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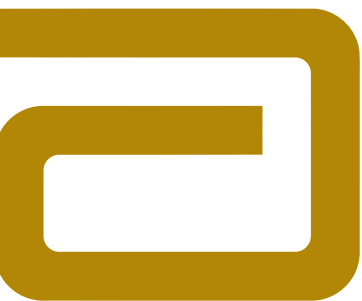
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UNDER 40**



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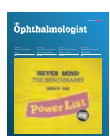
Power List

TOP 40
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Pistols' album released in the same
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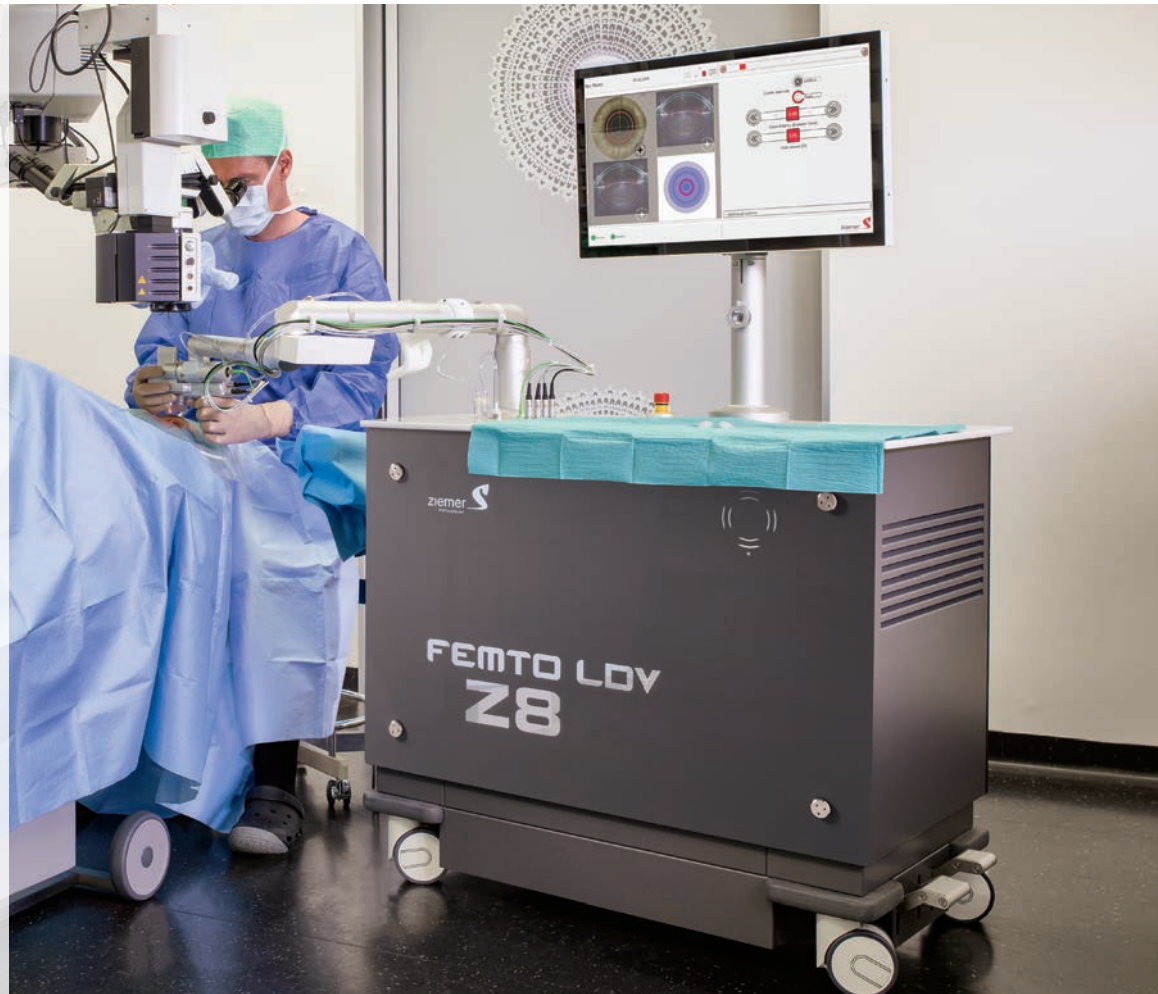
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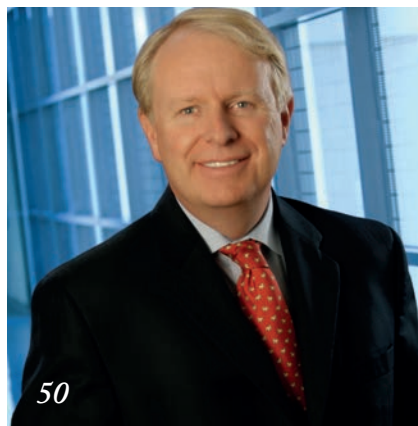


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The multifactorial nature of dry eye disease means that often, there's a discordance between signs and symptoms, confounding diagnosis. Can things be improved?

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An exploration of the last five decades of Fight For Sight's achievements, and what might be coming next?



Sitting Down With

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The Value of The List

*We run the Power List to contribute,
not to be controversial.*

Editorial



How do you build a Power List? Many years ago, I worked on a project that attempted to map the great and the good of asthma physicians. It was (ostensibly) a wholly objective exercise: examine people's PubMed-listed publication records, their number of podium presentations, editorial board memberships... and so on, and use them as a surrogate marker of a doctor's influence. We actually do something like this almost every month in our benchmarking articles, and it's satisfying to produce, and interesting to read and interpret.

But it's never wholly objective. You have multiple sources of information, which all have to be weighted – and if this can't be validated against something, the best that the weighting can be is a best-guess. It's hard to validate against Zeitgeist when all you have is the contents of some tables in a database.

In my opinion the Power List is fantastic. It's the (subjective) Yang to this sort of mapping exercise's (semi-objective) Yin. How better to capture the feelings of a community towards its brightest and best, and celebrate them accordingly? We're not doing it to validate anyone's KOL mapping projects either – this is a project from and for the ophthalmology community, published in the open for all to see. In other words, it's for the people.

The subjective nature of the Power List is also why I think it has been so controversial. Everyone has their own opinions, and across a group of highly educated, intelligent people, there will be a lot of differing ones – and not everyone will be pleased with what they see. It's the nature of the best – a side-effect of the exercise. But believe me, it's not my intention to be controversial. We don't run the Power List to be divisive. We just want to reflect the opinions of our readers, and celebrate those people that our readership feel deserve it.

We know the Power List isn't perfect. Just like almost all epidemiological studies, not all of our 18,000 print audience (and 22,000 online) will vote, so it's an approximation of the true feelings of our readership. Nonetheless, I think we've produced something worthwhile, and worthy of your interest and consideration. So if you are interested, turn to page 21 to see this year's list.

Mark Hillen
Editor

Upfront

Reporting on the innovations in medicine and surgery, the research policies and personalities that shape ophthalmology practice.

We welcome suggestions on anything that's impactful on ophthalmology; please email

mark.billen@texerepublishing.com

3-D Printed Prosections

Inexpensive, high-resolution 3D printouts of orbital prosections can help ophthalmology trainees revisit basic anatomy

During early medical training, it's vital for all doctors – especially ophthalmologists – to gain a basic grounding in human head, neck and orbital anatomy. But by the time those same doctors earn their specialist credentials in clinical ophthalmology, their years of examining cadaveric remains are often far behind them. Unfortunately for advanced trainees who want to refresh their knowledge, access to specimens is often restricted or otherwise difficult – most facilities are centralized in larger cities, while others may have limited open hours or be available only to medical students at the host institution. In more remote locations, the task becomes even more challenging; many locations may not have access to cadaveric specimens at all due to health and safety regulations, cultural or ethical considerations, lack of necessary storage requirements, or the prohibitive cost of cadaver bequest programs. As a result, many trainee ophthalmologists are limited to photographs and diagrams when updating and increasing their knowledge of orbit, head and neck anatomy – a distinct disadvantage in the study of a region with such complex 3D anatomy.

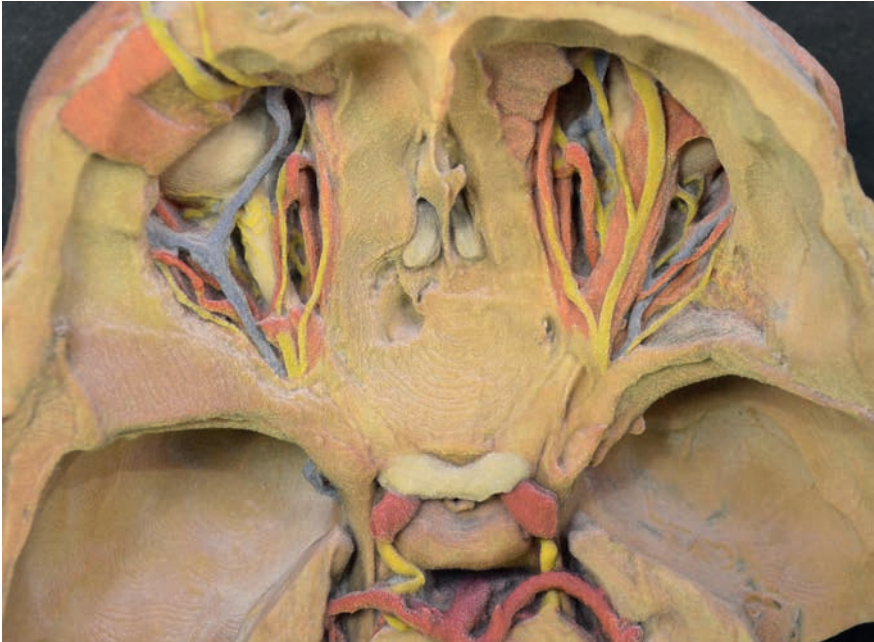
How can these difficulties be addressed? A group from Monash University (Clayton, Victoria, Australia) is exploring 3D printing as a new and inexpensive way to tackle them (1). Historically, single-color 3D printouts have been of limited value in soft tissue anatomy,

because color provides important information. But recent developments in full-color and multiproperty 3D printing are beginning to overcome this obstacle, making it possible to create low-cost, high-resolution reproductions of prosected human cadaver orbits.

The group began by preparing teaching prosections of the orbit from a superior, a lateral and a medial perspective, optimizing the number of features displayed in each. Once the prosections were complete, researchers created surface meshes of the specimens using a high-resolution 3D scanner that captured both shape and color details. For added value, they also enhanced the colors of important features using digital painting, to ensure that vessels and nerves that look similar in wet prosections were easier to see in the 3D reproductions. The resulting prints were found to be highly realistic and clearly represented the most delicate structures of the orbit. Not only that, but they offer a number of advantages over either cadaver or plastinated specimens – accuracy, detail, rapid reproduction, easy storage, portability, and the avoidance of cultural, ethical and safety concerns associated with human cadaveric material. There's promise for future developments, too; though the output is only as good as the input (in this case, the prosections), the investigators have also managed to create 3D printouts from MRI and CT datasets. Because of their many advantages, the printouts offer an excellent substitute where cadaveric material isn't available – and can serve as a useful adjunct even where it is. *MS*

Reference

1. JW Adams et al., "3D printed reproductions of orbital dissections: a novel mode of visualising anatomy for trainees in ophthalmology or optometry", *Br J Ophthalmol*, [Epub ahead of print] (2015). PMID: 25689987.



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Reducing Corneal Graft Rejection on a Very Small Scale

Nanoparticles deliver sustained corticosteroid levels to prevent corneal graft rejection

Corneal transplantation is the most commonly performed solid tissue transplant procedure in the world, with about 100,000 being performed each year (1). But 10 percent of those transplants end in graft rejection, and this is largely due to poor patient adherence with postoperative corticosteroid eyedrop treatment regimens. This is an unacceptable situation, especially as it's estimated that there are as many as 10 million people worldwide with corneal blindness, who cannot receive transplants because of a shortage of donor tissue. On the other hand, it's also understandable: many patients receiving corneal transplants are elderly, many different drugs are required in the immediate postoperative period, with frequent dosing schedules of q1h and q2h, and some – like corticosteroids – need to be applied according to this regimen for a period of one year – or longer. With steroids, it's a function of ocular pharmacokinetics (PK) and pharmacodynamics (PD); they're poorly absorbed and rapidly cleared from the eye, so therapeutic steroid concentrations don't last long, hence their need for frequent application. Subconjunctival injection of corticosteroids at the time of surgery is often employed, but again, PK/PD works against the patient – the injection produces a short spike of steroid levels (which can be associated with an increased rate of ocular side-effects),

which is followed by a rapid clearance of the molecule.

In an effort to limit graft rejection because of these issues, specialists in ophthalmology and nanomedicine at The Johns Hopkins University School of Medicine (Baltimore, MD, USA) have worked to develop a biodegradable, subconjunctivally-injected sustained release formulation of dexamethasone (2).

“Corneal grafts are not easy to come by, and a lot of testing and time goes into ensuring the safe use of a graft for cornea transplant,” explained one of the study's authors, Qingguo Xu. (3) “This is why we want to do a better job at making sure corneal transplants don't end up in rejection, and our study illustrates a potentially better way.”

The nanoparticles, which are composed of poly(lactic-co-glycolic acid) and contain dexamethasone sodium phosphate (DSP), are 200 nm in diameter, or slightly thicker than a strand of human hair. When administered to 20 rats that had undergone corneal transplantation, the nanoparticles provided sustained levels of DSP over seven days and, given weekly, prevented corneal graft rejection in all animals for the full length of the nine-week study. Control treatment groups that received weekly injections of placebo nanoparticles or “free” (topically administered) DSP showed graft rejection in less than four weeks, accompanied by severe corneal edema, opacity and neovascularization. The fact that this nanoparticle delivery system shows 100 percent efficacy in preventing rat corneal graft rejection in this study means that it may one day translate into similar results for human patients. *MS*



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1. Cornea Research Foundation of America, “Artificial Cornea”, (2008). Available at: <http://bit.ly/1H63AfU>. Accessed March 27, 2015.
2. Q Pan et al., “Corticosteroid-loaded biodegradable nanoparticles for prevention of corneal allograft rejection in rats”, *J Control Release*, 201, 32–40 (2015). PMID: 25576786.
3. Johns Hopkins Medicine, “Tiny Nanoparticles Could Make Big Impact for Patients in Need of Cornea Transplant”, (2015). Available at: <http://bit.ly/1EvaNbI>. Accessed March 27, 2015.

