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I hope you all had a wonderful Festive Season and that you caught up with your soul again after such a busy 2015! I wish you all a very happy and prosperous 2016 and may you and your loved ones enjoy inner peace, joy, friendship, love and good health in the New Year. I have become acutely aware in the last few weeks of how many ophthalmologists have lost family members or who suffer in silence with many challenging diseases.

I have been asked to handle the illnesses of OSSA members confidentially, as doctors prefer to practise without everybody asking: ‘Are you still around?’ I respect their wishes and pray for them and their families, and salute the great courage they show in adverse conditions.

I had a very interesting experience when my cataracts were operated on in November 2015. I will share this experience with you in the next issue of the journal.

Newsletter
We will be starting an OSSA/OMG newsletter to improve the communication between the members. The plan is to have this newsletter available electronically every 14 days and I look forward to this new challenge.

I have also been appointed by OSSA as an Independent Consultant to the OSSA Office. I officially start in January but have been working in close collaboration with Ms René Botha, Executive Office Manager, for the past four months. We are collecting all the old minutes and books and special photographs, and our aim is to make the OSSA Office a user-friendly place to visit.

Museum upgrades
We are also upgrading the different museums in the country. An original prescription for spectacles by Dr DJ Wood will be put on display at the Museum of the Somerset Hospital in Cape Town where he worked as the first Ophthalmologist in South Africa.

Books that belonged to Dr Edward Epstein, pioneer of cataract surgery, and memorable photographs will be displayed at the Adler Museum at the University of the Witwatersrand, and Dr Sashi Kassen is kindly helping us to set this up.

Prof Colin Cook from UCT is looking after all the beautiful, original paintings of the eye by the well-known artist, Tinus de Jongh.

Dr Brody was responsible for establishing a very interesting museum at the Cape Eye Hospital with an original slitlamp from 1930 – still in working condition!

We discovered one of the first laser photoocoagulation machines that was used in South Africa in Bloemfontein. The trunk was lost for many years, but found in an old store the other day. How many teaching hospitals still have their old Jumbos?

Congratulations
I want to add my congratulations to Dr Kgao Eddie Legodi, for officially being elected as one of the Vice-Chairmen of the International Council of Ophthalmology. This is an achievement to be proud of, not only for a deserving Dr Legodi, but also for OSSA and the African continent.
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Advancing the ICO’s key areas of activity

With the World Ophthalmology Congress (WOC) being held in Guadalajara, Mexico, in February this year, the International Council of Ophthalmology (ICO) comes under the spotlight.

The Ophthalmological Society of South Africa is an increasingly active member of the ICO and will host the WOC in Cape Town in 2020.

The ICO is the most broadly representative body for the Ophthalmology profession worldwide. Their three key areas of activity are: refocusing education in ophthalmology; enhancing eye care; and advancing leadership in ophthalmology societies and eye care-related organisations.

On the education front they have been functioning as an independent examination body since 1995, offering examinations in Basic Science and Clinical Sciences related to Ophthalmology at the same standard as the highest board and qualifying examinations anywhere in the world. They are involved in setting standards for residency curricula, and offer opportunities for Ophthalmologists from developing countries to undergo sub-specialty training.

The ICO Advocacy Committee coordinates efforts in prevention of blindness activities towards the goals of VISION 2020.

The third key area of focus is advancing leadership where the ICO seeks to impact education and access to eye care through collaboration with ophthalmological societies, other eye care organisations and teaching programmes. As part of this initiative, two of our OSSA EXCO members, Drs Matt Young and Bayanda Mbambisa, were privileged to attend a Leadership Training Workshop in Kenya during the course of 2015.

OSSA’s rising star in the ICO has undoubtedly been Dr Kgao Eddie Legodi, Past President of OSSA. It is with great pleasure that I can announce that he has been elected as a Vice-President of the ICO for the next two years. Kgao has been playing an increasing leadership role in the ICO and the African Ophthalmology Forum. His quiet wisdom is well recognised on the African continent and beyond, and his appointment is well deserved. I am sure that all OSSA members will join me in offering him our full support in this prestigious position.

Dr Andrew Boliter MBChB(UCT), DipObstetrics(SA), FCS(Ophth)(SA)
President: The Ophthalmological Society of South Africa
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South African Ophthalmology Journal

guidelines for authors

The SA Ophthalmology Journal is a peer-reviewed scientific journal and the official mouthpiece of the Ophthalmological Society of South Africa. It appears on a quarterly basis.

