Revisiting the Ophthalmic Illustrations of Lee Allen

ABSTRACT: *Just as few of us ever know the origin of things we take for granted; very few of us are proficient in one discipline, let alone mastering several. For over half a century, Lee Allen taught himself to seek out arcane interests, to revise, rebuild, and reconstruct them, and through them, to actively generate new ways to improve patient eye care. Ocularistry (and this journal) benefited greatly from his shared expertise as a significant, innovative ocularist and medical illustrator. For this article, several of his paintings and illustrations are presented and critiqued.*

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INTRODUCTION

True before Newton's day, and still true today, we are "dwarves standing on the shoulder of giants"—*anos gigantum humeris insidentes*. We all are allowed to "see further" into our chosen professions by the work of the few "giants" that have gone before us and created our frameworks of reference and the techniques necessary to our crafts. Eye care professionals of all types "see further" today because of giants like Lee Allen.

Lee had learned from his father, an engineer, to study the evolution of the fields surrounding his interests, allowing him to innovate in his own areas of expertise by looking at them from different perspectives. Later in his career, this resulted in his highly uncommon, multi-planar levels of expertise, which led to his being adopted as a peer among the studied various professional groups with whom he worked.

Surprisingly, Lee Allen was largely self-taught in the fields he advanced. Today, the term "self-taught" is often used to preclude technical prowess or excuse sub-standard performance. The term seems quaint, even provincial, in today's world of assumed professional training and certifications. However, it was common and laudable when Lee was first employed by the University of Iowa, in a time when training courses were unknown in the sciences in which he came to be renowned.

By careful study of the work of his predecessors, networking with colleagues, and using his acute mind and adaptability, Lee developed

myriad ways to improve ocularistry, medical illustration, applied optics, patient eye examination, eye surgery, and ophthalmic photography.

At the time ocularistry was almost an artisan secret taught by father to son, and only practiced in limited areas—a closed craft. Lee made his techniques public, as a scientist, in order that overall patient care might improve. Ophthalmic photography was in its infancy, hindered by caring professionals. Lee rewrote the field, inventing many of the techniques that would be used for decades. Ophthalmic illustration was crude and many areas of the eye remained unteachable. Through close examination and study, Lee fostered the advances to the benefit of future doctors and patients.

The intent of this article is to showcase his artistic methods as one of the tools Lee Allen used to show others the inside of the human eye, as never seen before.

IMPACT ON OPHTHALMIC ILLUSTRATION

Few artists without formal training in medicine could thrive in such a niche as drawing eyes. Jumping-in blind must have been even more difficult. The processes involved in showing the internal structure of the eyes, require that the artist see what and how the physician sees into a patient. It requires that the artist understand how a clinician examines the nether regions of the darkened eyeball, and synthesize teaching tools from this experience. Today's graduate medical school programs that accomplish this practical art are difficult and challenging. Without the benefit of tutelage, most functions would seem impossible.

Simply put, ophthalmic illustration is a high point of medical illustration, and Lee mastered it, inventing some portions while helping make others obsolete. Using accepted techniques of the field (learned over the shoulder of Emil Bethke, his illustrative predecessor at Iowa), by networking, and sheer force of will, Lee used watercolor, ink, gouache, airbrush, and colored pencils (the same media used by Dr. Frank Netter) in a different way. The ultimate goal in ophthalmic illustration is visualization and teaching, whatever tools are used: pen, brush, lens, film, or invention of new tools.

After he started in oils and printmaking as a teen, Lee studied with some of the best fine artists of his time. Iowa painter, Grant Wood ("American Gothic"), was his supervisor in the Works Project Administration (WPA). Lee also traveled to Mexico to learn fresco with Diego Rivera (renowned muralist of Rockefeller Center).

He was able to pick up whatever worked, improve on it, and easily move on to advance the current state of the art. It is certain that today, Lee would have mastered state-of-the-art computers and computer animation, in areas that would be used as aids to teaching. The recent advent of high dynamic range imaging (HDRI) would have made great strides in his hands, as would the virtual immersion visualizations only possible now using computers.

Depth-of-field issues, low-sensitivity recording media, and patient movement are all challenging aspects of eye exam and photography. Lee, while trying to ensure that all those interested could duplicate

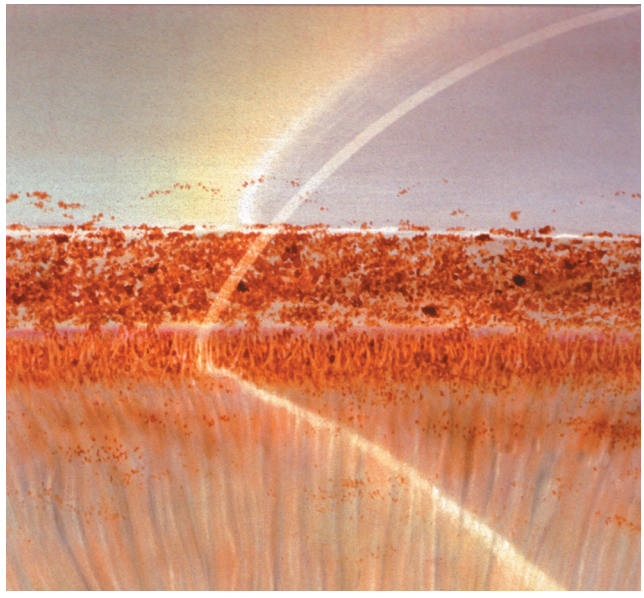


FIGURE 1 This illustration (and Figures 2A and 2B) depict conditions in the angle of the eye, normally unseen by looking directly into the cornea. Figure 1 is also visible in Figure 8 with the companion illustrations. Lee advanced a new lens to look at the angle sideways through a prism-mirror for examinations of this kind, and was granted several U.S. patents in this area. So they could be lighter and more-easily manipulated by ophthalmologists, he cast the prism mirrors in the new plastics recently developed for WWII fighter cockpits.