Classifying Keratoconus – Classically

There's still a place for retinoscopy in the diagnosis and staging of corneal ectasias

The diagnosis of keratoconus is not difficult when clinical signs like corneal ectasia, Vogt's striae, or Fleischer rings, are present. But not all patients present with these signs – and in their absence, identifying keratoconus is much trickier.

There are a number of sophisticated tools that can be used to assist in the diagnosis and staging of the disease; corneal topographers, tomographers, biomechanical assessment devices, and so on. But dedicated, high-tech approaches aren't the only way to diagnose keratoconus – the humble retinoscope also has a part to play.

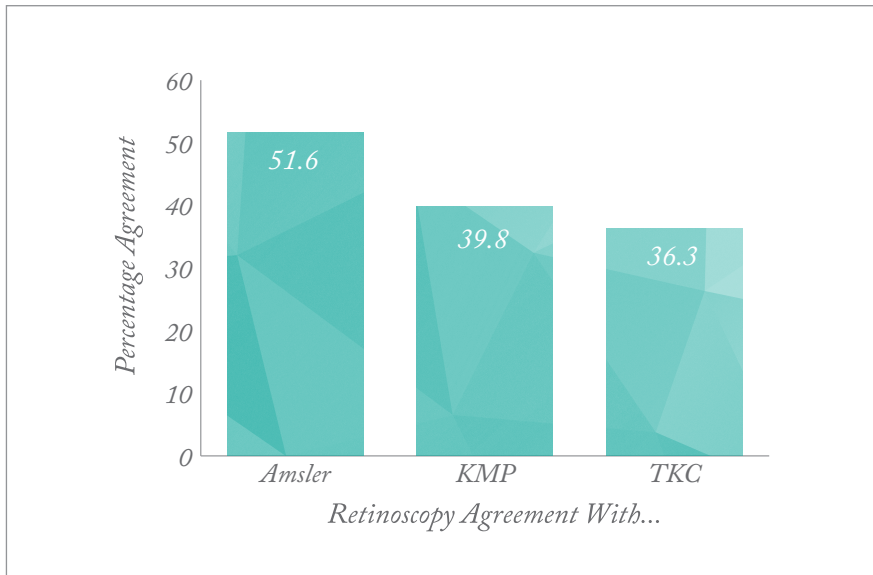


Figure 1. Percent agreement in keratoconus staging between retinoscopy and other methods.

A team of ophthalmologists from Saarland University (Homburg, Germany) compared different techniques for investigating keratoconus (1). They analyzed data obtained by Amsler grading, retinoscopy, topographic keratoconus classification (TKC), and keratoconus match probability (KMP) in 126 patients, classifying their disease into one of five stages from normal to severe. Using descriptive analysis and cross tables, the researchers discovered that the different methods showed significant classification differences when staging keratoconus; Amsler grading agreed with TKC in only 54 percent of cases and with KMP in 48.4 percent, whereas TKC and KMP agreed with one another just 53.3 percent of the time. Retinoscopy was equally incongruent, matching Amsler grading in 51.6 percent of cases, KMP in 39.8 percent, and TKC in only 36.3 percent (see Figure 1). In a binary decision (between normal eyes and keratoconus), the different classification methods performed much better. Retinoscopy agreed with Amsler grading 98.6 percent of the time, KMP 82.4 percent, and TKC 88.8 percent, and featured a sensitivity

and specificity of 98.8 and 94 percent, respectively. The team were surprised to find that the various diagnostic techniques – both clinical and instrument-based – were so inconsistent, but the consequences of this discovery are clear. The techniques cannot be used interchangeably, meaning that in longitudinal studies or in disease monitoring over time, trends can only be reported properly if the same classification technique is used at each point in time.

The study authors concluded that retinoscopy is no more consistent than any other method, but hasten to add that it has other advantages – for instance, it is easy to use in noncompliant populations such as children or disabled patients, or, as a result of its low cost, in developing regions where expensive instruments are unavailable. However, the researchers raise another key issue in the diagnosis of keratoconus: the need for an international expert committee to define a “gold standard” for classification of the disease. *MS*

Reference

1. S Goebels et al., “Can retinoscopy keep up in keratoconus diagnosis?”, *Cont Lens Anterior Eye*, [Epub ahead of print] (2015). PMID: 25731818.

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A Penny Pusher Model of Lens Growth

New research shows that lens epithelial cells proliferate along a narrow line, pushing older cells toward the equator and then the center of the lens

Until recently, the mechanisms that regulate the number of cells in the lens and, accordingly, its size and shape, have remained a mystery. Now, a group from Washington University School of Medicine has published the results of nearly four years of research into growth regulation in mouse eyes. Steven Bassnett and his laboratory examined the dynamic relationship between cell proliferation in the epithelial layer and macroscopic growth of the lens. To do this, they used confocal microscopy to track the locations on the lens surface where cells were in S phase – the point in the cell cycle at which DNA is replicated to prepare for cell division.

The researchers discovered that mitosis was largely restricted to a narrow segment of equatorial epithelium known as the germinative zone (1). As new cells are formed in the germinative zone, they pushed previously formed cells toward the equator of the lens; cells at the equator were pushed away from the lens' surface and into its center. The number of cells in the lens epithelium continued to increase until the mice were about four weeks of age, peaking at 50,000 – but even after that number began to decline, the lens continued to grow. This, the researchers concluded, was due to a continued increase in the surface area of all cells, whether newly replicated or older.

Having determined the way cells replicate in the lens, the Washington

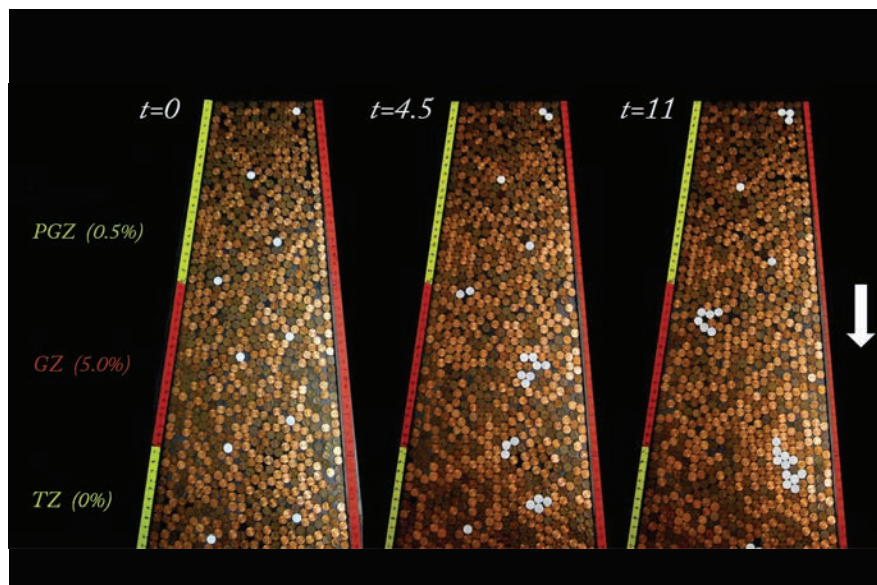


Figure 1. The researchers' Penny Pusher model of cell proliferation, shown at the start of the simulation, midway through, and at the end. Cells, represented by coins, "divide" slowly in the pregerminative zone (PGZ), rapidly in the germinative zone (GZ), and not at all in the transition zone (TZ). Increasing the number of cells in the PGZ and GZ allows older cells to migrate in the direction of the arrow, toward the edge of the TZ; in a living lens, fiber cell differentiation would begin at the bottom of the TZ. Image courtesy of IOVS.

University group realized that it was similar in nature to the movement of coins in the Penny Pusher carnival game (Figure 1). In Penny Pusher, players add coins to a moving platform already covered in older coins, pushing the oldest coins off the platform's edge onto a lower, larger platform and, ultimately, into a collection area where the player can access them. "We made a physical model of the lens equator using layers of pennies to simulate the division and migration of the lens cells," Bassnett told the Association for Research in Vision and Ophthalmology. "Our Penny Pusher model looked very similar to [the carnival game]." The model was simplified, considering all cells to be of a single type whose proliferative behavior depended solely on latitude. Despite this, though, it was able to predict the emergence of cell clones, and its simulations were in good agreement with data obtained from

lineage-tracing studies in mice.

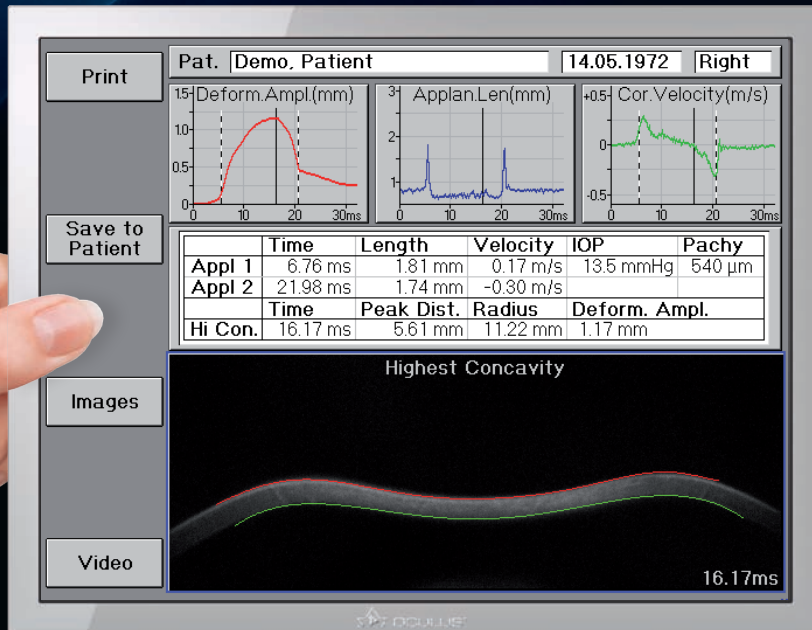
The next step for Bassnett's group is to examine the effects that these cells could have on the lens as a whole. With relatively few cells responsible for replication, mutations could have a multiplicative effect. "We are currently examining whether mutations in the DNA of individual lens cells can be transmitted to large numbers of lens cells, potentially influencing the clarity of the tissue and resulting in cataract," explained Bassnett. Whether exploring the size and shape of the lens or analyzing the effects of proliferative cell mutations, it seems that the simple, stochastic Penny Pusher model offers valuable new insights into lens growth and regulation. *MS*

References

1. Y Shi et al., "The penny pusher: a cellular model of lens growth", *Invest Ophthalmol Vis Sci*, 56, 799–809 (2014). PMID: 25515574.

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Picketing Parliament

Ophthalmologists and other eye health stakeholders lobby UK Parliament to implement improved sight loss and eye health services

In the lead-up to the forthcoming UK general election, ophthalmologists and other eye health and sight loss stakeholders are being urged to lobby their local parliamentary candidates, using the UK Vision Strategy Manifesto and accompanying lobbying guide to support their position. As well as having a devastating impact on people's lives, sight loss is currently costing the UK nearly £22 billion a year through direct, indirect and burden-of-disease costs. It's an issue that concerns every parliamentary candidate, with an average of 3,000 people living with sight loss in every parliamentary constituency.

The UK Vision Strategy Manifesto was put together by leading eye health organizations in the UK, including the Royal College of Ophthalmologists, the Royal College of Nursing Ophthalmic Forum and the Royal National Institute of

Blind People. The manifesto and lobbying guide have been designed to take into consideration the extremely tough public expenditure environment in the UK, where health and social care budgets are tighter than ever before and a considerable strain is being placed on eye health and sight loss services. To remediate this, UK Vision Strategy partners, including the ophthalmic health community, are calling for the next government to prioritize and invest in providing high-quality services across the eye care patient pathway.

The manifesto sets out six key interventions to save sight and deliver improved quality of life for people with sight loss. Each intervention offers benefits that will far outweigh its cost. For instance, each year more than 300,000 cost-effective operations are carried out on the NHS to remove cataracts. Cost-effective treatments are also available for wet AMD, diabetic retinopathy and glaucoma. By having these treatments readily available through the NHS, money would be saved in the long term through preventing unnecessary sight loss. There is also a need to promote better understanding of the importance of eye health across the population and to improve the uptake of regular vision tests for older, disabled and socially disadvantaged groups – measures

that increase the early detection and treatment of eye conditions.

Katherine Raven, senior manager at UK Vision Strategy, commented on the manifesto, "Nearly two million adults, children and young people in the UK are living with a serious sight problem, and without decisive action, this is set to double by 2050. The general election presents an important opportunity for the ophthalmology community to work together and lobby parliamentary candidates to drive forward the big eye health and sight loss issues in the next Parliament."

The ophthalmology community is invited to hear more about the UK Vision Strategy Manifesto and other key issues affecting the profession at the 7th annual Vision UK 2015 conference. Titled "Working together to deliver the UK Vision Strategy," the conference will be held on June 18, 2015 at Central Hall, Westminster, London, UK. This year's event will feature a two-stream format, with one entitled "Making the case for improving eye health" and the other aimed at "Transforming patient care to ensure timely treatment and support," both issues of particular relevance to the ophthalmology profession. *KR*

To read the UK Vision Strategy Manifesto in full, visit www.ukvisionmanifesto.org.uk.

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The BMJ Bevacizumab Brouhaha

Novartis “embarked on a campaign to undermine” the use of bevacizumab in wet AMD, a BMJ investigation alleges.

There’s a fair amount of evidence out there that supports the use of Roche’s VEGF inhibitor, bevacizumab for the treatment of wet AMD (AMD). Around 60 percent of patients with wet AMD in the US receive it, but for most of the world, such use is off-label.