1 A cover sheet is to be submitted with each manuscript. It should contain the title of the manuscript, the names of all authors in the correct sequence, their academic status and affiliations. The main author should include his/her name, address, phone and email address.

2 Articles should be the original, unpublished work of the stated author. All materials submitted for publication must be submitted exclusively for publication in this journal. Written permission from the author or copyright holder must be submitted with previously published figures, tables or articles.

3 The Editor reserves the right to shorten and style any material accepted for publication.

4 Authors are solely responsible for the factual accuracy of their work.

5 Articles should be between 2 000 and 3 000 words in length. A 200-word abstract should state the main conclusions and clinical relevance of the article.

6 All articles are to be in English and are to follow the Vancouver style.

7 Abbreviations and acronyms should be defined on first use and kept to a minimum.

8 Tables should carry Roman numerals, I, II etc., and illustrations Arabic numbers 1, 2 etc.

9 References should be numbered consecutively in the order that they are first mentioned in the text and listed at the end in numerical order of appearance. Identify references in the text by Arabic numerals in superscript after punctuation, e.g. ...trial.11

10 The following format should be used for references:

   Articles:

   Chapter in a book:

11 Articles are to be submitted by email to the Editor-in-Chief, Prof Andries Stulting at the following email address: aaseyedoc@gmail.com. The text should be in MS Word. Pages should be numbered consecutively in the following order wherever possible: Title page, abstract, introduction, materials and methods, results, discussion, acknowledgements, tables and illustrations, references.

12 All figures, tables and photographs should also be submitted electronically. Each figure must have a separate self-explanatory legend. The illustrations, tables and graphs should not be imbedded in the text file, but should be provided as separate individual graphic files, and clearly identified. The figures should be saved as a 300 dpi jpeg file. Tables should be saved in a PowerPoint document or also as a 300 dpi jpeg.

13 Authors should declare any interests, financial or otherwise, regarding the publication of their article.

Correction

Please note that the email address given for Dr Danie Maritz, author of ‘Thirty-three years of private practice’ in the Spring (November) 2015 vol 10 no 4 issue of this journal, should have read: eye@healthyeye.co.za
Clinical Ophthalmology has been a trusted reference through five editions for thousands of students and practitioners. Established as one of the world’s leading ophthalmic resources it has now been updated for a new generation of readers ensuring its continuing place as a leading textbook in its field.

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2. **Spectral domain OCT system**
   The AngioVue™ has a high-speed scan acquisition, allowing 70,000 A-scans per second. Detailed B-scans up to 12mm and deep choroidal imaging are also available, as well as real-time tracking.

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   MCT is used to remove motion artifacts such as saccades. Working closely with MIT, Optovue developed significant improvements in MCT, which are available only in the AngioVue™ imaging system.

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OCT + OCT Angiography
HIV/AIDS: How it has affected my Ophthalmology practice

Dr Karin Lecuona MBChB(Pret), FCS(Ophth)SA, MSc(Com Eye Health)LSHTM
Ophthalmologist, Division of Ophthalmology, Groote Schuur Hospital and University of Cape Town

Paper presented at the Annual Congress of the Ophthalmological Society of South Africa, in Durban, KwaZulu-Natal, in March 2014

There have been many wonderful discoveries and achievements made in Medicine since my intern year in 1977.
As part of the BC (before computers) generation, I stand in awe when I see how we have moved forward – from wheelchairs to hip and knee replacements, from pilocarpine to prostaglandin analogues, from seven-day hospital-stay cataract surgeries with +10 corrections to 20-minute day-case back-at-work-the-next-day multifocal IOL phaco surgery.

We have progressed from tentatively cutting off a bit of prolapsing vitreous to removing all the vitreous; we now inject the vitreous cavity with anything from steroids to antibiotics to antivirals to anti-VEGF to chemotherapy. We used to examine children with retinoblastoma with a direct ophthalmoscope, developed 150 years earlier to torture GPs and medical students; now we use RetCams to photograph, not only retinoblastomas, but the fundi of premature babies of 32 weeks’ gestation. We have come a long way with CT scans and MRI scans and Pentacamcs and Excimer lasers and OCTs.