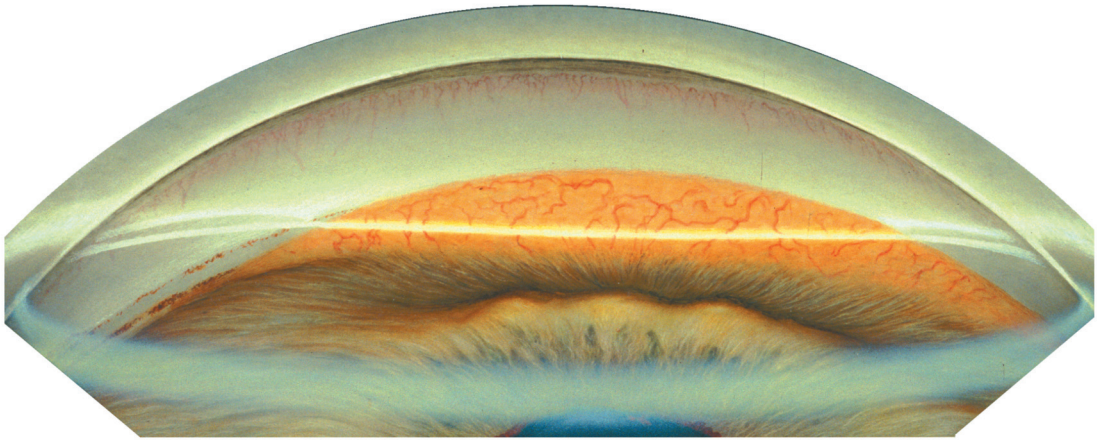


FIGURE 2A In this figure, the gonioscopic angle ("gonio" is Greek for "angle" or "knee") is depicted at high magnification, using a slitlamp beam of high-intensity light to show the relative position of this iris which is being pushed anteriorly by a tumor. The beam traces the interior cornea at the edges, transitioning to the iris tumor in the middle; this continuity of the beam shows that it is flat against the cornea, bulging in the middle, invading the angle, and dehiscing the iris root. Painted in watercolor and colored pencil, Lee airbrushed the front reflection of the cornea onto the mirror with opaque gouache. Lee Allen became one of the first and best gonioscopy specialists, teaching the skill of patient exam to ophthalmologists for over 20 years. This watercolor illustration could only have been painted by examining the patient (rather than from a photograph), since the photographic techniques necessary were only then being invented—by Lee himself.

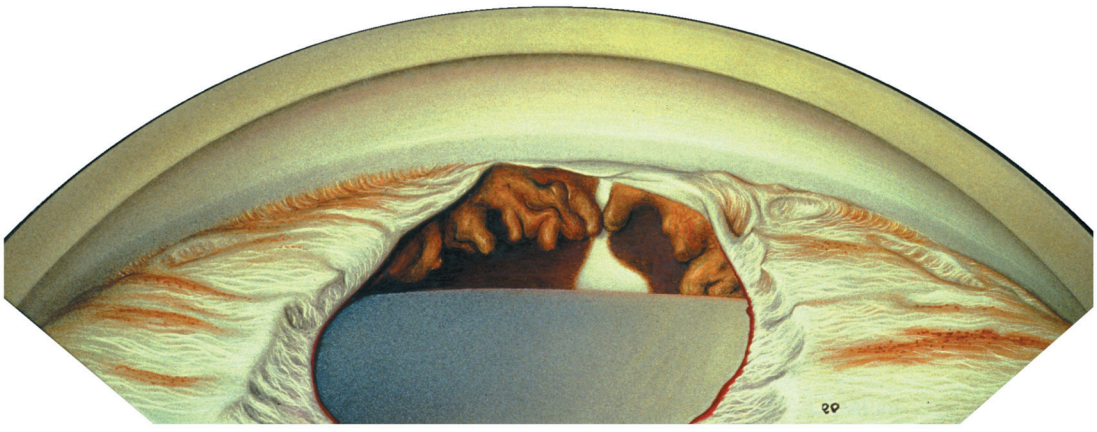


FIGURE 2B The brownish ciliary processes seen clearly in this illustration were once (and too-often even today) shown as whitened blobs, an artifact of hydration of the epithelium covering the uveal tract after death. The fact is, accurate depiction of eye anatomy occurred quite late, as many attempts to section the globe cleanly disoriented structures within the eyeball; the first accurate diagrams only arrived when the eye was frozen solid before cutting. The training of eye physicians to look for abnormalities was hampered until the use of lenses on the living eye allowed examination. Recording this with photography lagged far behind a visual exam.

