the role of good patient education for contact lens wearers. They must be alerted to the possible signs of complications, and encouraged to report any problems to their doctor. The doctor's office in turn must be well prepared to detect and schedule potential problem patients for timely visits.

The second area of patient education involves the lens care procedures. By giving good instruction, and emphasizing the importance of lens care and the possible consequences of poor compliance, the risk of complications will be lessened. Patients also need to be educated as to the risk that overnight wear of contact lenses, and that smoking have on their likelihood of suffering the generally mild but potentially serious complication of corneal infiltrates. Finally, we as practitioners must recognize that while frequent replacement of contact lenses has been a tremendous benefit to our patients, it may not be without its own risks, and we cannot allow lens wear or lens care to be trivialized or lessened in importance.
New faculty

Indiana University School of Optometry has recently employed four new faculty through the search and screen process. **Dr. Jack Downey, Jane Ann Gregg, and Susan Kovacich** will primarily be responsible for clinically oriented teaching while **Dr. Joe Bonanno**, a tenured faculty member, is primarily involved in research and classroom teaching. We are pleased to have this opportunity to introduce these four outstanding individuals to you.

**Dr. Joseph A. Bonanno** received his B.A. in Biology from the University of Pennsylvania, an M.A in Biology from University of California Berkeley, an O.D. degree and Ph.D in Physiological Optics also from UC Berkeley. Dr. Bonanno has an active research program in elucidating the ion and fluid transport mechanisms of the corneal endothelium, a cell layer that is responsible for maintaining the transparency of the cornea. The goal of the project is to understand how fluid transport is regulated so that medical clinicians can be developed to enhance fluid secretion in corneas damaged by injury or disease. His research interests include: bicarbonate transport, intracellular pH regulation and cell volume regulation. He has also studied the effects of contact lens wear induced hypoxia on corneal physiology and is currently developing a technique for non-invasive measurement of tear oxygen tension under contact lenses. Dr. Bonanno will be teaching Medical Biochemistry to first year IU Optometry students.

**Dr. Jack Downey** received his B.A. degree in Economics from the University of Wisconsin at Milwaukee and his O.D. degree from Indiana University. He practiced for four years in inner-city clinics in Milwaukee, ten years in a private ophthalmological office and fifteen years in a group optometric practice. He is, currently, a clinical instructor and interim Chief of Staff at the Indianapolis Eye Care Center of the Indiana University School of Optometry.

**Dr. Jane Ann Gregg** received both her B.S. and O.D. degrees from Indiana University. After graduation she accepted a staff position at the world-renowned Bascom Palmer Eye Institute where she was the Director of the Student Externship Program. Currently, she is a clinical instructor in the Ophthalmic Disease Clinic, lecturer in the Ocular Disease Courses, and the staff optometrist at the Student Health Center. In addition to her clinical and classroom teaching responsibilities, she has lectured at continuing education courses on the local, state, and national level.

She is the Director of the Indiana University Contact Lens Residency Program.

**Dr. Susan Kovacich** received both her B.S. and O.D. degrees from Indiana University. After graduation she accepted a hospital-based residency at the St. Louis Veterans Administration Medical Center. Following her residency she was in private practice in the St. Louis area for ten years, concentrating on primary care, ocular disease and contact lenses. Currently, she is a clinical instructor in the Primary Care and Contact Lens Clinic.

**Other Items of Interest**

**Dr. Gerald E. Louthier** was selected as the new Dean of the IU School of Optometry in September and assumed the position on October 1, 1998, following **Dr. Jack W. Bennett's** retirement as dean.

**Dr. Jack W. Bennett** has accepted the position of Dean at the University of Missouri School of Optometry. His appointment will begin January 1, 1999. Dr. Bennett has taken a leave of absence from his faculty position at the IU School of Optometry.

Dr. Louthier announced that there will be a remodeling of the Atwater Clinic starting in the winter of 1999. A committee has been appointed to develop a remodeling plan.

**The Council of Optometric Education Evaluation Team** visited Indiana University School of Optometry in October to reassess the School for accreditation purposes. Their report will be made next spring. The School had worked for months preparing for the site visit.

The Indiana University School of Optometry was again well represented at the American Academy of Optometry this past December in San Francisco. Thirty-seven of our faculty, staff and students had presentations of various kinds at the Academy with some having more than one presentation. Ten of the presenters were students. When one considers that our full-time faculty numbers 32, this representation is outstanding.

The Indiana University School of Optometry faculty are often serving optometry and representing the School by lecturing and consulting outside of the School. For example, in the last few months, beside the numerous faculty presentations given within the United States, the following faculty have lectured or consulted abroad: **Dr. Arthur Bradley** on two separate trips to Great Britain; **Dr. Clifford Brooks** in China; **Dr. Shaban Demirel** in Australia and South Africa; **Mrs. Andrya Lowther** in Australia and Canada; **Dr. Gerald Lowther**
in Australia, Portugal, & Germany.

The Indiana School of Optometry is organizing the Vision USA program for Indiana. This is a program through which needy persons are provided eye and vision exams at no charge.

On November 1, Indiana University hosted a workshop on RGP lenses sponsored by the Rigid Gas Permeable Lens Institute (RGPLI). Dr. Ed Bennett, IU Optometry Class of 1979 and director of the RGPLI, conducted a portion of the program. Demonstration patients were recruited by Dr. Paula Hernandez, the current resident in contact lenses at the school. During the workshop, interns worked with keratoconic, post-surgical, bifocal, bitoric, aspheric, and other interesting and challenging RGP patients. This was the third consecutive year for IU to host this program.

The Class of 2002 started classes this fall at IU School of Optometry. There were 81 students selected from a pool of 509. There are 34 Indiana residents and 47 students from 18 other states, Canada, Taiwan, and Thailand. There are 34 men and 47 women. The average age is 23, and the range is 21-36 years old. The mean cumulative undergraduate GPA is 3.46. Eighty-one percent of the admitted students have a bachelor’s degree.
Rededication of the Community Eye Care Center

The School of Optometry’s Community Eye Care Center (CECC) was started as a community outreach service in 1972, in a remodeled garage of Bloomington’s Christian Center. Twenty-eight years later the clinic has developed into an important part of the health care services of the Bloomington community.

In May of 1998, an open house was held to celebrate the remodeling and the expansion of the CECC facilities.

The Community Eye Care Center now has twelve complete exam rooms, three special test areas and a remodeled EyeWear Center. The clinic has added the Ocular Disease Service to compliment the Low Vision, Binocular Vision/Pediatrics, Sports Vision and Contact Lens Services already operating in the facility.

This expansion was made possible through the generous donations of several individuals and companies.

Bell Laboratories, Inc. provided funding for the EyeWear Center expansion.

Bell Optical Laboratories, Inc. provided funding for the EyeWear Center expansion.
Woody Witt, above, representing Woodlyn, Inc., donated equipment and the Student Education Center.

The Conference Room was donated by the Eye Specialists of Indiana, represented in the photo at left by Paul Walton and Jim Hunter.

Dan Grossman, Matthew Fornefeld, Chad Huck, and Steven Holbrook, all pictured at right, presented a check from the Eye Center of Southern Indiana to fund equipment for a special testing room.