But the single event that has affected my career the most is not an awe-inspiring discovery in Medicine. This is an event that has changed the spectrum of disease that I am seeing in my clinics, it has changed the way I practise Ophthalmology and it has certainly affected the budget within which I work. This event was the outbreak of a disease endemic in certain parts of Western Africa. The name 'lente', which means slow. The viruses in this genus characteristically have a very long incubation period – up to 10 years in the case of the HIV.

Viruses are very cell- and species-specific because they can only infect a cell if there is a perfect fit between the virus and the host cell surface receptors. That is why, for instance, Herpes viruses only latch onto mucous membrane, and the viruses of the primate subgroup of the Lente viruses, onto mucous membrane, and the viruses of the primate subgroup of the Lente viruses, only attach to a ‘cluster of differentiation’ (CD4) receptor, most commonly found on T-helper lymphocytes.

Ironically, this CD4 surface receptor facilitates attachment of infective organisms to T-helper cells that present them to the killer T cells where they are destroyed. The Lente virus, however, turns the tables by using the same attachment to, not only enter the T-helper cell, but take it over for its own use. Once invaded, the T-helper cell cannot activate the killer T cells leaving this arm of the immune response paralysed.

Pathogenesis of HIV-AIDS
The terms epidemic and pandemic are often used interchangeably in the press. I have used the following definitions:2
• An epidemic is an outbreak of a disease within a community or region. It may be seasonal, such as outbreaks of influenza and Ebola.
• A pandemic is an outbreak of a disease across different countries – or in global proportions. It is usually caused by a new virus or new sub-strain of a virus, such as Spanish flu and HIV/AIDS.
• A disease is endemic when it is maintained in a population without any external stimulus, such as malaria in central Africa. There is concern that the lethal Ebola epidemic may become endemic in certain parts of Western Africa.

The Human Immunodeficiency Virus (HIV)3
The HIV/AIDS pandemic is caused by a virus. Viruses carry genetic material (in this case, two strands of RNA), they reproduce (quite spectacularly), and they certainly evolve through natural selection. So, viruses are a form of life, some say. But viruses cannot metabolise because they do not contain the cell structures necessary for metabolism, and they do not respond to stimuli; both these characteristics are also considered essential elements of living organisms. Because viruses possess some, but not all, of the characteristics of living organisms, they have been described as ‘organisms at the edge of life’. Since they are not quite family, they are classified separately from the Taxonomy of Life in the Taxonomy of Viruses.4

In the Taxonomy of Viruses, HIV is classified under the genus Lentiviridae in the Retroviridae family. The Retroviridae family characteristically carry a reverse transcriptase enzyme that translates viral RNA into a DNA strand which is permanently incorporated into the genome of the host cell.

The name Lentiviridae is derived from the word ‘lente’, which means slow. The viruses in this genus characteristically have a very long incubation period – up to 10 years in the case of the HIV.

Viruses are very cell- and species-specific because they can only infect a cell if there is a perfect fit between the virus and the host cell surface receptors. That is why, for instance, Herpes viruses only latch onto mucous membrane, and the viruses of the primate subgroup of the Lente viruses, only attach to a ‘cluster of differentiation’ (CD4) receptor, most commonly found on T-helper lymphocytes.

Ironically, this CD4 surface receptor facilitates attachment of infective organisms to T-helper cells that present them to the killer T cells where they are destroyed. The Lente virus, however, turns the tables by using the same attachment to, not only enter a T-helper cell, but take it over for its own use. Once invaded, the T-helper cell cannot activate the killer T cells leaving this arm of the immune response paralysed.
Figure 1. World Map depicting the HIV/AIDS pandemic in 2008

The minimally structured structure of the HIV consists of a surrounding capsule and a central capsid.

The capsule has about 70 surface receptors, which consist of a superficial docking receptor, GP 120 and a deeper transmembrane receptor, GP 41. The GP 120 receptors are covered with glycoprotein until just before docking, which prevent antibodies binding to them and rendering them harmless.