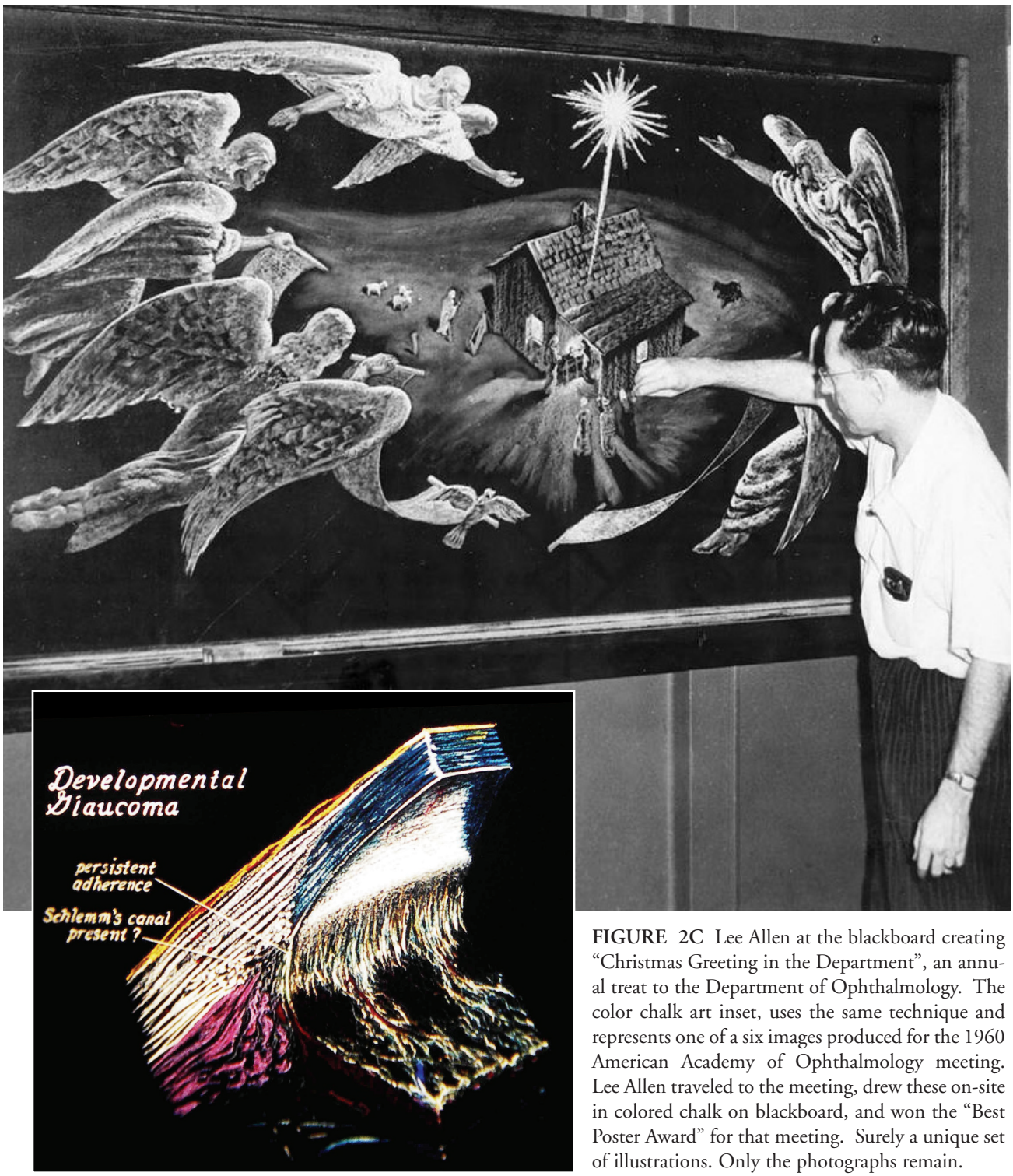


FIGURE 2C Lee Allen at the blackboard creating "Christmas Greeting in the Department", an annual treat to the Department of Ophthalmology. The color chalk art inset, uses the same technique and represents one of a six images produced for the 1960 American Academy of Ophthalmology meeting. Lee Allen traveled to the meeting, drew these on-site in colored chalk on blackboard, and won the "Best Poster Award" for that meeting. Surely a unique set of illustrations. Only the photographs remain.