In the UK’s National Health Service (NHS), one dose of ranibizumab costs £740, whereas a single dose of bevacizumab comes in at least a tenth of the cost. In 2009, against that background, the NHS was planning to perform its own clinical trials, in order to get evidence regarding the relative safety and efficacy of ranibizumab and bevacizumab in wet AMD: the IVAN (head-to-head comparison [2]) and TANDEM (dose-finding [3]) trials. It’s at this point where an investigation by the BMJ (4) alleges that Novartis tried to interfere with the operation of these trials. The key allegations are:

- Novartis tried to prevent UK ophthalmologists joining the IVAN trial, “with their sales representatives lobbying potential principal investigators against the trial and telling them that the IVAN protocol was seriously flawed”
- Novartis urged some primary care trusts to pull out of the trial, hinting that industry funding would be lost for other trials
- A Novartis sales representative

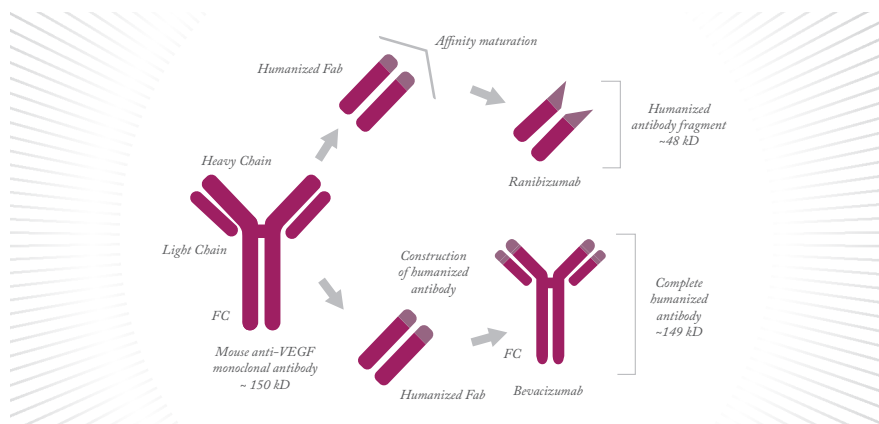


Figure 1. Ranibizumab and bevacizumab have a shared origin.

warned Alex Foss, TANDEM’s principal investigator, that “Novartis would do everything it could to stop the TANDEM trial and would particularly challenge its ethics,” and that “that the challenge would not come from Novartis itself but from the RNIB [Royal National Institute of Blind People]”

- The RNIB did indeed express concerns about the design of TANDEM one year later, in 2010 – and the person that raised those concerns now works for Novartis Oncology.

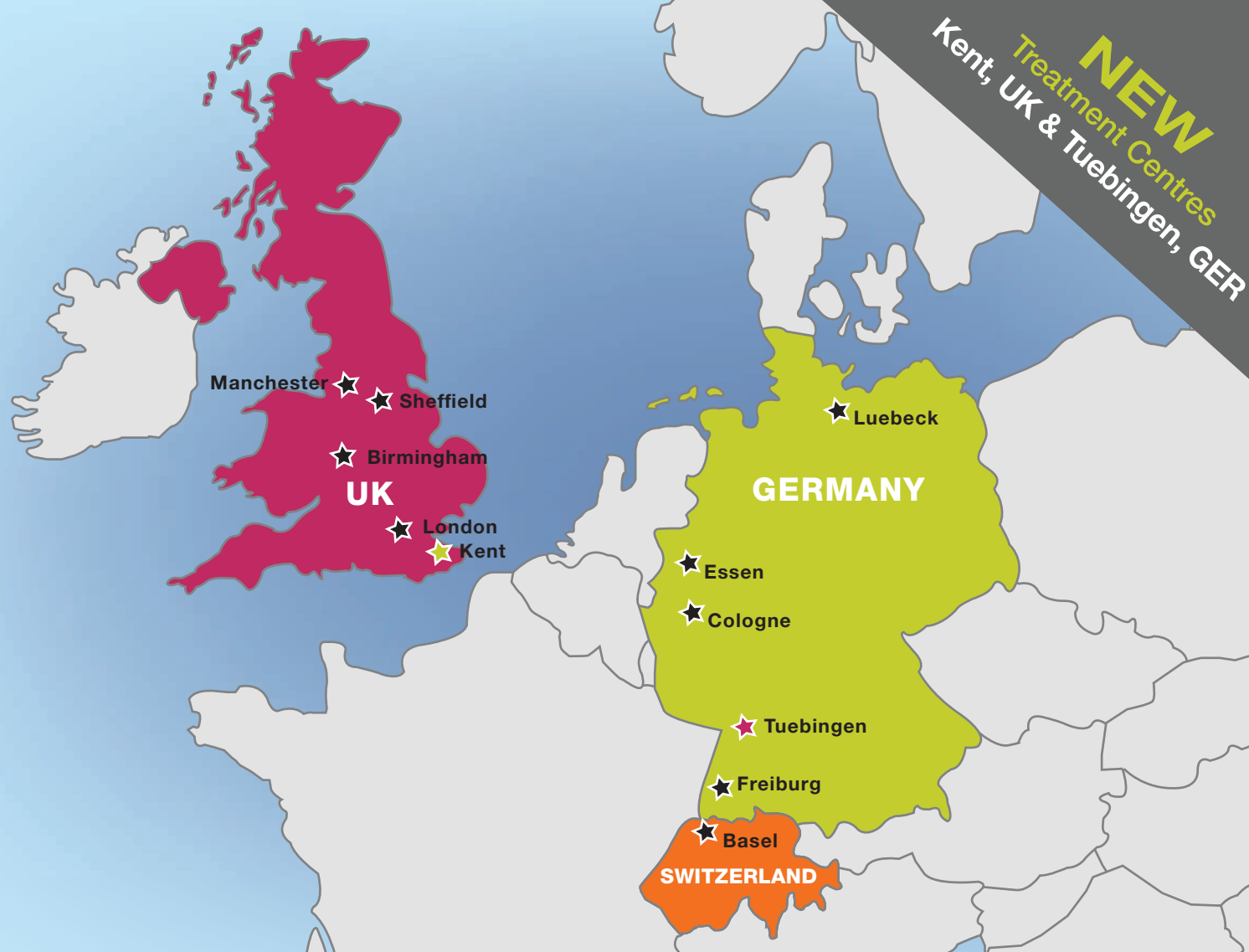
Novartis refute these allegations, with a spokesperson telling the BBC that they “take any allegations seriously and are closely reviewing the content of the article,” adding that “Novartis is committed to improving health outcomes for patients with serious eye disease as demonstrated by our substantial engagement in ophthalmology, including significant research and development efforts in the UK” (bit.ly/bbcnvs). The spokesperson made the point that “Novartis continuously conducts clinical trials in the UK and other countries. Discussions with UK study sites and healthcare professionals occur during all stages of these clinical trials,” explaining that, “During the feasibility stage these discussions often focus on the capacity

and capability to conduct studies in accordance with the highest clinical and ethical standards.”

The RNIB also robustly challenged the BMJ’s assertions (bit.ly/RNIBbmj), stating that “The reason we raised an ethical challenge to the TANDEM trial is because we believe it takes unnecessary risks with patients’ eyesight, which could ultimately lead to them going blind. Wet AMD can develop extremely quickly, sometimes leading to complete sight loss within three months. The design of the TANDEM trial means that some patients might receive dosages which are so low they won’t be effective, by this point it could be too late to save their sight. We feel strongly that this is unacceptable.” *MH*

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*The INTREPID 2-year results are published in *Ophthalmology*, January 2015. The targeted population includes wet AMD patients with lesion size ≤ 4 mm and macular volume >7.4 mm³ as measured by Stratus OCT™.

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HERE'S THE

Power List

TOP 40
UNDER 40

In 2014, we compiled a list of the Top 100 most influential people in ophthalmology – an endeavor that received a significant amount of attention and, it's fair to say, caused more than a little controversy. For our 2015 Top 40 Under 40 list we've taken a different approach, asking: who are the young, up-and-coming individuals set to rise to the top of their field? That's the question we posed to ourselves – and then to you – ahead of open nominations and a painstaking judging process. Our list this year almost halves the average age of the celebrated individuals, with many of them born in the same year as the iconic Sex Pistols cover – 1977. Though we admit that no list of this type can be definitive, it does clearly show that the future of ophthalmology is very bright indeed. And so, without further ado, we celebrate the movers and shakers aged 40 or under who show what can be achieved with determination, passion and inspiration.

40–11 (in alphabetical order)

Bryan Lee

Assistant Professor of Ophthalmology,
University of Washington, Seattle,
WA, USA.

Lee's current work involves using the internet to improve patient understanding of eye disease, and increasing transparency in the doctor–patient relationship. A recipient of the Maxwell Grand Prize in Ophthalmology, the Latham Vision Research Innovation Award for his academic pursuits, and Vanguard Ophthalmology Society's Anterior Segment Fellow of the year 2012, he is passionate about health policy and the ways in which legal and regulatory issues affect doctors and their patients. He has taught many courses at national meetings and published extensively.

He offers two key pieces of advice to those wishing to succeed in the field: "1. Find great mentorship. 2. Seek out other young ophthalmologists to be your sounding board as you grow in your careers together."

Cagri Besirli

Assistant Professor, Ophthalmology and
Visual Sciences, Kellogg Eye Center, Ann
Arbor, MI, USA.

Besirli's basic research program on neuroprotection, which he directs in tandem with a busy fellowship, has already received several awards and honors. His interests lie in disease and surgery of the retina and vitreous, including diabetic retinopathy, AMD, retinal vascular disease and complex retinal detachment. His current research focus is on molecular mechanisms of photoreceptor cell death and survival during periods of retinal stress.

A nominator said: "Besirli has received nearly every honor a vitreoretinal fellow can achieve, including: Fellowship Awards from the Heed Foundation, Michels Foundation, and the Retina Society. At the Kellogg Eye Center, Besirli won awards for resident teaching and, two times, for resident research. His publication record is outstanding, and he has already served as a reviewer for several journals."

Christopher Teng

Director, Glaucoma, Associate Professor
of Ophthalmology and Visual Science, Yale
University School of Medicine, New Haven,
CT, USA.

With many peer-reviewed publications and presentations at international meetings, Teng's research and clinical interests include the optic nerve complex, parapapillary atrophy, glaucoma surgery, micro-invasive glaucoma surgery and complex anterior segment and cataract surgery. He has received an American Glaucoma Society Clinician Scientist Research Award, was awarded Lecturer of the Year at New York University and received The John S. Hermann, MD Memorial Award for Excellence in Teaching from The New York Eye and Ear Infirmary. On which technologies he thinks will transform the field: "I am very excited about OCT angiography, which will help improve diagnostic capability in retina and glaucoma. With this technology, doctors will be able to assess the perfusion of the macula and optic nerve to evaluate progression of disease."

Andrew Bastawrous

Ophthalmologist and Clinical Lecturer in International
Eye Health at the London School of Hygiene and Tropical
Medicine, Co-Founder of Peek Vision, London, UK.

Bastawrous is involved in the PEEK (Portable Eye Examination Kit) project; a smartphone app and adaptor designed to help solve the problem of avoidable sight loss amongst the millions of people worldwide who don't have access to expert eye health care. Bastawrous has worked in Sierra Leone, Peru, Belize, Sri Lanka, Madagascar and Uganda and is working on the collaborative development and testing of PEEK, which can be used by health workers to test eyes easily and affordably, at the point of care. On his biggest achievement to date, "Persuading brilliant and talented people to work alongside me and make up for my weaknesses."

A nominator said: "Bastawrous has published numerous peer-reviewed papers, and won the prestigious Max Perutz Science Writing Award in 2012 and is a 2014 TED Fellow. The PEEK project will transform eye care in Africa."





David Goldman

Founder, Goldman Eye, Palm Beach Gardens, FL, USA.

Goldman began his career at Bascom Palmer Eye Institute and quickly became their second highest volume surgeon. He has been recognized by Premier Surgeons as one of the top 250 surgeons in the US, and in 2012 was awarded the Florida Society of Ophthalmology Michael R. Redmond Young Outstanding Ophthalmologist Award. He has served as President of the Palm Beach County Ophthalmology Society two years in a row, and served as a representative councilor for ASCRS to the AAO. He has also published advice on independent practice startup in several trade journals, and does part-time consulting and computer programming work for EMA Ophthalmology, an iPad-based electronic medical records system.

A nominator said: "Goldman has embarked on a busy private practice while continuing to speak nationally on a number of topics. He continues to be a key opinion leader while in private practice."



Fernando Faria-Correia

Ophthalmologist, Cornea and Refractive Surgery Department, Hospital de Braga, Cornea and Refractive Surgery Department, Instituto CUF, Porto, Portugal.

Faria-Correia is a member of the Rio de Janeiro Corneal Tomography and Biomechanics study group. Praised for its modern thinking, the group have won several awards for their work on corneal thickness profiles, tomography, corneal biomechanics, and enhanced screening. He has spoken at several international conferences, including ASCRS.

A nominator said: "Faria-Correia is a talented young ophthalmologist who has published important articles for the field of keratoconus, cataract and refractive surgery. I am positive he is a future leader who will continue to contribute to his field."



Florian Kretz

Resident and Research Fellow at the International Vision Correction Research Centre (IVCRC), Department of Ophthalmology, University Hospital Heidelberg, Germany.

A rare breed today in ophthalmology, Kretz is an ophthalmologist with active research interests in both anterior and posterior segment disease. "I love my job and I can say I am lucky having found the right thing for me to do," he says. He considers his biggest achievements so far to be becoming a member of the Young Ophthalmologist Committee of the ESCRS (and being awarded father of the year by his own family), and he predicts intraoperative life-time OCT and Scheimpflug imaging as the next game-changers in the field. His advice to young ophthalmologists is simple: "work hard, play hard!"

Here's what some of the nominators said: "Florian Kretz has a unique combination of excellent medical expertise, surgical skill, inventiveness in research-laboratory methodology and business acumen – and with all of this, a warm and thoughtful personality with good communication skills – he is surely an ophthalmologist destined for greatness in the future."