The CCR5 ∆32 mutation

There are some people who have a mutation at the CCR5 site on the CD4 cell, called the ∆32 mutation. This mutation occurs in 13% of Caucasians and less than 0.3% of people from African origin. Its presence is thought to be a result of natural selection that occurred during a previous viral pandemic. Homozygous carriers are resistant to HIV infection because failure of GP 41 binding prevents virus entry into the host cell. The carriers of the mutation are called ‘long-term non-progressors’. The downside for those with the mutation is that they are far more susceptible to West Nile Virus infection than the general population.

The HIV capsid contains two single RNA strings that code for nine genes, compared to 20,000 genes coded for in each human cell. The reverse transcriptase enzyme, characteristic of the Retroviridae family, translates the two single RNA strings into DNA which is incorporated into the host genome, where it overrides all other cell functions to only produce viral RNA that will be released as new viruses. The HIV protease enzyme snips the string of proteins thus produced in the appropriate place so that the correctly sized protein strings are incorporated as RNA in the new virion.

The production of viral RNA, by virtue of the fast replication cycle, is extremely error prone, resulting in 90% of the new viruses being defective and nonviable (even in a viral sense of the word). This error-prone process is actually to the advantage of the virus. The remaining 10% of viruses are not only viable but have mutated in such a way that they are not recognised by the host immune response formed against the precursor virus. Once a person is infected, new mutations enter the bloodstream on a daily basis.

The immune response to HIV is therefore not, as in most other infections, enough to control the infection because of the uncanny immune evasion tactics by the virus, which includes:
- The concealment of the viral GP 120 receptor
- The high mutation rate that results in a continuous production of antigenically different new viruses
- Immune dysregulation by failure to activate killer T cells.

History of the disease

Considering its efficiency in reproducing and evading immune recognition, it is not surprising that the HIV has managed to cause the pandemic as depicted on the 2008 WHO map in Figure 1. It is still not clear why the prevalence is less in Central compared to Southern Africa.

It is thought that HIV is a new mutation of a simian immunodeficiency virus that came into contact with man in the early part of the 20th century. This process whereby a new mutation skips across species is known as zoonosis. This process occurs quite commonly in viruses that have high mutation rates, such as the influenza viruses, that undergo zoonosis annually and consequently cause seasonal flu epidemics.

However, whereas the influenza virus spread through droplet contamination, the zoonosis of the simian immunodeficiency virus required contact between simian and human blood, because the virus infects lymphocytes. The zoonosis of HIV most probably occurred in hunters in Eastern West Cameroon, who hunted wild animals, including monkeys. This theory is borne out by the remarkable similarities between the early strains of the HIV and the SIV found in simians in West Cameroon.

The next piece of evidence of the spread of the disease was found in the discovery of HIV in blood samples and in a lymph gland biopsy preserved from 1960 in Belgian Congo (now known as the Democratic Republic of Congo [DRC]). The most plausible explanation for the spread of the disease from rural Cameroon to the larger cities such as Léopoldville (now Kinshasa), is the urbanisation of colonial Africa, which

Adult HIV prevalence %
- >20
- 15-20
- 10-15
- 5-10
- 2-5
- 1-2
- 0.5-1.0
- 0.1-0.5
- <0.1
- No data

occurred on a large scale in the first half of the 20th century. HIV had become a pandemic in Central Africa by 1960. According to Dr Jacques Pepin in his book, *The Origins of AIDS*, a series of unrelated events then occurred which contributed to the spread of the disease into the rest of the world. Firstly, the collapse of colonial rule in the Belgian Congo in 1960 resulted in economic and administrative chaos. The ensuing poverty led to prostitution; Léopoldville, in the centre of transport routes between north and south, became the nidus for the heterosexual spread of the disease.

Just before you come down too hard on the women of Léopoldville, may I quote Sarah Dunant who, writing in the *Guardian* on the outbreak of syphilis in Europe, stated: ’Prostitution bears the brunt of the blame, though the real culprit was testosterone.’

Just like the economy, the administration of the Civil Service was also in ruins, as the local population had not been trained to run local government. With the best intentions, the United Nations sent 4 500 Haitians, fluent in French and English, to the DRC in 1966, to assist with building the new administration. When it was time for them to return home, some of the aid workers unknowingly took the disease with them to Haiti (bear in mind that the disease can have a 10-year incubation period).