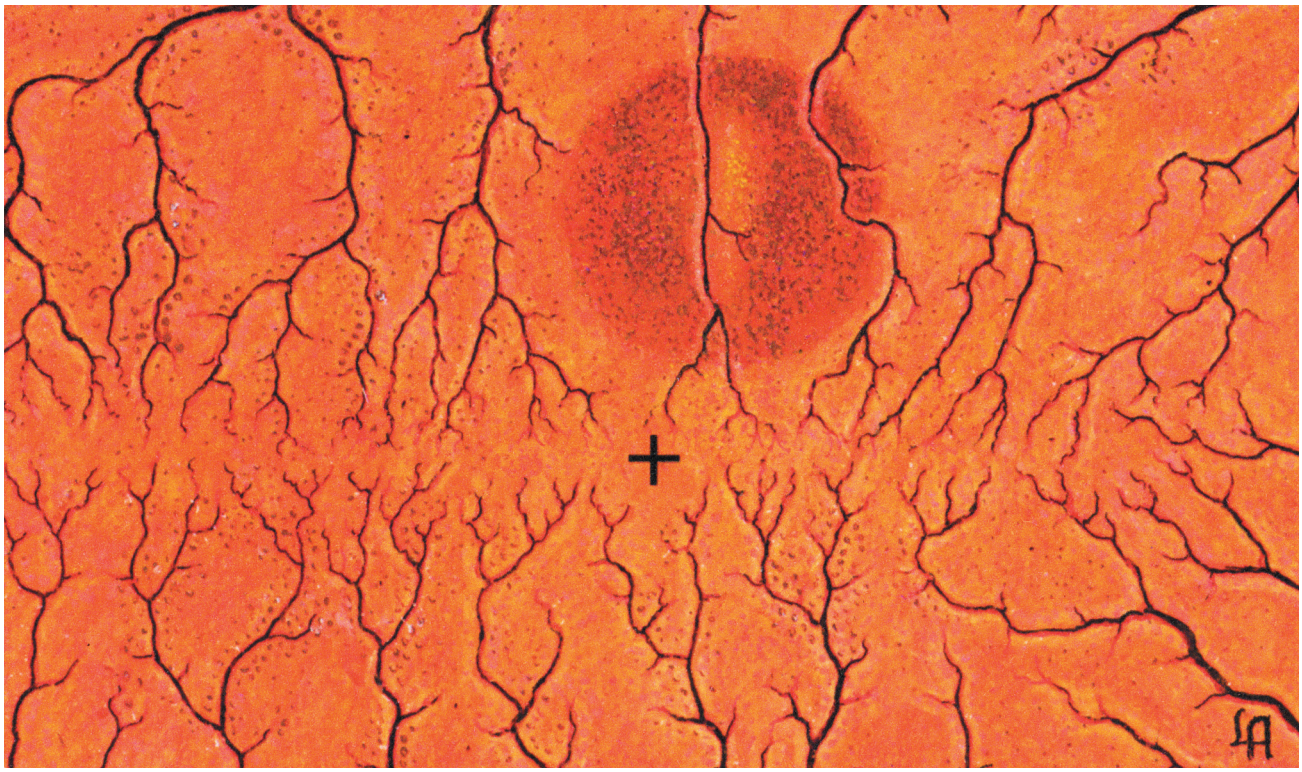


FIGURE 3A Purkinje Vascular Figure. This illustration depicts the perceived view in the eye, as seen by shining a fiber optic light through the closed eyelid. Lee painted a series over 6 years to document the changes he experienced with macular degeneration. Here, he uses orange paper and ink with colored pencil to show exactly what he saw: the retinal vessels are shown only as their linear shadows, and the capillary deficits around them appear as granular dots. This unique view of the retina cannot be photographed, and had only once before been published by anyone. The "+" marks the fovea, the finest focus of the retina. This illustration is from the fly-leaves of his posthumous book, *The Hole in My Vision,* Penfield Press: 2000.

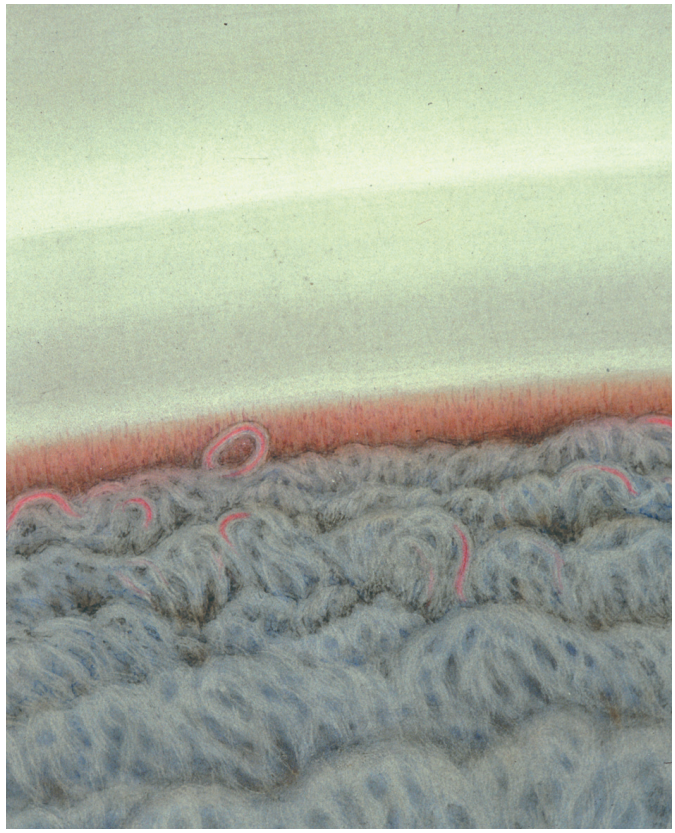


FIGURE 3B Gonio view of pigment in the angle of a blue iris, with blood vessels seen in the peripheral iris. Here Lee is showing a field of iris stroma that would have little pigment, although it shows up in the uvea of the angle. We can see the arterial walls, not just the red blood within the vessels. Most of the hue of a blue iris is from light refracted through the collagen in and around the vessel walls.