"An outstanding international presence, Florian has written many publications and interesting studies using 'state of the art' ophthalmic devices, especially IOLs with a future-oriented focus."

"Even if Florian Kretz is quite young of age and has just finished his consulting physician degree, he already has a great surgical expertise, especially in cataract surgery and IOL implantation. He applies his wide scientific knowledge also when arranging clinical and laboratory studies, which are powerfully supported by his effective contacts in the ophthalmic industry. Kretz is very actively presenting his scientific results at international congresses, and is also involved in performing surgery in Africa, actively fighting against blindness even in his spare time."



Giuliano Scarcelli

Assistant Professor, Fischell Department of Bioengineering, University of Maryland, College Park, MD, USA.

Scarcelli is co-inventor and co-developer of Brillouin imaging. A recent prototype clinical instrument based on the technology was developed to collect in vivo human data from the cornea, demonstrating Brillouin microscopy as a viable and effective ophthalmic tool, able to discriminate keratoconus from normal corneas, and able to detect the stiffening effect of collagen crosslinking. "Our new imaging modality maps the stiffness of ocular tissue without having to touch it," explains Scarcelli. His articles have been cited over a thousand times, and he has received several awards, including the Human Frontier Science Program Young Investigator Award, the NIH Quantitative Career Award, and the Harvard University "Teaching Excellence" award. "Ten years from now I hope every hospital and eye center will have a Brillouin scanner to test corneal stiffness," says Scarcelli.

A nominator said: "Measuring Brillouin scattering in cross-sectional maps of the cornea and crystalline lens to acquire stiffness maps is important for diagnosing keratoconus, and also the study of crystalline lens aging, and Scarcelli's in vivo system has the potential to enter the clinical praxis."



Gary Wortz

Founder, Bluegrass Eye Surgery, Stanford, KY, USA.

As well as running his own successful practice in Kentucky, Wortz helps run a free eye clinic for those in need. A specialist in cataract surgery, he has been published in numerous trade journals, given several lectures at the AAO and ASCRS annual meetings and participates in FDA studies for new ophthalmic therapeutics.

A nominator said: "A progressive surgeon, Gary is the most innovative young cataract surgeon currently in the US. He started his own practice after his residency, and in a very short time built it to become one of the largest cataract providers in the state of Kentucky. He then joined Commonwealth Eye, one of the largest providers in the state, and is now providing care to thousands every year. At the same time, he has worked with industry to develop and improve devices and disposables with companies such as Alcon, AMO, Lenstec and Ocular Therapeutix. He also recently received patents on a novel IOL design that could have far-reaching implications."



Jasmine Francis

Assistant Attending Surgeon of Ophthalmic Oncology at Memorial Sloan Kettering Cancer Center and an Assistant Professor of Ophthalmology at Weill Cornell Medical College New York, NY, USA.

A clinician-scientist with many published papers and book chapters, Francis served as the primary investigator of a National Cancer Institute-funded study on The Cancer Genome Atlas for uveal melanoma. She received the 2014 Outstanding Poster Award from the ARVO, and she has presented at many national and international meetings. What does she feel will be the biggest game-changer in the next five years? "I predict a move towards personalized ophthalmic care that is driven by genetic evaluation, and tailored to specific genetic mutations." And she advises those just starting out to, "Follow your heart as well as your mind."

A nominator said: "Jasmine is developing new and effective ways to treat cancers of the eye in children and adults."

John Berdahl

Partner at Vance Thompson Vision, Founder and CEO of Equinox, Sioux Falls, SD, USA.

Berdahl has been chosen to take part in the Vision for Mars team, which is working closely with NASA and NSBRI to help solve vision problems during long-term space travel. He has received several awards, including the Claes Dohlman award from Harvard and the 2013 top physician's award for South Dakota. He also has a leadership role in EyeCare America (which provides free eye care to the underserved). Specializing in advanced cataract, corneal and glaucoma surgery, as well as refractive surgery, his research efforts are currently focused on intracranial pressure in glaucoma and fixing astigmatism after cataract surgery. Speaking of his objectives for the next 10 years: "My goal is to leave our beloved profession a little better than it is now. My hope is to cure glaucoma." And his advice to budding ophthalmologists? "Always do the right thing and use your naïveté to your advantage, since you are not yet encumbered by dogma."

A nominator said: "John has been a leader in the development of the microinvasive glaucoma space. A pioneer of the iStent, helping to achieve great results and target the appropriate patients. This has helped lead change in glaucoma care and usher in a whole new category of treatment. John is also a class act, skilled teacher and unique personality. His patients are lucky to have him."

**Jonathan Solomon**

Surgical/Refractive Director, Solomon Eye Associates, Fairfax, VA, USA.

Featured in GQ Magazine's "Men of the Year" issue, and recognized as an American "Top Doctor", Solomon is also Medical Director of Dimensions Surgery Center and cofounder of the Bowie Vision Institute. He serves as an executive board member of the Maryland Society of Eye Physicians and Surgeons, and acts as a consultant to the FDA's Ophthalmic Device Panel.

A nominator said: "Jonathan is a young thought leader with a vibrant surgical practice. He is frequently featured in all of the monthly journals and periodicals, and is an exciting and thought provoking speaker. I always look forward to hearing his talks on the way he is incorporating new technology into the surgical process to enhance outcomes. He is always on the cutting edge, and I enjoy hearing his perspectives on the pros and cons of these new tools."

**Kaweh Mansouri**

Consultant Ophthalmologist, Geneva University Hospitals, Geneva, Switzerland, and Switzerland Adjunct Associate Professor, University of Colorado, Aurora, CO, USA.

Mansouri pioneered the use of 24-hour IOP monitoring technology in glaucoma, and contributed to the development of the Triggerfish, a contact lens sensor for IOP monitoring. He was the first ophthalmologist to give a TEDx talk, with the aim of improving glaucoma awareness. He continues to develop IOP monitoring technologies, and to work to improve imaging and surgical techniques in glaucoma.

He believes mapping of the genotype and phenotype of glaucoma and other ophthalmic pathologies, which will enable individualized and targeted treatment to patients, will be the field's next big game-changer.

**Mandeep Singh Dhalla**

Partner, Retina Group of Florida, Fort Lauderdale, FL, USA.

Dhalla is currently president of the Broward County Ophthalmology Society and an editor for Retina Times. He has been recognized by the Consumer Research Council of America as a "Top Ophthalmologist", and has multiple peer-reviewed publications to his name. As a resident at the Henry Ford Hospital in Michigan, he was given the Jan Rival Award, and named the most outstanding resident across all specialties in the Henry Ford Health System. His research interests include wet AMD, retinal detachment, and treating advanced diabetic retinopathy, and he has presented his research at various meetings including AAO and ARVO. Outside of work, he enjoys playing the sarangi (Indian violin), and is a marine aquarium enthusiast."



Monika Fleckenstein

Clinician-scientist, Department of Ophthalmology, University of Bonn, Bonn, Germany.

Fleckenstein's clinical and research focus is on AMD, with an emphasis on the natural history and pathogenesis of geographic atrophy (GA). Her aim is to identify the exact pathogenic pathway of the 'trickling' GA-subtype and to develop treatment strategies. She is also a co-founder of YouRetina, an initiative to support young retinal specialists within EURETINA.

A nominator said: "A world-wide expert in the fields of AMD and retinal imaging, Fleckenstein has substantially contributed to the understanding of the disease manifestation and natural history of geographic atrophy."



Mor Dickman

Resident in Ophthalmology, University Eye Clinic Maastricht, Maastricht University School of Mental Health and Neuroscience, Maastricht, the Netherlands.

Dickman is coordinating a multicenter, randomized study comparing ultra-thin DSAEK with DSAEK and, and is involved in the development of a novel photosensitizer for crosslinking. He hopes to complete his residency and continue combining research and clinical practice in an academic setting. "In the short-to-medium term I expect novel drug delivery and monitoring systems, and new treatments for myopia to change clinical practice," he says.

A nominator said: "Mor is working on innovations in endothelial keratoplasty techniques using new microkeratomes. Three of his presentations at ASCRS and EuCornea were awarded best papers of session. He is still a resident, and I foresee an interesting career for him."

Nathan Radcliffe

Clinical Assistant Professor, Department of Ophthalmology, New York University School of Medicine, New York, NY, USA.

An experienced glaucoma and cataract surgeon, Radcliffe has published over 40 scientific papers, lectured internationally, and received awards for his surgical videos and teaching.

A nominator said: "Nathan Radcliffe is among the most innovative anterior segment surgeons in the country. Aside from being a fantastic cataract surgeon, Radcliffe has excelled as a national thought leader in the field of surgical glaucoma management. His microinvasive treatment protocols are shaping and redefining the standard of care within this very important field. He is a highly respected member of the AAO, American Glaucoma Society, the Vanguard Ophthalmology Society, and the Ophthalmology Laser Society among others. He is widely published in the peer reviewed literature and is a highly sought after speaker. In his short career, he has already had a lasting impact."



Mauricio Andres Pérez Velasquez

Cornea, External Diseases and Refractive Surgery Clinical Fellow, University of Toronto, Toronto, Canada.

A Chilean ophthalmologist, Perez is currently finishing his fourth year of subspecialty training. A surgical instructor for ASCRS in iris suturing, iris prostheses and anterior vitrectomy, he has contributed multiple papers in the field of anterior segment, and has received "Winner of the Film Festival" at ASCS in 2013 and "Best of Show" at AAO in 2012. He has served as an author for many books on cornea and anterior segment surgery, including the upcoming newest edition of the Krachmer Cornea Book. When asked if he would chose a different path if starting again, Perez said "No. Unless it would mean playing point guard for the Chicago Bulls, or lead guitarist for Pearl Jam or Pink Floyd!"

A nominator said: "My man is Mauricio Pérez – I'm pretty sure that you (and all of us) will hear about him in the near future. He has given lectures at all the big meetings (ASCRS, ESCRS), been an instructor on several courses in surgical technique (ASCRS, ESCRS) and publishing novel surgical approaches to complicated cataract, cornea and refractive surgeries in various forms of media. He is also an accomplished pianist, speaks four languages fluently, and, of course, plays electric guitar – he is truly a renaissance man."

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Nikki Hafezi

Managing Director and CEO of GroupAdvance and EMAGine, Zug, Switzerland.

Hafezi is Managing Director and Chief Executive Officer of GroupAdvance – a fundraising and business development service provider – and EMAGine – developer and manufacturer of ophthalmic medical products. She is also in charge of business strategy and development at a new eye hospital and research center in Zurich, the ELZA institute. “Currently, my career focus is to help translate research on CXL technology to treat infectious keratitis into clinical applications,” she says. She predicts that PACK-CXL will create a paradigm shift in treating eye infection, especially in developing countries, and she’s hoping to lead a team to translate the technology to clinical application for treating infections beyond ophthalmology. Her advice for getting ahead? “Diversify your skill set. Identify and strengthen your talents. Pursue your interests. No one wants “just” a clinician.”

A nominator said: “I have experienced Hafezi’s influential way of doing business with researchers, clinicians and industry alike. With her deep understanding of intellectual property and industry relations, Nikki Hafezi is an asset to her company since these aspects are usually confusing to most clinicians and scientists.”

Parul Ichhpujani

Assistant Professor, Government Medical College and Hospital, Chandigarh, India.

With over 50 peer-reviewed publications and 14 book chapters under his belt, Ichhpujani also serves as a reviewer of several journals and is Chief Editor of “Expert Techniques in Ophthalmic Surgery”, and co-authored the book “Pearls in Glaucoma Management.” She currently oversees medical student education in ophthalmology, and her clinical practice focuses on management of glaucoma and cataract. Repeating the words of her mentor, she would say to her peers, “When we take care of a single patient we are taking care of a part of God. Every single patient is important. Secondly, there is no problem with making money, but the intent behind the action is what should guide us.” *A nominator said: “Ichhpujani is a bright and focused physician who is doing outstanding work in ophthalmic research and academics, especially in field of glaucoma. She displays a broad depth of knowledge in many areas and a keen intellectual curiosity, which takes her work to perfect fruition. Her demeanor and supervisory talent are exemplary, and she is an asset to any project or institution she serves.”*



Tiarnan Keenan

Fight For Sight Clinical Fellow, University of Manchester, Manchester, UK.

Keenan has received several awards, including the UK's Royal College of Ophthalmologists/ Fight For Sight Research Prize, and the 2013 Fulbright Fight for Sight Research Award, which allowed him to study the role of the complement system in AMD using Gregory Hageman's "unique repository of 12,000 human eyes", held at the University of Utah. He's no stranger to working with tissue from an eye bank – as a Fight for Sight Clinical Fellow at the University of Manchester, he has already used such materials in order to study the how the macula ages.

Other awards and recognitions including an ARVO international travel award, a North West ophthalmology trainee research prize, and several prizes for his research papers.



He has over 15 first author publications, and his research has led to the discovery of a potential new disease mechanism in AMD. He is currently completing his clinical training at Manchester, and continues to publish his clinical and scientific research in the field of retinal disease.

A nominator said: "Tiarnan Keenan is an excellent young researcher, who went to work with Greg Hageman in Utah to unravel the mysteries of AMD pathogenesis – and I'm sure he's learned a lot. He's a really gifted guy, and I'm sure he'll do great things over the course of his career."

Nino Hirschall

Resident and PhD student, Vienna Institute for Research in Ocular Surgery, a Karl Landsteiner Institute, Hanusch Hospital, Vienna, Austria.



Hirschall's research interests include IOL power calculation, astigmatism, OCT and patient assessment techniques, glaucoma, and he has developed and patented a novel algorithm for intra-operative IOL power calculation, which he describes as his biggest achievement to date. "I always wanted to make patients happy, deal with something beautiful (nothing is more beautiful than the eye) and work precisely with my hands – that's why ophthalmology is for me," he says. In the future he hopes to make his IOL power calculation concept ready for daily use; a novel algorithm for toric IOL power calculation (in progress), and to tackle presbyopia.