Circumstances in Haiti in the 1970s were such that it was one of the countries best poised to send a blood-borne disease into the world. Not only was it a favourite holiday destination for the gay community, but it was also the base of Hemo-Caribbean, a privately owned company that supplied the United States with about 5 000 litres of plasma each month. The company paid its blood donors, and was found, in retrospect, to be very lax in preventing cross infection in blood products. Needles were re-used, and the tubing was not changed between donors. Serial transmission of the blood-borne disease was rapid. The consequences of this practice only became evident in the USA and elsewhere 10 years later.

In 1981, the Centre for Disease Control (CDC) in the USA had four requests in four months for antibiotics to treat Pneumocystis pneumonia, whereas they previously received a request once in 10 years. Their investigations led to the publication of the clinical features of the first HIV/AIDS cases in the USA in 1981, all from the gay community in San Francisco.

In 1982, one paper after the other was published describing similar conditions in haemophiliacs, IV-drug abusers and finally immigrant Haitians, resulting in the coining of a new colloquial term, ‘the 4 H Club’. The usual community reaction resulted in prejudice against the gay community, refusal of admission to his school of an HIV+ haemophiliac scholar and Haitian workers losing their jobs and their homes and finally being repatriated to Haiti. The virus was identified by Luc Montagnier in 1983 and Gallo in 1984.

### Spread in South Africa

The first HIV-positive patient in South Africa was reported in 1981; the patient had a homosexual contact in San Francisco. The first black patient who was infected through heterosexual contact was reported in 1987. The authorities, not quite knowing what to do, made the disease notifiable and those affected were quarantined for 14 days.

#### Putting pandemics in perspective

In terms of the number of people killed, the Spanish flu pandemic in 1918 was far more devastating than HIV/AIDS. The Spanish flu killed about 50 million people, considerably more than the 10 million killed by humans in the First World War.

Although the Spanish flu pandemic caused more deaths than the HIV pandemic, the Spanish flu pandemic only lasted a year. HIV infection is causing far more hardship because it has become a chronic disease. It not only causes illness of the individual, but, due to the chronicity and the wide geographical spread of the disease, it causes widespread social disruption. In Sub-Saharan Africa alone, it has resulted in 14 million children being orphaned. The HIV/AIDS pandemic has affected the macro-economy, reducing GDP and growth rates in countries most plagued by the disease. The hardship among the poorest of the poor in the world is continuing.

### Prevalence of HIV/AIDS in South Africa

The prevalence of a disease is determined by performing community-based studies. The South African prevalence figures are determined by aggregating the results from two different community-based studies, namely the Antenatal Survey and Department of Health National Household Surveys.

- **Antenatal surveys are ongoing, and determine the prevalence of HIV in women aged 18–45 years as tested at antenatal clinics. In some areas the prevalence figure reached 29.5%**.
- **Household Surveys have been run by the Department of Health in 2005, 2008 and 2012. Fifteen thousand (15 000) households and 38 000 people were surveyed. Sixty-four per cent (64%) of people agreed to be tested for HIV; those from higher income households were more likely to refuse to be tested for HIV than those from lower income households.**

By aggregating these two surveys, the national prevalence of HIV/AIDS in South Africa in 2012 was found to be 12.6%, or about 6.4 million people. This was an increase from the previous findings, to some extent due to a failure of prevention, but mostly due to increased survival of those treated with anti-retroviral therapy.

### Control of the pandemic

There are two strategies that are used in the control of a pandemic, namely prevention of infection by immunisation and prevention of exposure, and treatment of those infected.

#### Prevention

**Immunisation**

On 23 April 1984, the USA Health and Human Services Secretary, Margaret Heckler, announced that Dr Gallo had identified and isolated HIV, and concluded that ‘A vaccine for HIV will be available in 2 years’. This was one of the more unfortunate Government statements on Health Care to be recorded, and should serve as a reminder to pay more attention to the experts than politicians when dealing with matters such as Health and Science.

**Why is it so difficult to find a vaccine against HIV, compared to other infective diseases?**

Vaccines can be made of attenuated or dead virus, or from a sub-unit of a virus, but none of these techniques are suitable to develop a HIV vaccine.

The measles vaccine is made from attenuated virus, because the measles virus is so stable that it will not become ‘wild’ and cause the actual disease itself. HIV however has such a high mutation rate that attenuated HIV may be just as dangerous as the virus itself.