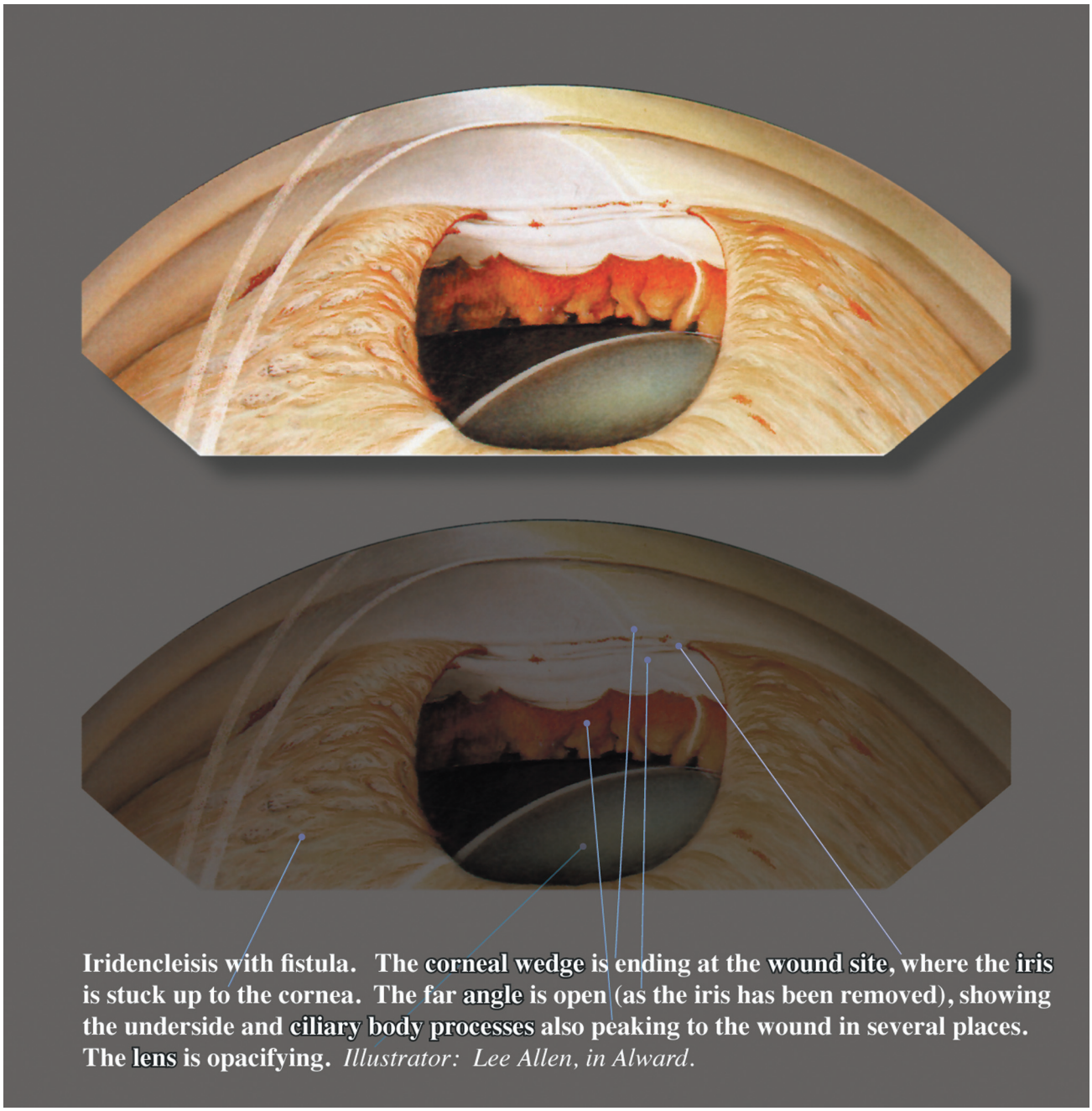


FIGURE 4 In this gonioscopic view, it is easier to appreciate the use of painting rather than photography. Notice the strong directional lighting on the iris textures here, which are often quite dim when observing a living patient through the slitlamp biomicroscope. In the chemical photography used at the time, many elements of the eye that are white quickly begin to appear yellowish as they move away from the light, due to the lower film "latitude" or sensitivity to wide changes in light. This is only now becoming less of an issue when viewing HDRI on a computer. Lee had to paint this from directly viewing it, or use his experience to adjust the colors in photographs he used for reference. The lower part of the illustration is a transparent watercolor containing opacities in gouache on the brown ciliary bodies, and colored pencil in the iris and slit beam. Lee's standardized gonio frames were adopted by many illustrators, as the bevels below are actually the edges of the mirror seen in the goniolens; the optics get distorted past that point.