A nominator said: "At the age of 30, Nino has published as first author on over 10 of his peer-reviewed articles. He is already considered an expert on IOL optics, biometry and IOL calculation. He is also a very active member in the Young Ophthalmologists committee of the ESCRS, and has given a number of lectures and courses. His dedication to the complex field of optics and engineering and the profound knowledge he has acquired at this early stage of his career are outstanding, and I am convinced that he will have a major impact on future developments in this field."

Petros Carvounis

Associate Professor and Director of the Vitreoretinal Surgery Fellowship Program, Cullen Eye Institute, Baylor College of Medicine, Houston, TX, USA.



Carvounis was born into a family of ophthalmologists, and fell in love with vitreoretinal surgery the first time he saw the fundus on a wide-field viewing system. With an interest in optimizing the patient experience, and visual outcomes after vitreoretinal surgery, he is currently publishing the outcomes of his surgical techniques. He has published over 46 peer-reviewed papers and book chapters, and has given over 70 presentations at international meetings. His awards include the AAO Achievement Award, the Honor Award from the ASRS, and he has been voted one of the Best Doctors of America annually for the last five years.

A nominator said: "Petros is a brilliant young leader in the field of ophthalmology. In particular, he is being groomed as a possible future President and Scientific Advisor of the Retina Research Foundation of Houston, Texas, and is now on the Board of Directors."

Shi-Ming Li

Ophthalmologist at the Eye Center of
Beijing Tongren Hospital, Capital Medical
University, Beijing, China.

Li has established the largest cohort to study myopia in Chinese children; the Anyang Childhood Eye Study. He hopes to find clinically effective interventions on controlling myopia progression and methods for preventing myopic complications – with an aim to clarify the gene-environment interaction in the etiology of myopia. On the next biggest advance in the next five years, he predicts that “wearable devices combining internet and big data on screening, rapid diagnosis, real-time monitoring and treatment of most ocular diseases,” will be a key feature.

A nominator said: “Shi-Ming Li has devoted himself to myopia research for more than 10 years. He has demonstrated tenacity, persistence and diversity. He was elected as Beijing New Star of Science and Technology (2012) and Beijing outstanding young talent (2014). He has published over 20 papers in peer-reviewed international journals and is also an active reviewer for IOVS, PLOS ONE, Ophthalmic Epidemiology and Human Genetics.”

**Tushar Agarwal**

Additional Professor of Ophthalmology, Dr. R.P. Centre for
Ophthalmic Sciences, All India Institute of Medical Sciences,
New Delhi, India.



When working as a Fellow in the Cornea and Refractive service, Agarwal developed the technique of computer simulation-assisted rotational autokeratoplasty, and gained recognition nationally – receiving the Indian National Science Academy Young Scientist Medal, and a Best of Show award from the AAO. He was also recognized for discovering a cause of severe ocular alkali burns in Indian children – bursting Chuna packets (edible calcium hydroxide). He has more than 60 published papers, including over 15 new surgical techniques.

A nominator said: “Among his many accomplishments, Dr Agarwal described the use of smartphones in diagnosing fungal keratitis. This pioneering work has opened up a new area of research in mobile phone based point-of-care diagnostics in ophthalmology, and he continues to adapt high-end technology for use in the most basic settings in developing countries, thus enriching the lives of the most underprivileged people. He was instrumental in development of International Council Ophthalmology residency curriculum committee. His other passion is teaching cataract surgery to residents for which he has established a world-class wet Lab at RP Centre.”

Steffen Schmitz-Valckenberg

Assistant Medical Director,
Department of Ophthalmology,
University of Bonn, Germany.



Schmitz-Valckenberg's research is focused on AMD, retinal imaging, fundus autofluorescence and molecular imaging. He has contributed to over 60 publications and 16 book chapters, and acted as co-editor of “Atlas of Fundus Autofluorescence Imaging”. He predicts that the next big advance in ophthalmology will be the increasing number of intravitreal agents available for the treatment of retinal diseases.

A nominator said: “Steffen has made major contributions in the field of geographic atrophy due to age-related AMD. He played a pivotal role in the development and validation of quantitative analyses of areas of geographic atrophy, based on cSLO-fundus autofluorescence, a method that is now used in basically all interventional clinical trials as an anatomic main outcome measure in patients with geographic atrophy. He leads the GRADE Reading Center in Bonn, Germany, and is thus involved in many ongoing natural history and interventional clinical studies on dry AMD.”

Wolfgang Riha

Corneal and Refractive surgeon, Sehkraft Eye Center, Cologne, Germany.

Licensed to practice in the UK, Austria and Switzerland, Riha splits his work as a consultant ophthalmologist throughout Europe, with his main scientific interest being the correction of presbyopia. Frequently the youngest member of the faculties, committees and boards that he serves on, he sees the future in ophthalmology lying in improving the training programs for young colleagues, better worldwide standards and cooperation.

Speaking of his primary goal, Riha said, "I aim to provide excellent service for the patients using only the state of the art technology. The cooperation with colleagues and companies around the globe to improve and develop the procedures and devices we are using is the key for future success in refractive surgery."

A nominator said: "Riha was deeply engaged in the development of the KAMRA inlay. He is member of the Clinical Advisory board at AcuFocus and has trained every single surgeon worldwide in implanting the inlay. He is ethical, dedicated to deliver high quality and focused on patient satisfaction. He will be supporting future development of refractive surgery and new technologies."

**Tarun Arora**

Senior Resident, Cornea, Lens and Refractive Surgery Services, Rajendra Prasad Centre for Ophthalmic Sciences, All India Institute of Medical Sciences, New Delhi, India.

After observing the lack of basic instruments and academic teaching found in some institutions in India, Arora was inspired to found the Young Ophthalmologist Society of India (YOSI), which includes an online forum for discussing clinical cases, surgical techniques and the latest guidelines, and now a magazine; YO Times. Arora also uses social media to promote better eye care awareness, and to help young ophthalmologist network and collaborate. He says "My dream is to minimize the differences in opportunity in learning as I consider that a basic right. This step will promote scientific growth in YOs, who will take ophthalmology to the next level."

**Thomas Patrianakos**

Chair of Ophthalmology, Cook County Health and Hospitals System, Chicago, IL, USA.

Patrianakos has frequently lectured on glaucoma and general ophthalmology to residents, physicians and patients, and has many published articles. His main research interests include glaucoma, optic nerve imaging techniques, and microinvasive glaucoma surgery. His aims: to find ways to improve surgical treatment of glaucoma, and better ways of teaching and developing ophthalmologists in training. When asked who he most admires in the field, he says, "All of my mentors, who over the years have bestowed their knowledge to countless future ophthalmologists."

A nominator said: "Thomas has trained and inspired many young ophthalmologists, not only clinically but academically. Through functions and newsletters, he remains influential to his past graduates."

**Szilard Kiss**

Director of Clinical Research and Associate Professor of Ophthalmology, Weill Cornell Medical College, New York, NY, USA.

Kiss' clinical and translational research focuses on retinal imaging, ocular gene therapy, novel therapeutic targets for ocular neovascularization, and genetic markers for retinal diseases. He has participated as a principal investigator in over a dozen prospective clinical trials and laboratory investigations, he has authored over 200 publications, given over 100 lectures worldwide and his awards to date include the Research to Prevent Blindness Physician-Scientists Award. Kiss has been named in several regional and national Top Doctors lists.

A nominator said: "He has published over two dozen articles including publications on innovative surgical techniques and novel treatment paradigms for retinal disorders."



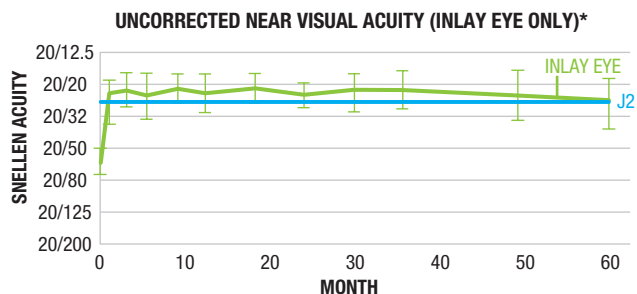
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The Top 10

10

Alain Saad

Anterior Segment and Refractive Surgery Department,
Rothschild Foundation, Paris, France.

A gifted corneal surgeon, along with his colleague Damien Gatinel, Saad developed an artificial intelligence system for the detection of ectasia-susceptible eyes; the SCORE analyzer. A reviewer and editor for several ophthalmology journals, he has over 30 publications to his name. His research interests include corneal ectasias, corneal topography and tomography, wavefront biomechanics and new keratoplasty techniques.

Saad was recently appointed to the “future leaders” subcommittee and the international council of the International Society of Refractive Surgery. His honors and awards include two best paper awards at the annual meeting of the AAO and “surgeon of the month” from the International Society of Refractive Surgery.

His top career tip? “I was once told: don’t choose a job, choose a boss! Damien Gatinel’s mentorship has been a great opportunity, and working with him has been a rare privilege and a true asset to my career.”

A nominator said: “He is not only a skillful and experienced surgeon for his young age, but also publishing a significant number of papers and working on some incredible projects. He will definitely be one of the top guys 10 years down the road.”



9

Elizabeth Yeu

Assistant Professor, Eastern Virginia Medical School and
Cornea, Cataract and Refractive Surgeon with Virginia Eye
Consultants, VA, USA.

With a research focus on corneal astigmatism and higher order aberrations, ocular surface disease diagnostics and therapeutics, keratoconus management and technical advances in endothelial keratoplasty, Yeu also dedicates her time to ophthalmology residency education at Eastern Virginia Medical School.

On her work, Yeu says, “the cornea provides a beautiful marriage of science, innovation, and the “wow” factor for our patients. It is a dynamic field that welcomes advances to improve outcomes and patient care. I dream big and work tirelessly, and I hope to advance my field through innovations in cataract surgery and dry eye management.”

She advises newcomers to the field to, “Push past your own expectations and be the best version of you possible!”

A nominator said: “Elizabeth Yeu is a rising leader in the fields of cornea and cataract surgery. She serves several national organizations, and is currently the Chair for the Young Eye Surgeons Clinical Committee for the ASCRS, and serves on various committees for the AAO including the Communications Secretariat and the Annual Meeting Program Refractive Surgery Committee. She has an uncanny ability to meld academic theory and research with real world surgical experience in a busy private practice.”



8

Greg Parkhurst

Founder and Physician-CEO,
Parkhurst Nuvision, San Antonio,
TX, USA.



After training with the first surgeon in the US to perform LASIK, Parkhurst has gone on to pioneer new trends in refractive surgery. “Nothing surpasses the privilege of restoring sight. Maintaining positions of leadership in ophthalmology is maximizing my scale-of-influence in that endeavor,” he says.

Named a Top Ophthalmologist by the Consumer’s Research Council of America, and included in the Super Doctor’s Rising Star List in Texas Monthly Magazine, he was the only surgeon under the age of 35 to serve as teaching faculty for the American-European College of Ophthalmic Surgeons. Parkhurst has also

acted as principal investigator during numerous FDA clinical trials, ranging from CXL and presbyopic inlays to MIGS devices and lasers. His advice to his ophthalmology peers: “Advance the profession through publication in the peer-review literature and podium education, and endeavor for leadership as physician-CEO of your own practice.”

A nominator said: “Greg is a star. Serving for several years for the military to pay back his training, Greg is on the cutting edge of all cataract and refractive surgery technology and research. He is former Chief of Ophthalmology and Refractive Surgery at Fort Hood, and highest volume ICL surgeon in the US in 2009 and 2010. An author of multiple peer-reviewed papers and multiple textbook chapters on laser cataract surgery and phakic IOLs, Greg is also founding member of the American-European Congress of Ophthalmic Surgery and the Refractive Surgery Alliance, and current president elect.”

7

Sophie Bakri

Professor of Ophthalmology, Vitreoretinal Diseases
and Surgery, Mayo Clinic, Rochester, MN, USA.

Bakri considers her work in describing the pharmacokinetics of intravitreal therapies as one of her biggest achievements so far, and has hopes that her current work on new pharmacotherapies for retinal vascular diseases, such as AMD and diabetic retinopathy, will result in more convenient and effective ways to treat patients. She believes that if sustained drug delivery of anti-VEGF therapy becomes a reality, it could be a game-changer.

With over 100 peer-reviewed papers and 17 book chapters on retinal disease, she is also editor-in-chief of the book “Mayo Clinic on Vision and Eye Health”, and serves on the Editorial Board of the American Journal of Ophthalmology, Retina, Seminars in Ophthalmology and Clinical and Surgical Ophthalmology.

She is a principal investigator in several multicenter clinical trials on novel drugs for retinal disease, and has received an Achievement Award from the AAO, and an Honor Award from the ASRS. Her advice: “There is no substitute for hard work. And listen carefully to your patients – they will give you the answers as to what the unmet needs are in ophthalmology.”



A nominator said: “Sophie is a compassionate educator, a leading researcher and a thinker who will develop her field.”

6

Justis Ehlers

Assistant Professor of Ophthalmology at Cleveland Clinic Lerner College of Medicine and the Vitreoretinal Service of the Cleveland Clinic Cole Eye Institute, Cleveland, OH, USA.

Ehlers specializes in diagnosing and managing medical and surgical vitreoretinal diseases, with his laboratory work focusing on translational intraoperative OCT technology, with a particular focus on microscope integration, OCT-compatible surgical instruments, and pathology-specific software algorithms.

He is Associate Editor of the British Journal of Ophthalmology, a member of the AAO Knowledge Base Retina Subspecialty committee and Ophthalmic Technology Assessment committees, and has received several awards, including the AAO Achievement Award and several Cleveland Clinic Innovator Awards.