The polio vaccine contains dead virus and is very effective. Unfortunately, dead HIV does not elicit an immune response. It may be possible to use a small sub-unit of the HIV for immunisation, but, since no person has yet become immune against the virus, the elusive universal sub-unit still has to be identified.

**A vaccine is therefore unlikely to become available in the foreseeable future.**

#### Prevention of exposure

Many Governments have adopted the so-called ABC programme, based on the
principles of Abstention before marriage, Being faithful, and using Condoms, to prevent exposure to the virus. The programme was initially thought to be quite successful. In Uganda for instance, the prevalence of HIV/AIDS was reduced from 15% in 1991 to 6% in 2007.

However, further analysis of ABC programmes revealed that the Abstention part on its own was not effective and its failure just resulted in an increased number of unplanned pregnancies. Advocating 'Being faithful' was also thought to be of limited value as it probably buckled under that same uncontrollable pressure as abstention. The use of condoms was the only part of ABC that really contributed to the success of ABC programmes.

The Uganda programme has been re-analysed and is found to be less successful than initially thought. ARV treatment roll-out was not run concurrently with the ABC programme, and the drop in prevalence was mainly due to the mortality of those dying of AIDS. The programme was colloquially dubbed as the ABCD programme, with the D standing for Death. The positive outcome from the ABC programme in Uganda however, lies in the fact that it is a Government programme supported by the President and it has empowered women to have a say in safe sex practices, something that women in poor communities rarely have had up to now.

From discussions with my Infective Disease colleagues, it appears that the most practical approach to prevent exposure is to aim to reduce the viral load in the community to such an extent that the disease does not spread. Exposure prevention is achieved by:

- Prophylactic treatment after exposure, such as with needle stick injuries
- Prophylactic treatment of partners of HIV patients
- Roll out of anti-retroviral therapy (ARV) for all HIV+ patients

**Treatment**

AZT, a competitive reverse transcriptase analogue (NRTI) was patented in 1987, but resistance to the drug was soon apparent. Subsequently four other types of drugs have been developed, acting on different enzymes in the HIV reproduction pathway. These include non-competitive inhibiting reverse transcriptase (NNRTI) and protease inhibitors (PI). The combination of different drugs acting at different levels of viral proliferation is known as highly active anti-retroviral therapy or HAART. In South Africa, HAART in the public sector consists of 1 NNRTI and 2 NRTI drugs that are given in fixed drug combinations and allow once-daily dosing.

**The cost of HIV control and World Aid**

**World Aid**

The crippling effect of this chronic pandemic on developing countries was recognised by the World Bank and some developed countries, resulting in the creation of numerous AIDS organisations, the most important of which are the Global Fund and PEPFAR.

1. **The Global Fund** (for the prevention of AIDS, tuberculosis (TB) and malaria) channels global funding, with the USA as its major contributor. Twelve billion dollars ($12 billion) was donated to HIV/AIDS programmes between 2014 and 2016, with a shortfall of $3 billion.

2. **The President’s Emergency Plan for Aids Relief (PEPFAR)**

This fund was set up by the President of the USA in 2002 as an alternative to contributing to the Global Fund. PEPFAR funding resulted in the increase of the number of people on ARVs from 50,000 in 2004 to 1.2 million in 2008. From 2008 to 2015, $50 billion was spent in 15 focus countries, including South Africa, supporting HIV, TB and malaria programmes. The fund has been criticised for all the strings that are attached to its support, such as insistence on the inclusion of abstinence programmes which were known to fail, and withdrawal from comprehensive plans that included treatment roll-out for sex workers (which is far more successful in preventing spread of the disease than abstinence programmes).

However, the President is using his taxpayers’ money, and he has the right to spend the money according to the will of his voters whose support he needs to ensure his re-election, That is, after all, one of the principles of democracy.

The reality of donations are well summarised in the following two quotes:

- ‘Private charity is an act of privilege, it can never be a viable alternative to State obligations,’ Dr James Obrinski from Medicins Sans Frontier at The People’s Health Assembly 2001.
- ‘In a nutshell, industry and private donations are feel-good, short-term interventions and no substitute for the vastly larger, and essentially political, task of bringing health care to more than a billion poor people.’ — Rajshri Dasgupta, Patents, Private Charity and Public Health, Himal South Asian, March 2001

**South African funding**

The South African Department of Health budgeted for about $1 billion to be spent on HIV/AIDS programmes in 2014, from a total public sector Health Care Budget of $14 billion. Following the appointment of Dr Aaron Motsoaledi as Minister of Health in 2009, the number of people on ARVs increased from 500,000 in 2007 to almost 2,500,000 in 2014. However, that still means that less than half of those infected are currently on treatment.