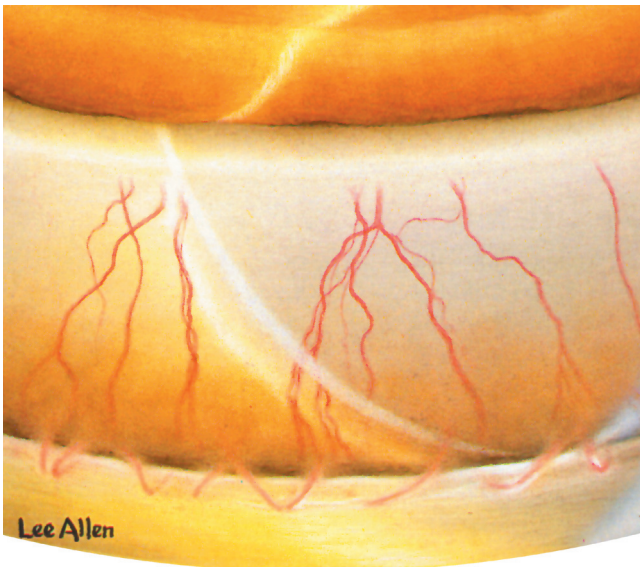
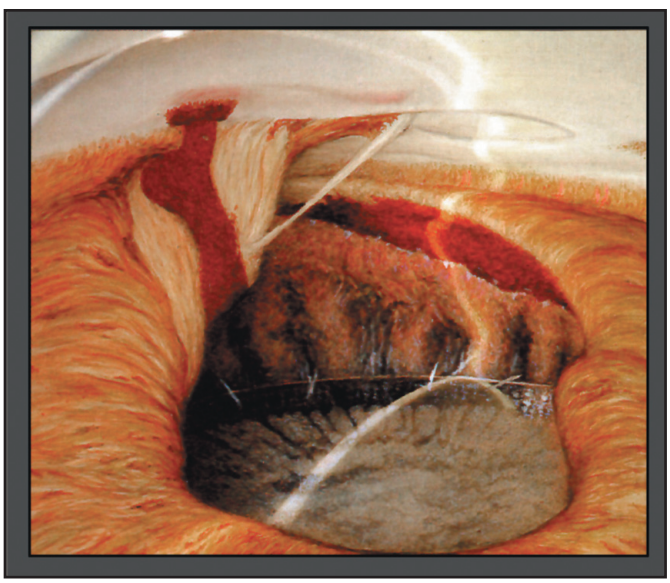


FIGURE 5A Gonioscopic view of corneal neo-vascularization. This observation is in one mirror of the prism that Lee invented, and is an example of his trained observation. The cornea can be traced by following the light beam across and down the opposite side. As it meets the iris, the beam comes forward again over the lens and proximal iris, thus describing the entire anterior chamber. Here the slit-lamp beam is seen to show that the vessels are actually inside the cornea, not just beneath it. The colored pencil that Lee often uses for vessels is replaced here with watercolor. The cornea is airbrushed while the iris remains in pencil; the beam is again lightened with white pencil, applied over the dried watercolor. See the care that he takes to show the vessels almost a full third into the stroma of the corneal thickness. Since the cornea is only optically-clear where it is actively pumped-dry by the corneal endothelium, Lee shows that it becomes cloudy with the new arteries.



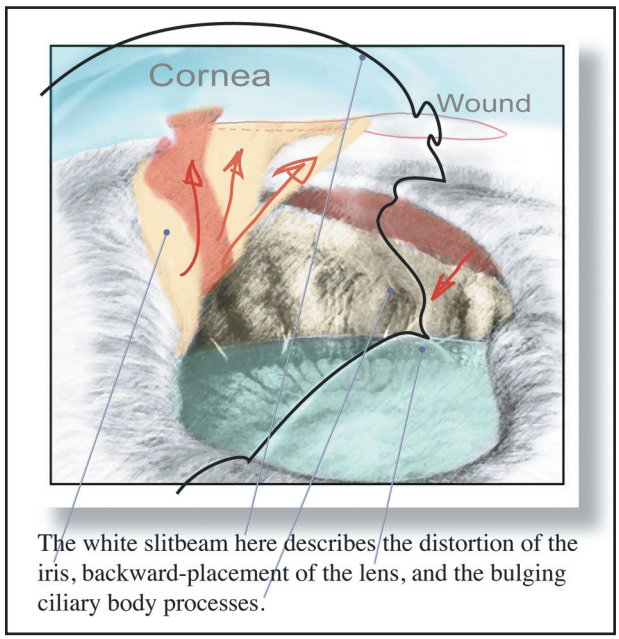


FIGURE 5B Iris incarceration after Trabecular Surgery. This is the result of inflammation after angle surgery, as the opposite side iris is trapped in the wound scar. The pupil is grossly-distorted, iris is adherent to the lens, and there is likely, blood under the uvea, between the ciliary body and internal sclera. Although Lee's watercolor may have been laid-down first, it was quickly eclipsed with gouache, colored pencil, white pigment and some ink. One can imagine the distorted anterior view of this eye, given Lee's careful recording of the optical cross-section offered by the slitlamp beam. Many structures inside the eye cannot be appreciated directly, so the beam of the slitlamp is very good at establishing the shape and depth of a transparent element. While the iris is lovingly painted, it is shown as being affixed to the limbus on the left. The beam is highlighted with white pencil, floating over the watercolor and textured by the board's surface. The art to the right uses the original art and has had the anatomical figures that Lee was illustrating highlighted by the author.

FIGURE 6 Lee Allen with his Gonioscopic Ophthalmic Illustrations. Note that the original paintings and line drawings are 120-300% the size of the published works. This way, while, it is easier on the eyes for the artist, the figures "tighten" on reduction. (The upper left painting is Figure 1.) Although probably produced separately (on separate papers), they are seen together here for wall exhibition. The color paintings would be on a watercolor board and the ink drawings on a smoother Bristol board. The layouts would have been done first, the line drawings and paintings assembled in a "photomechanical" before being photographed for the printing plates (where reduction takes place). Lee had to understand the printing process to make this happen in a predictable manner—yet another aspect of ophthalmic illustration. Photograph taken of Lee Allen at his one-man show at the University of Iowa Museum of Art in 2001.

his findings and techniques, not only made huge strides in each area, but taught gonioscopic examination at the American Academy of Ophthalmology (AAO) for over 20 years.