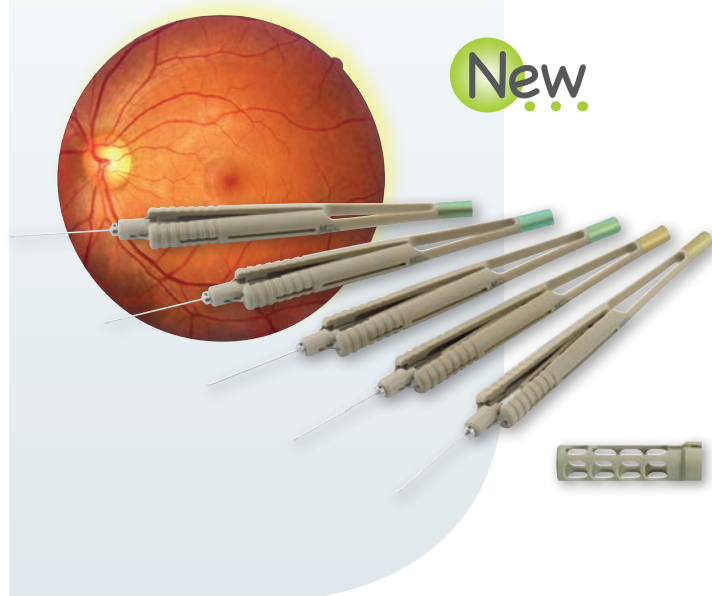
A nominator said: "Justis tested and optimized a prototype operating microscope integrated OCT system allowing for real-time OCT-based visualization of intraocular maneuvers. Complementing the use of intraoperative OCT, he is currently developing novel OCT-friendly surgical instrumentation. A major contributor to the medical literature with over 50 original reports, book chapters, and abstracts; he currently serves as a scientific reviewer for numerous ophthalmic journals and has served as an associate editor of Retina, and he was also the co-chief editor of the Wills Eye Manual, 5th Edition, one of the best-selling texts in ophthalmology."



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5

K. Thiran Jayasundera

Assistant Professor, Ophthalmology and Visual Sciences,
University of Michigan, Kellogg Eye Center, Ann Arbor,
MI, USA.

Jayasundera gained recognition as one of the first surgeons to implant the first Argus II implants in the US following FDA approval, which he considers to be his biggest achievement to date – and will soon chair the first Argus II investigator meeting.

His interests include the diagnosis and treatment of inherited retinal degenerative diseases, including Stargardt disease, retinitis pigmentosa variants, cone dystrophies and unusual retinal dystrophies that require electrophysiological testing for diagnosis. His research focus is genotype-phenotype correlations in inherited retinal disease, predictors of disease progression and outcome measures for therapeutic clinical trials. He predicts that gene therapy will see the most advances in the next five years.

“My goals are: to provide patients with an accurate diagnosis and prognosis; to help guide the choice or targeting of treatment; and to develop outcome measures which will determine progression of their disease state in therapeutic trials,” he adds.

A nominator said: “Jayasundera completed fellowships in medical retinal diseases and in vitreoretinal surgery, a unique combination that allows him to fully treat patients with retinal dystrophies. This background will enable him in the near future to deliver molecular and gene therapies for these patients. His medical fellowship emphasized retinal electrophysiology, which very few ophthalmologists perform and interpret. His publications on retinal degenerative diseases, particularly Stargardt disease, retinitis pigmentosa (RP) 2 and X-linked RP have enhanced clinical diagnosis of these diseases, leading to improved genetic counselling for patients and their families.” Meeting Program Refractive Surgery Committee. She has an uncanny ability to meld academic theory and research with real world surgical experience in a busy private practice.”

4

Pearse Keane

NIHR Clinician Scientist, Institute of Ophthalmology,
University College London, and Honorary Consultant
Ophthalmologist, Moorfields Eye Hospital NHS Foundation
Trust London, UK.

Keane specializes in applied clinical imaging research, with a particular interest in OCT. Prior to his appointment at Moorfields, he carried out OCT research with the original inventors of the technology at the Doheny Eye Institute, US. His work focuses on late stage development, clinical testing and translation of new imaging technologies into clinical practice, and the novel application of these devices for the generation and validation of anatomic biomarkers, for use in trials and in routine clinical practice.

In January 2015 he was awarded a “Clinician Scientist” award from the National Institute of Health Research (NIHR) – the first ophthalmologist in the UK to receive the award – and his remit is to explore the potential of new medical technologies and innovation in the treatment of visual impairment and blindness, with a particular focus on ophthalmic imaging. Keane predicts that increased miniaturization of OCT devices and their use to perform comprehensive, automated eye exams will transform ophthalmology. *A nominator said: “An outstanding young UK ophthalmologist, and an acknowledged international expert on OCT. Keane has published almost 90 papers on medical retina in high-ranking journals, the majority of which are specifically around OCT imaging and its analysis. He is in high demand for his opinion on OCT, is an invited speaker to major international conferences, and has over £1 million in grant income.”*



3

Boris Stanzel

Bonn University Eye Hospital, Bonn, Germany, and the National Eye Institute, Bethesda, MD, USA.

Stanzel works on stem cell replacement for age-related blindness, and with his collaborators, performed a world first: the transplantation of retinal pigment epithelium into the subretinal space of rabbits – a first in a large-eyed animal model. Furthermore, the transplants remained intact at four weeks, suggesting that many of the roadblocks to RPE monolayer transplantation have been overcome. Many aspects of this work has been incorporated into a pig model at the US National Eye Institute, where Boris acts as a consultant for their upcoming iPSC-RPE clinical trial.

His hope for the future “is that despite conflicting evidence to date, autologous induced pluripotent stem cell derived RPE will not show rejection and prove efficacious in clinical trials to preserve visual function” and his his long-term objective is “to combine my preclinical research with clinical work in a translational approach. Given the complexity for clinical translation of RPE replacement with cultured cells, I wish to build or join a larger network or team of experts to realize this vision.”

He advises young ophthalmologists to “have a vision, believe in it, remain stubborn, avoid coffee and go biking!”

A nominator said: “Boris already made it last year on the Power List – among all those big names – despite them being almost half of their age. so he shouldn’t be missing on the 2015 youngster’s list!” Another wrote “He is a future Nobel Prize laureate, for his stem-cell transplantation program, the most promising approach for the future treatment of AMD.”



2

Malik Kahook

The Slater Family Endowed Chair in Ophthalmology and Director, Glaucoma Fellowship, University of Colorado, Aurora, CO, USA.

With over 30 patents filed – 20 licensed for development and commercialization, and four currently at the clinical trial stage – Kahook’s research is focused on advanced cataract surgery devices and implants, AMD, novel glaucoma therapies and advanced imaging techniques.

He is Director of Clinical and Translational Research, and serves as chief of the glaucoma service at the University of Colorado. He is also the editor of Essentials of Glaucoma Surgery, MIGS: advances in Glaucoma Surgery, and author of over 250 papers, chapters and abstracts. He has amassed a number of awards since 2007, including the AGS Clinician-Scientist Fellowship Award, the AGS Compliance Grant, the AAO Achievement Award, the AAO Secretariat Award and ARVO’s Ludwig Von Sallmann Clinician-Scientist Award, as well as being named New Inventor of the Year 2009 and Inventor of the Year 2010 at the University of Colorado.

Kahook says “My research focuses on efficiently translating new device solutions from the laboratory to clinical and surgical practice,” and his philosophy is “the keys to success are simple – work hard, answer your phone, reply to your emails, find your passion, and create a team that is invested in the patient above all else.”

A nominator said: “Kahook is well-published, and at the forefront of new ophthalmic advances – partnering with industry in multiple specialties including glaucoma, cataract and refractive cataract.”





1

Bala Ambati

Professor of Ophthalmology, Moran Eye Center, University of Utah, UT, USA.

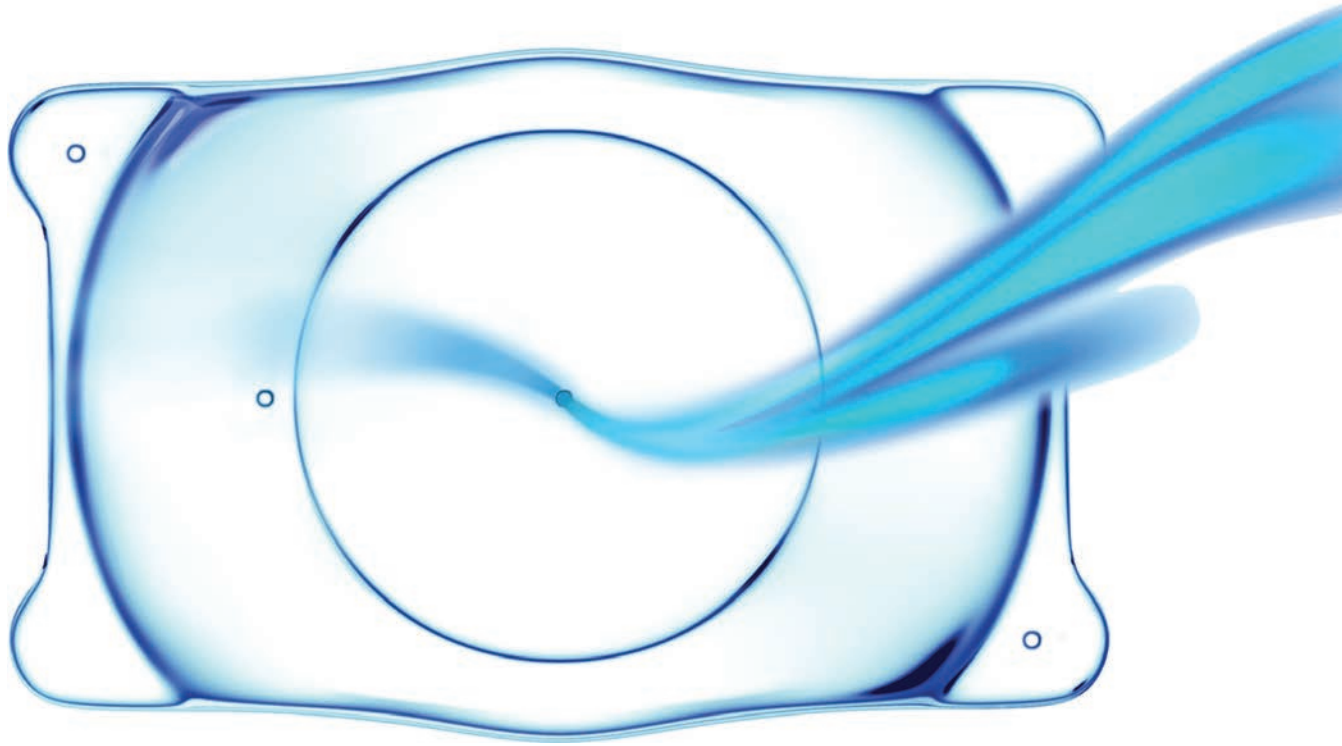
Ambati holds the distinction of being the world's youngest person to graduate from medical school – at the age of 17 – and since specializing in ophthalmology, has gone on to receive many awards, including the Ludwig von Sallmann Clinician-Scientist Award from the ARVO Foundation in 2014, and in 2013, the Troutman-Véronneau Prize from the Pan-American Association of Ophthalmology. Asked why he chose the career that he did: “At 4, I was burned on both legs and underwent three surgeries in three months. Seeing the doctors and nurses was formative, and a love for biology flowed into medicine.” He devotes several weeks per year to volunteer work, including overseas missions with ORBIS, a nonprofit organization with a Flying Eye Hospital, and he hopes to support the opening of an eye clinic in India too.

His research focuses on the development of implants for drop-free cataract surgery and 6-9 month release anti-VEGF therapy for AMD. His biggest achievement? “Demonstrating that sVEGFR1 keeps corneas free of blood vessels laid the foundation for understanding photoreceptor avascular privilege, and for a new class

of intracellular anti-angiogenics.” And his advice to those wishing to succeed? “Stand in the shoes of patients, students, mentors, staff, family, and colleagues. Give back in research, service, teaching, or policy.” Given the chance, would he have chosen a different career? “No way! Where else could I do transplants, prosthetics, lasers, overseas work, and research? Restoring vision is a miracle.”

A nominator said: “Ambati was the first to describe use of bevacizumab to treat corneal transplant rejection, and he has developed key surgical innovations including the technique of posterior endothelial rotational lamellar keratoplasty (PERL-K) as a non-transplant treatment for Fuchs dystrophy. He is president of iVeena, an ocular drug delivery device company and developers of the iVeena capsule drug ring, which has the capacity to serve as a versatile platform for treating macular degeneration, glaucoma, and other diseases by sustained release of multiple drugs from within the lens capsule. This will mark a major advance over the use of intravitreal injections or complex regimens of topical polypharmacy. Ambati has also been recognized for his teaching excellence by a University of Utah Resident Research Mentor Award and by serving as an Instructor at the Harvard Cataract Course for 2009 and 2010. His community and overseas service is consistent and giving: he has conducted free eye screenings in New York, Georgia, and Utah, and served as a volunteer eye surgeon with ORBIS, Sight for the Sightless, and Help Mercy International.”

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Dry Eye Disease's Diagnostic Challenge

The multifactorial nature of dry eye disease means that often, there's a discordance between signs and symptoms, confounding diagnosis. Can things be improved?

Diagnosing dry eye disease (DED) is a challenge. As we saw last month, it's a multifactorial disease, with many disparate causes. DED has a highly variable symptom profile at different stages of the disease, and there's often a discordance between signs and symptoms (1,2): a patient can have severe symptoms, yet show no sign of ocular surface damage, whereas others have advanced ocular surface damage, yet report no symptoms. Historically, this has been characterized by a lack of correlation between patients' subjective irritative ocular symptoms (as determined by, for example, questionnaires) and the results of commonly performed objective tests, such as corneal fluorescein staining (CFS) and tear film break up time (TFBUT).

Clearly, symptoms alone are not enough to obtain an accurate and timely diagnosis of the severity of many cases of DED – which can impact upon treatment decisions and complicate the evaluation of disease progression.