In 2013, the cost of the treatment in the public sector had decreased from R150 per month for multiple drugs to about R89 per month for a single tablet per day.

South Africa is mostly self-funded in controlling the pandemic and the money comes out of the taxpayers’ pockets. As painful as this may sound, it is also true that if HIV/AIDS is brought under control, a significant number of people will get back to their jobs and be able to raise their children – all of which is to the benefit of all in South Africa. There is a principle in Health Economics, called common good, whereby the whole population benefits from a health intervention for a proportion of the population. For example, by treating everyone who has tuberculosis, the rest of the population benefits by not being exposed to the tuberculosis bacillus. This ‘common good’ principle is one of the many reasons why health care cannot be managed as a free market system.

Ultimately, as a nation, South Africans will all benefit from the control of the HIV/AIDS pandemic.

**HIV/AIDS in Ophthalmology**

I would now like to turn to the issue of HIV/AIDS in my practice of Ophthalmology at Groote Schuur Hospital which is a Tertiary Care Public Sector Institution.

The Ophthalmology Department at Groote Schuur Hospital, together with the Ophthalmology Department at Tygerberg Hospital, serves the indigent population of Cape Town and the surrounding area, which amounts to about 3 million people. In 2012, the prevalence of HIV/AIDS in Cape Town was 5%, and that of tuberculosis was 1%, which gave Cape Town the dubious honour of being the tuberculosis capital of the world.

In our department, a database has been kept of all patients seen in the uveitis service and the ocular oncology services since 2007. I will use some of this data in my discussion of infectious uveitis and ocular tumours, as affected by the HIV/AIDS pandemic.
Infectious uveitis

Whereas HIV infection often is asymptomatic, opportunistic infections are one of the hallmarks of HIV/AIDS. These organisms causing the infections include:

- Cryptococcus
- Cytomegalovirus (CMV)
- Toxoplasma gondii
- Mycobacterium tuberculosis (TB)
- Herpes simplex and Varicella zoster
- Histoplasmosis
- Pneumocystis carinii

Apart from Pneumocystis carinii, all the above organisms can cause infective uveitis, and therefore the incidence of infective uveitis is much higher in areas with a high HIV prevalence.²⁶

When a HIV+ patient presents with a panuveitis or chorioretinitis, the diagnosis should be determined within a few days to prevent irreversible blindness. Making the correct diagnosis is often hampered by a poor fundal view, the possibilities of co-infection and similarities in clinical presentations of different infective organisms. Special investigations are essential to make the correct diagnosis.²⁷ At our unit, patients presenting with panuveitis or chorioretinitis therefore undergo serological testing for HIV and syphilis and a chest X-ray. Depending on the clinical findings, a vitreous sample is obtained for polymerase chain reaction (PCR) assay for the most common infective organisms, or for microscopy, culture and sensitivity.

A retrospective case review was performed to determine the commonest causes of sight-threatening uveitis in HIV+ patients attending our clinic. The study included patients who presented with an acute history and a vision of less than 3/60 in one or both eyes due to a panuveitis or chorioretinitis. The results formed part of the presentations made by Andries Stulting, Linda Visser, Danie Louw, Carl Heinz Cruse, Hamzah Mustak and myself at the Ophthalmological Society of South Africa (OSSA) Symposium at the World Ophthalmology Congress in Tokyo in 2014, thanks to the sponsorship of OSSA and Allergan.

An infective cause for the uveitis was found in 66% of 117 HIV+ patients. By performing syphils serology, vitreous PCR for the herpes viruses and toxoplasmosis, and cryptoccal serology in a few selected cases, the cause for the uveitis could be established in 81% of cases within two to three days after presentation. The diagnosis of tuberculosis was made on clinical appearance in a further 5% of cases. Not one positive PCR for TB was found. Of the remaining 14% of cases, 7% improved on systemic steroid treatment and the other patients defaulted before a final diagnosis could be confirmed.