If colored pencils could make fine vessels in the eye look dimensional, or stay on the surface while allowing other colors underneath to be seen, Lee used them. Whatever medium might work better as a teaching point—or to detail a prosthesis—and better it, Lee tried. His experimentation in new media fostered several fields. He followed a scientific strategy to document his findings and relate them to the journals of each specialty, eventually serving as president of the respective professional organizations. He invented media that we all take for granted every day in our work.

Others will describe his various talents, but here only a few paintings and illustrations are presented and reviewed. However these are reproduced, they will always pale when compared to the originals.

CONCLUSION

When Lee Allen accepted his position at the University of Iowa in 1937, he vowed that he would

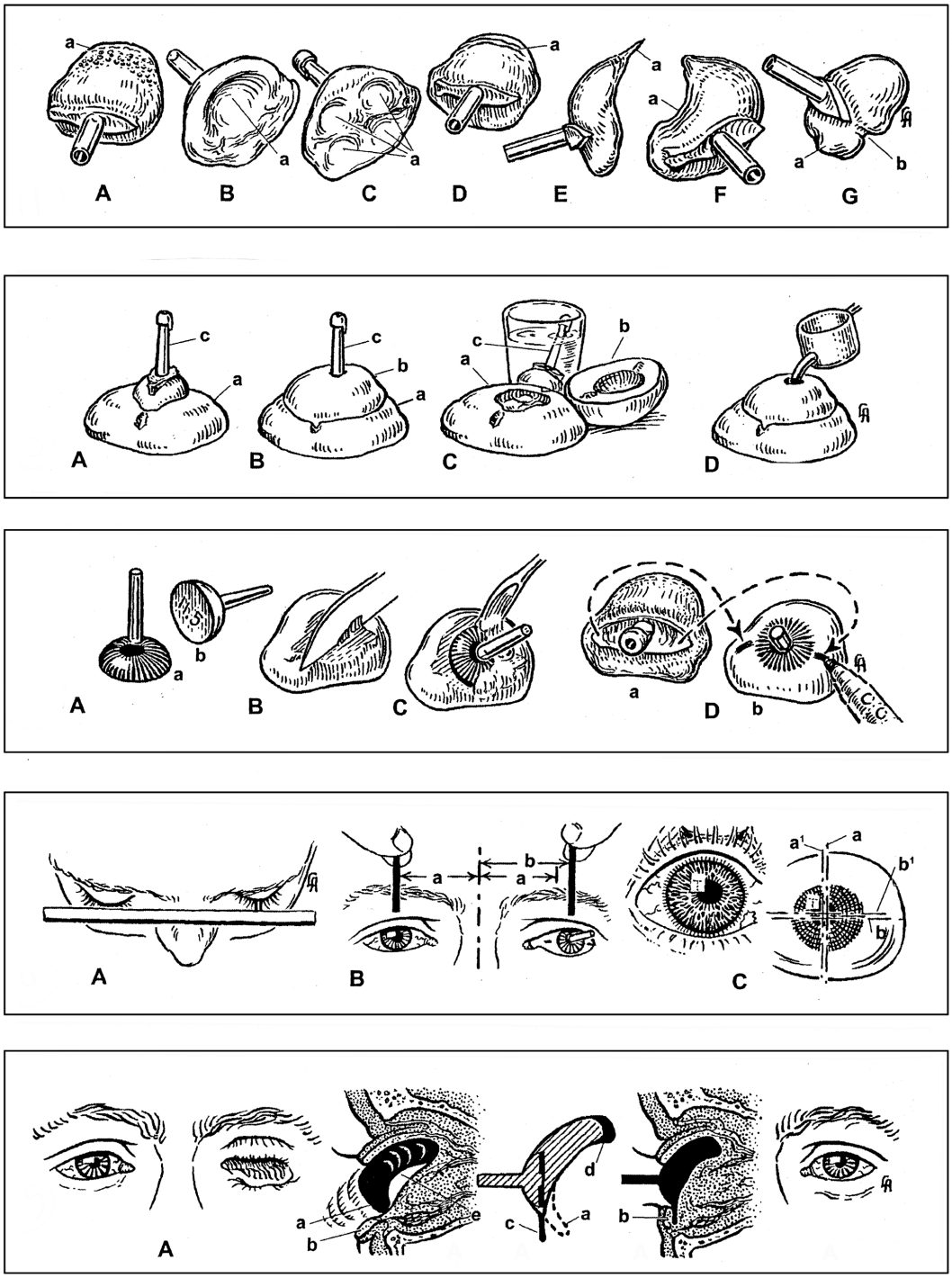


FIGURE 7 A summary of Lee Allen's 1969 publication in *The American Journal of Ophthalmology* of his Modified Impression Technique (See References). Opting for clarity over realism, Lee showed in this teaching tool the "how," rather than the "appearance"; a photograph could not have done this job. This simplified line-art diagram was drawn with pen and ink (probably on paper) with press-on transfer lettering.