This was the situation when members of the ODISSEY European Consensus Group met in September 2012, with the goal of reviewing the clinical and scientific challenges in diagnosis and management of severe DED and generating an algorithm that identifies the criteria most relevant to the patient. This would allow for a simplified, targeted and reproducible evaluation of the ocular surface and facilitate the assessment of disease severity (3). They discussed and evaluated 14 criteria for DED severity

(Box 1), eventually producing a two-step scoring algorithm for diagnosing severe DED (Figure 1), with just two criteria – a symptomatic assessment with the Ocular Surface Disease Index (OSDI) questionnaire and an evaluation of ocular surface damage by CFS being sufficient as a frontline assessment of DED severity for the majority of patients. Where there was discordance between signs and symptoms, further assessments are recommended with eight “determinant” factors being listed – and these included biological markers of inflammation and apoptosis as well as osmolarity and meibomian gland disease or eyelid inflammation. Their presence, in addition to OSDI scores ≥ 33 or CFS score ≥ 3 on the Oxford scale, was accepted as diagnosis of severe DED.

It's long been known that most patients find long questionnaires boring, so it's important to keep the number of questions down to the absolute minimum – the OSDI questionnaire asks only twelve. However, OSDI address the symptoms' frequency but not the intensity. DED – particularly severe DED – negatively impacts patient QoL, which is in turn, poorly associated with clinical findings (4–7). A new questionnaire, developed and validated first in Japan (and now in the UK): Dry Eye-Related Quality-of-Life Score (DEQS) successfully combines both symptoms (frequency and intensity) and QoL in just 15 questions, and was found to have good reliability, validity, specificity, and responsiveness for the assessment of DED symptom severity and their effect on QoL (8).

The multifactorial nature of DED, combined with the confusing discordance between signs and symptoms will always mean that the diagnosis and staging of DED and its impact on QoL has been particularly challenging, but diagnostic algorithms, such as ODISSEY, and easy-to-use patient-reported outcomes, such as DEQS, are improving the situation, and benefitting patients with DED.

- Aberrometry
- Blepharospasm
- Conjunctival staining
- Corneal fluorescein staining
- Filamentary keratitis
- Impaired visual function
- Impression cytology
- In vivo corneal confocal microscopy
- Inflammatory biomarkers (e.g. HLA-DR, MMP9, cytokines)
- Meibomian gland disease or eyelid inflammation
- Refractory to standard disease treatments
- Schirmer test
- Tear film breakup-time
- Tear hyperosmolarity

Box 1. List of the markers and evaluations of disease severity, as discussed by the ODISSEY European Consensus Group.

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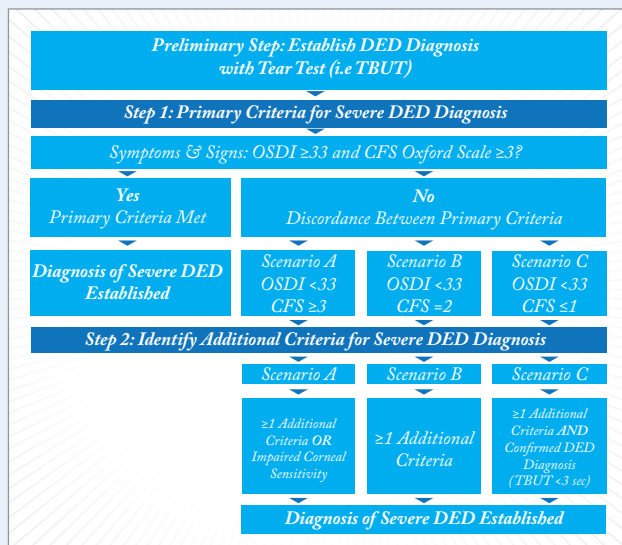


Figure. 1. ODISSEY European Consensus Group scoring algorithm for the diagnosis of severe DED. Adapted from (3).

Next month

Treatment challenges and the need for European consensus

Patients with severe dry eye in the EU have a problem: few effective treatment options, and little in the way of professional consensus regarding what the best course of treatment is. Lubricant eyedrops and ointments often fail to provide relief – as they do not address the underlying problem of ocular inflammation.

Corticosteroid eyedrops have a potent anti-inflammatory effect... but come at a cost of common and concerning side-effects like cataract and IOP elevation.

Ciclosporin eye drops should be an option – but to date, this has either meant off-label commercial products, or impractical hospital pharmacy-produced ciclosporin formulations that require refrigeration and have a short shelf-life.

Patients with severe dry eye in Europe need something better than the current treatment options – so we'll explore what could meet their requirements in next month's issue.



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44-48

Look How Far We've Come
1945 saw the foundation of Fight
for Sight. Fifty years later, FFS
have funded some of the biggest
breakthroughs in ophthalmology. Ade
Deane-Pratt reviews the highlights.

Look How Far We've Come

We look at the last 50 years of Fight for Sight – the projects it has funded, and the discoveries its funding helped to achieve.

By Ade Deane-Pratt

Fifty years ago, the United Kingdom was a very different place. Its National Health Service (NHS) was a teenager and the population was booming with post-war babies. Just 810 of its 54 million people were centenarians – compared with 13,780 in 2013 – and only seven years had passed since Watson, Crick, Wilkins and Franklin had discovered the structure of DNA.

Fifty years ago also saw the foundation of the British charity Fight for Sight by the UK's first ophthalmic pathologist, Norman Ashton. Born in 1913, Ashton qualified in medicine in 1939, just as World War II began. In 1948 he was invited to be Director of Pathology at Moorfields Eye Hospital and the newly

created Institute of Ophthalmology at the University of London, a post he held for 30 years. It was in 1965 that he founded Fight for Sight to provide funding for the Institute of Ophthalmology.

"Ophthalmology was of little interest to most pathologists," says Michèle Acton, Chief Executive of Fight for Sight. "But Ashton believed that a 'complete pathologist' must also undertake research to understand the nature of disease." From his laboratory, Ashton published over 200 papers and trained numerous ophthalmic pathologists who dispersed around the globe.

Nineteen sixty-five also saw the Royal Eye Hospital League of Friends establish the charity Prevention of Blindness Research Fund. Following successive rebranding (first as the Iris Fund for the Prevention of Blindness, then as the British Eye Research Foundation), it merged with Fight for Sight in 2005, creating the largest UK national charity dedicated to funding eye research.

An early research breakthrough stemmed from Ashton himself. In 1953 he discovered that high levels of oxygen, given to help premature babies breathe, disrupted retinal blood vessel growth. Retrolental fibroplasia (now retinopathy of prematurity) was a major cause of blindness in the UK. Ashton's work led to controlled oxygen delivery, saving the sight of many. The charity has been instrumental to several significant landmarks via the basic steps that underpin new fields of research. In the 1970s and '80s, for example, when laser refractive surgery emerged, the Iris Fund supported Moorfields' John Marshall to help develop it.

"This was a brand new technique so we needed to find out how different eyes would respond, whether myopic, hypermetropic or astigmatic," says Marshall, now at the Institute of Ophthalmology at University College London (UCL). "The early work we did led to the 40 million procedures that

have taken place worldwide to date."

The Fund also supported David Spalton's work at St Thomas' Hospital, London, as he and his research colleagues investigated the effects of a square-edged intraocular lens (IOL) design on posterior capsule opacification (PCO) rates. They discovered that the physical pressure of such an edge provides a physical barrier to lens epithelial cell migration, preventing PCO after cataract surgery. "Our work had a fundamental influence on the design of the lens," says Spalton, now retired from the NHS but still active in research and consulting. "The lens won international recognition and improves visual outcome for millions of patients each year."

"It's not all about the double helix, though."

The next sequence of events

In 2003 the Human Genome Project was completed – arguably the most important body of biological knowledge we'll ever have. Almost every field of biomedical research gained momentum from the task begun over a decade earlier to map the entire genome of *Homo sapiens*. Finding the causative genes behind inherited disorders became possible.

Following the discovery that mutations in the gene *RPE65* cause Leber congenital amaurosis in some children, we helped fund the team responsible for the world's first clinical trial of gene therapy for eye disease. Knowing the right gene for Nance-Horan syndrome, for example, also means that families can be given a precise molecular diagnosis and realistic genetic counselling. The advent of next-generation DNA sequencing

At a Glance

- The UK-based charity, Fight for Sight was founded back in 1965 by the country's first ophthalmic pathologist, Norman Ashton
- Fight for Sight has funded a number of breakthroughs in ophthalmology in the last 50 years
- The charity funded David Spalton's work on square-edged IOL designs that have dramatically reduced rates of PCO following cataract surgery
- Some of the discoveries, such as the function of the gene that causes choroideremia, CHM, has led to the development of gene therapies, currently in clinical trials

Fight for Sight is 50

The early work we did led to the 40 million procedures that have taken place worldwide to date.

First link discovered between the calcium phosphate hydroxyapatite (HAP) and drusen in early AMD

2015

Portable Eye Examination Kit app Peek Retina gets crowdfunding

Keratoconus gene *ZNF469* identified

2014

Sight Loss and Vision Priority Setting Partnership

Global prevalence study 'Causes of vision loss worldwide, 1990—2010: a systematic analysis' published

2013

Keratoconus gene *MIR184* identified

First clinical trial for choroideremia

2011

2009

X-linked Nanace-Horan syndrome gene identified

£1 million donated to Children's Eye Centre

Amblyopia eye patch treatment drastically reduced

World's first gene therapy trial for eye disease

2007

Tommy Salisbury Fund established

2004

The Iris Fund becomes British Eye Research Foundation.

2005

Fight for Sight merges with British Eye Research Foundation

2003

Human Genome Project complete

The Help a Child to See charity was amalgamated with the Iris Fund

1993

Institute of Ophthalmology moves to Bath Street, London

1992

John Marshall's histopathology healing studies on excimer lasers for refractive surgery since 1985

1985

UK Cornea Transplant Service launched

1983

The Prevention of Blindness Research Fund becomes the Iris Fund for Prevention of Blindness

1979

First heart transplant

1968

Prevention of Blindness Research Fund established

First kidney transplant

1960

1965

Fight for Sight founded by Norman Ashton

Link between smoking and cancer found

1954

Cause of retinopathy of prematurity identified

1905

Structure of DNA discovered

1953

NHS and Institute of Ophthalmology founded

1948

First reported cornea transplant takes place Olomouc, Moravia (now Czech Republic)

to scan multiple regions simultaneously (rather than sequentially mapping one locus after another) makes this faster and easier – and this is how our teams discovered two key genes implicated in the development of keratoconus.

It's not all about the double helix, though. Our researchers at Queen's University Belfast have significantly advanced bone marrow-derived stem cell therapy for diabetic retinopathy. We funded the research underpinning the discovery that children with amblyopia need only wear an eye patch for three months – for only a few hours a day – to bring the “lazy” eye up to speed, rather than all day for years.

Landmark research

January of this year brought news of an unexpected potential trigger for AMD: its hallmark, drusen, form early in the disease process, and do so around rogue spherules of hydroxyapatite – the form of calcium phosphate found in teeth and bone mineral. This was huge news, providing a clear target for treatment and a biomarker of disease status. Imre Lengyel, the project's lead at UCL, is partially funded by Fight for Sight.

An organization without statutory funding must make a little go a long way. Donors want to fund research, not university overheads – but the latter are part of the full cost of research. Happily, universities can claim a top-up from the government's Charity Research Support Fund – up to 26 percent across all awards – if the call involves open competition and peer review. So that institutions can access this additional resource, our funding process involves both.

We have committed £25 million to eye research in the past decade. To increase our impact, we often co-fund. The award-winning prevalence study ‘Causes of vision loss worldwide, 1990–2010: a systematic analysis’ was part-funded by the Bill & Melinda Gates Foundation

and others; Fight for Sight paid for the data analysis.

One of our most rewarding lines of research has been in choroideremia. Super-supporter Emma Salisbury approached us to set up the Tommy Salisbury Choroideremia Fund when her son, then aged 5, was diagnosed with the condition that threatened to blind him by the age of 40. Ten years and £400,000 later, a treatment for choroideremia may be in sight. Emma's contribution helped enable Miguel Seabra at Imperial College

“Attention is shifting from researchers to patients in terms of who decides what gets funded.”

London to track down the function of the protein produced by the causative *CHM* gene. This led, via collaboration with a leading retinal surgeon and additional funders, to a successful Phase I gene therapy trial. Now startup biopharmaceutical company Nightstar has attracted a £17 million investment from Wellcome Trust subsidiary Syncona to get the treatment to clinic.

Innovation is everywhere. Andrew Bastawrous, a lecturer and ophthalmologist at the London School of Hygiene and Tropical Medicine, used our clinical training fellowship (co-funded with the UK's Medical Research Council) to take him across Kenya gathering data on the incidence and progression of conditions such as AMD and glaucoma. Inspired by

this logistically difficult task, Bastawrous launched the Peek project to develop a smartphone app toolkit for ophthalmic telemedicine. Last November, the Peek team launched a crowdfunding appeal to raise extra cash for manufacture and distribution. It worked. To date, they've exceeded their £70,000 target by over £45,000.

Attention is shifting from researchers to patients in terms of who decides what gets funded. With guidance from the James Lind Alliance, we partnered with The College of Optometrists, NIHR, RNIB, the Royal College of Ophthalmologists (RCOphth), and Vision 2020 on the 2013 Sight Loss and Vision Priority Setting Partnership.

“We thought it hugely important, given such limited resources for research and so many unanswered questions, for research funders to understand how patients, carers and eye health professionals prioritize these questions so that future research can be targeted accordingly,” says RCOphth CEO, Kathy Evans.

Now we aim to encourage UK funders of eye research to include the priorities in their grant application process. The challenge is to ensure that researchers are neither deterred from working outside the priorities where there is scientific merit, nor paying lip service to them in a bid for limited funds (as we can only afford one in six projects).

Where next?

It's impossible to predict the state of eye research 50 years from now. Stem cell research may have long since fulfilled its potential for human self-repair. Who knows where 3D printing will take us? Germline gene therapy might even eradicate inherited eye disease altogether, assuming the ethical considerations can be met. We will surely have treatment for dry AMD; a one-off fix for glaucoma. But what would our vision – a future where everyone can see – really look like?

The Comprehensive Glaucoma Solution with SPECTRALIS

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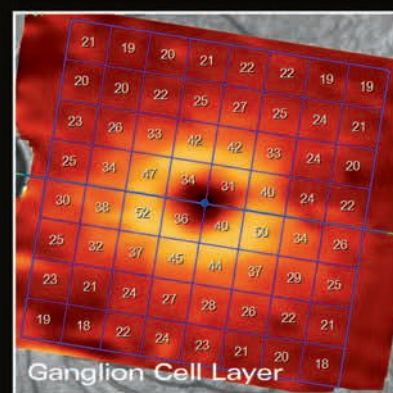
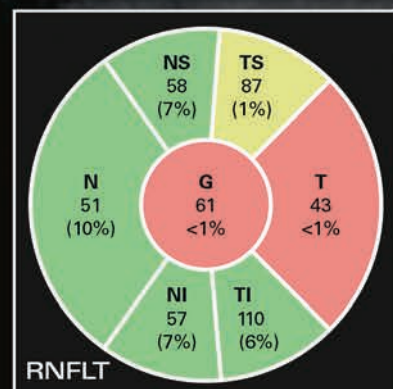
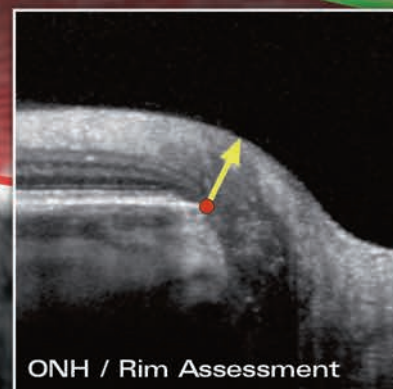
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50 Years of Fight for Sight

Living with sight loss in the UK

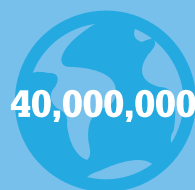


2 million in 2015 2.3 million in 2020



4 million in 2050

Global number of
refractive surgery
procedures using
excimer lasers



40,000,000

The number of people 100+ in the UK

810

In 1965

13,780

In 2013

6 Goals

- Prevention
- Treatments
- Causes of eye disease
- Early detection
- Risk reduction
- Providing information



10

Number of years it took mum Emma
Salisbury to raise £400k

£25,000,000

Committed to
research by
Fight for Sight
since 2005

£1,000,000

Grant made to
Children's Eye Centre
at Moorfields; our
largest ever

£45,000

The amount by which
crowdfunding for
Peek Retina exceeded
its £70k target

"Our family has always known about sight loss," says Emma Salisbury. "My granddad had choroideremia too. As kids, we learned how to help him. We let him know what was on his dinner plate by describing a clock face – your meat is at 12 o'clock, the potatoes at 4 – but he couldn't really play with us."

"I don't want Tommy's life to be like that. He already has difficulty seeing when it's dark. I know there is now hope, but I won't stop until I know Tommy will always be able to see me and see his own children."

How many causative genes are out there, unidentified? We don't know. Even when a gene is identified the pathway to pathology may be oblique.

"In some retinal diseases, the mutation is known, but how this causes disease and why one mutation can result in varying severity is not understood," says Omar Mahroo, Fight for Sight

researcher and academic clinical lecturer in ophthalmology at King's College London. "Better understanding of the retina at a cellular and molecular level, and of how genetic and environmental factors interact there, would help guide treatment or predict responses to treatment. This is very important."

"In the long term, previously untreatable diseases can become treatable. Existing treatments can be applied where they are more likely to work and less likely to harm. This would both improve quality of life for future patients and reduce the wider financial burden of untreated eye disease."

Never has the pace of change been faster. People who might once have been sent home from the clinic and told nothing could be done now have options or at least some hope.

"At the moment we have six goals," says

Michèle Acton. "We fund research to help us understand the causes of eye disease, to enable earlier diagnosis, to develop ways of preventing sight loss, to bring new and better treatments to the clinic, and ultimately to restore sight to those who have lost it. We also believe it's extremely important to inform people affected by sight loss about the things we learn."

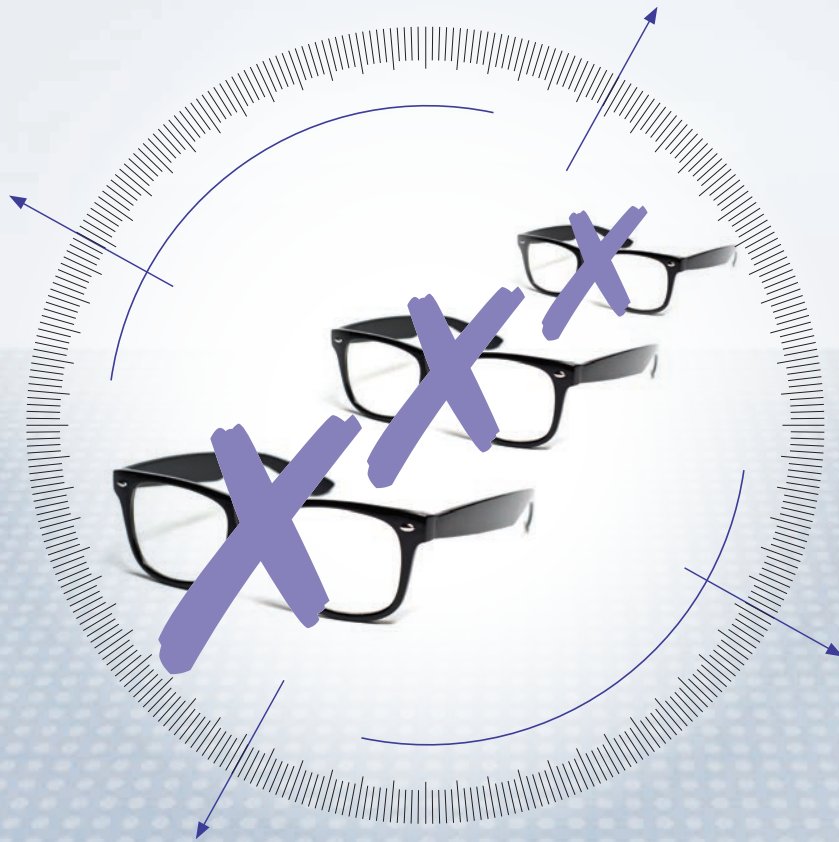
"Over time, our goals will need to adapt to new treatments reaching the clinic, a changing research landscape, an aging population and a potential doubling of the number of people with sight loss in the UK. But we will always continue to invest in research wherever we can have greatest impact and leverage. In the best case scenario we'll soon be out of a job."

Ade Deane-Pratt is Fight for Sight's Research Communications Officer.



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A portrait of David Pyott, a middle-aged man with light brown hair, smiling. He is wearing a dark suit, a light blue shirt, and a red tie with a small gold pattern. The background is a blue-tinted image of a modern building with large windows.

Freedom Fighter

Sitting Down With...

David Pyott, Chairman of the
Board and Chief Executive Officer
of Allergan, Inc.

How would you describe the battle you fought for Allergan over much of last year?

To an American, I would say it was like being in the Marine Corps; to a European, I would say it was like 1939. We were fortunate to have people who were very experienced and very tough. From early on, we believed Valeant was trying to steal Allergan for far less than its true worth, so our job became to drive up the share price. We rallied together – and it's a tremendous commendation for the whole team that we still managed to grow 17 percent globally last year.

In the end, we focused on value. We had to cut costs ourselves to bolster the stock price, but a lot of our customers – ophthalmologists, of course, but also other specialists – rallied behind us too. They prescribed Allergan instead of a competitor's product because they wanted to support us. They believed in what we'd been doing for innovation, patient care and physician education, and it showed.

What will happen to Allergan's R&D budget now?

I'm very proud of Allergan's research and development numbers. We measure R&D spending as a percentage of sales, and historically it's been 16 to 17 percent. Last year, because we had to moderate spending to defend ourselves, it ended up being about 14 percent. But that's not nearly as far as it would have dropped under an asset-stripping organization like Valeant – they planned an overall operating expense reduction of 64 percent, which included an R&D spending reduction of 90 percent.

I'm happy to say that what will occur with Actavis is quite different. The operating expense reduction is only 15 to 16 percent, so in terms of

the programs that are most visible to ophthalmologists worldwide, they won't see much difference between what we planned to spend and what Actavis will invest in the next few years.

So this is a story for the business school textbooks?

There are a lot of lessons in my career. I think a key one is to be prepared. For instance, we didn't really believe Valeant would come after us because they were too weak on their own. It was really the partnership with Pershing Square that made things difficult – it was like flying along in a fighter jet and suddenly having two enemy planes of different speed and capability attack from different angles with different weaponry.

*"It was like
total war every
single day."*

We defended ourselves by having an advisory team ready to go, and by having a strong board that was aligned around our strategy. Because of that, I was able to dedicate most of my time to fighting the raiders. It was like total war every single day. I visited the New York Times that summer and the reporter called me "the Braveheart of Allergan." To which I replied that I didn't plan on ending up in four pieces – I'd rather be Robert the Bruce!

How did you handle the media attention?

In the end, it comes down to business results. But we also needed to put our

goals and delivery of value into the right context for the public, because the other side was using whatever information they could to their own ends. Now that the hostilities have ceased, going to the media is a completely different experience – people that were screaming at me four months ago are congratulating me!

One person commented that few people in a tough spot like ours actually have the courage to talk to the media. There's value in being careful, but after hearing that, I said, "I'm going into the lion's den." The Financial Times had eight reporters in that day; the Wall Street Journal had 14 or 15! It's odd to be the most interesting person around, but it's also a bit like walking on a sea of knives. I'm proud that my team and I were able to handle that.

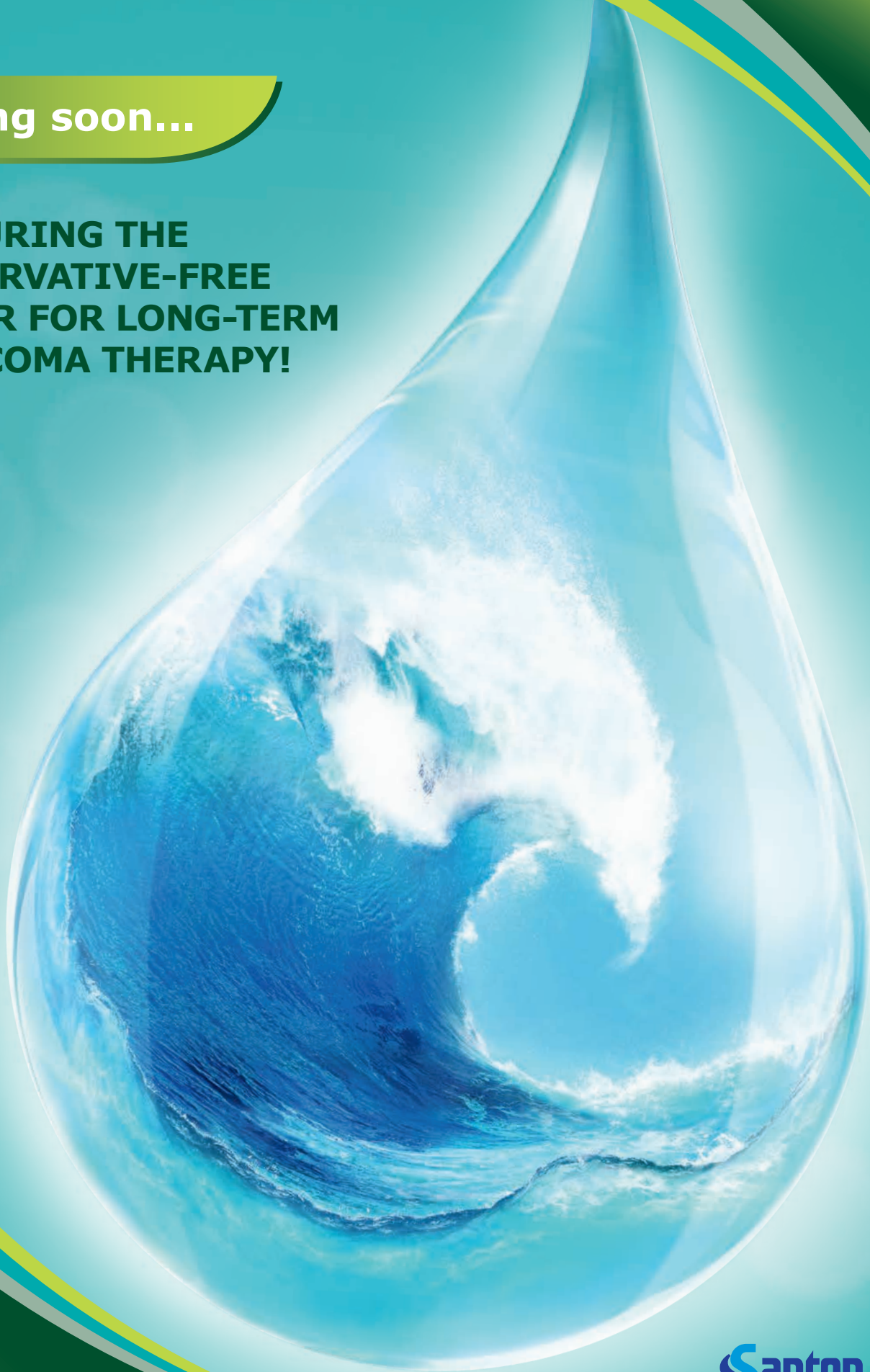
What's the next step for you?

I'm interested in philanthropy. My younger brother is an ophthalmologist, and he's realized that nowadays you can put pretty much anything in a bag and go and practice in the developing world – which he does. The reason I mention his work is because one of the things I plan to do in the future is build an eye hospital in Africa, so his advice might be very useful for that.

Once I've moved on from Allergan, I'll still have ongoing responsibilities in ophthalmology. I'm the president of the International Council of Ophthalmology Foundation, on the advisory board of the American Academy of Ophthalmology, and most recently the American Optometric Society. I'm happy to do all that. Philanthropy will be an integral part of what I do next, and after working in ophthalmology for so long, I think probably I've decoded its alphabet as well as anybody on the planet. So I've got to put it to good work now.

Coming soon...

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POWER FOR LONG-TERM
GLAUCOMA THERAPY!**



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