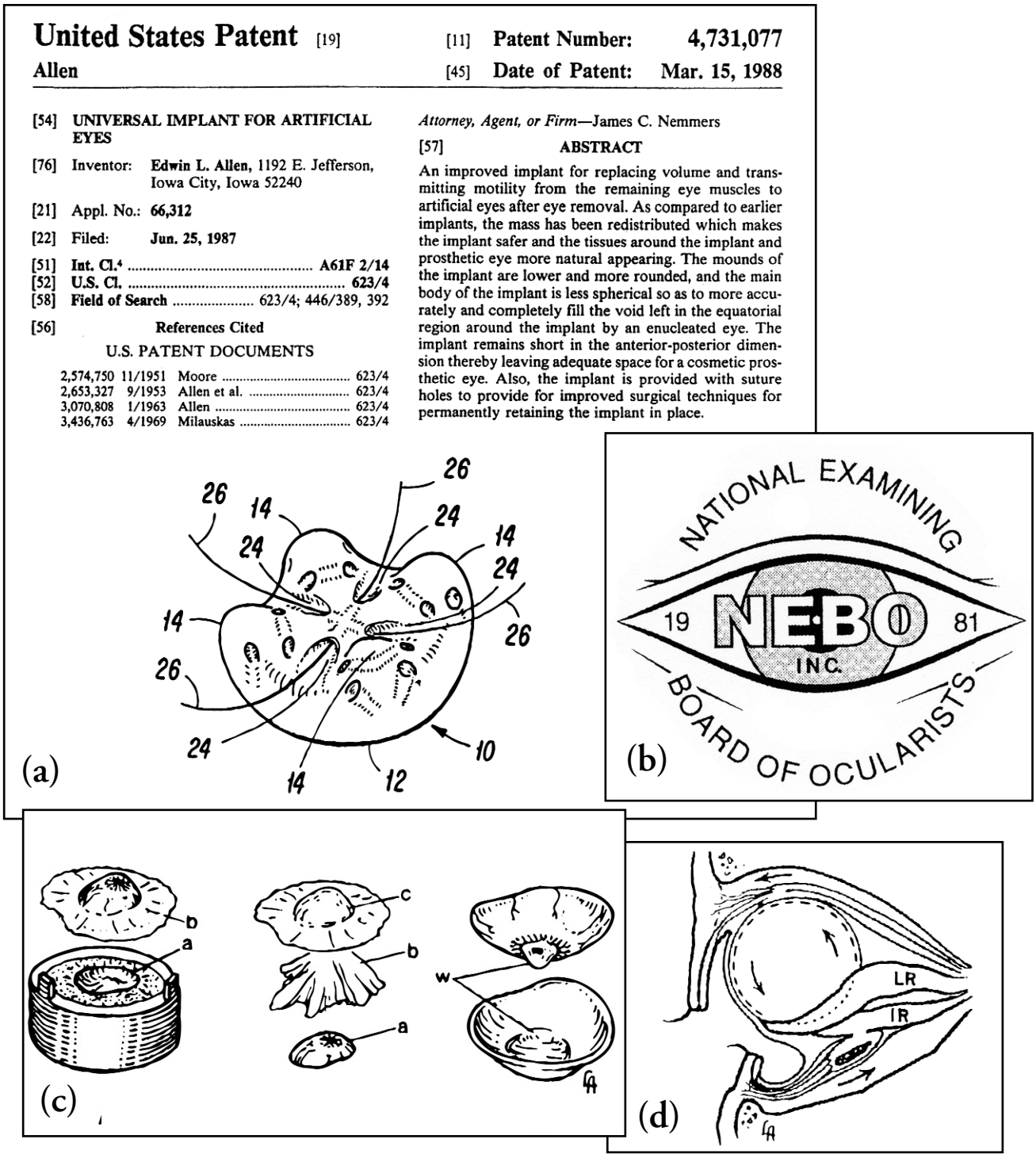


FIGURE 8 Lee was diverse, even drafting his own illustrations for the patent application process for his many inventions. This assembly shows simple but efficient, step-by-step with a concentration on their descriptive efficiency. The noted illustrations here include (a) the Universal implant design with suturing tracts, (b) the NEBO logo design, (c) the painting shell technique which simply shows the mechanisms to clearly describe his idea, and (d) a line drawing showing a (migrated) spherical ocular implant.

not exhibit or sell another (fine art) oil painting as long as he was employed there. His rationale was that the two interests would conflict if both were continued in parallel and that he would succeed at neither fine art nor medical illustration. So, with the exception of painting on vacation and portraits of department heads, Lee Allen confined his artistic pursuits to medical illustration for over 40 years.

One must wonder what Lee might have accomplished in the fine art world if unrestricted by his own segmentation and dedication to his employer. Still, his busy mind found artistic self-expression through the world of prosthetics, illustration, and ophthalmic diagnostic photography. We in related branches of ophthalmology are the grateful beneficiaries of Lee Allen's self-imposed restriction of focus to anything surrounding the eye.

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AUTHOR'S NOTE

At the 1980 American Academy of Ophthalmology meeting in Chicago, the author finally shook the hand of his distant hero, Lee Allen, who received the Outstanding Contribution to Ophthalmic Photography Award from the Ophthalmic Photographers Society. Some 29 years later, this paper is offered as a tribute to Lee Allen. Lee influenced many ophthalmic illustrators and photographers who will be unable to acknowledge his inspirational gifts.

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