One would have expected more patients with TB-related infectious uveitis but the diagnosis of intra-ocular tuberculosis remained a challenge due to a lack of sensitive and specific tests to confirm the diagnosis. We are currently using Gene Xpert PCR testing if all other tests are negative. It may also be possible that TB-related panuveitis is not as common as previously described.

HIV/AIDS is also associated with the increased incidence of neoplasms, the commonest two tumours seen in Ophthalmology being Kaposi’s sarcoma and Ocular Surface Squamous Neoplasia (OSSN).

Kaposi’s sarcoma²⁸

The tumour is not really a sarcoma, but most probably a tumour of lymphatic endothelium. This purple, raised skin tumour was first described in 1872 by Kaposi, a Hungarian dermatologist. The first patient diagnosed with HIV/AIDS in San Francisco in 1981 presented with multiple Kaposi’s sarcomas. Subsequently four subgroups of the tumour have been described with the commonest being that associated with HIV/AIDS. In 1994, Human Herpes Virus-8 (HHV-8) was identified as the oncovirus responsible for HIV-related Kaposi’s sarcoma. The cell proliferation of HHV-8 infected cells is triggered by a growth factor secreted by HIV-infected cells. Interestingly, treatment with acyclovir has no effect on the tumour growth. The mainstay of treatment is switching off the stimulus, namely the growth factor produced by HIV-infected cells, and HAART (highly active antiretroviral therapy) is the treatment of choice.

The last condition discussed in this talk is also the one that was most difficult to prepare for, because I really have more questions than answers regarding its management.

Ocular Surface Squamous Neoplasia (OSSN)

This is a continuum of dysplasia, carcinoma in situ and squamous cell carcinoma of the conjunctiva. OSSN is primarily caused by sun damage.²⁹ The main risk factor for the development of the disease is therefore degree of latitude, but the tissue damage is aggravated by HIV infection. Thus the incidence of the disease in USA, Australia and Uganda is 2, 16 and 32 per million respectively. One would expect far more publications on the management of this disease coming from Africa, but some of the reasons for the lack of publications will shortly become clear.

A rapid increase in the incidence of OSSN in the HIV era was seen in the Ocular Oncology Service at Groote Schuur Hospital. In 1984, two patients with conjunctival carcinoma-in-situ or squamous cell carcinoma were diagnosed and treated. Over the past 7 years we have seen on average 25 patients per year (which is probably as many as many units further north are seeing per month). Currently 75% of the patients with OSSN are HIV positive, which is similar to ratios elsewhere in Africa. Only 10% of patients seen at our Service have advanced disease requiring enucleation or exenteration, and we attempt to treat the rest conservatively.

Treatment consists of excision, mostly as an outpatient procedure, with cryotherapy at excision used for more advanced cases. Adjunctive therapy consists of brachytherapy with a beta plaque, or topical chemotherapy.³⁰ Iodine125 brachytherapy is used for invasive tumours.

Of 139 patients treated conservatively, recurrences occurred in 11.9% treated by beta plaque and in 18% of those treated by topical chemotherapy. Eighty-five per cent (85%) of those with recurrences were HIV+. It appeared that HIV infection may have played a role in the number of recurrences. However, other possible risk factors for recurrence also needed to be considered, namely:

- Tumour characteristics, such as size and histology
- Method of primary surgery including cryotherapy, no-touch technique and alcohol debridement, and margin involvement.

In the analysis, only patients with a reasonable follow-up could be included. In our series, fifty per cent (50%) of patients were excluded because of follow-up of less than 6 months with 10% not even completing their treatment. (In this regard it appears that we do have a lot in common with our colleagues from further north, who have repeatedly informed me that patients only return with recurrences!) After these patients were excluded from the study, the numbers were so small that meaningful statistical analysis could not be performed. After 8 years of data collection, the results were barely publishable.³¹

There are authors from Africa who have published very good papers with good follow-up, of which I would like to mention two, namely Dr Irma Makupa from Tanzania and Dr Keith Waddell from Uganda.³² ³³
- Makupa found that 16% of cases recurred within the first year, regardless of treatment.
Waddell, on the other hand, performed primary excision on 400 patients without post-operative adjuvant and only three recurrences. Both Makupa and Waddell may not have had access to the excellent facilities that some of us have at tertiary care hospitals, but they did utilise two resources. Their clinic nurses followed up patients in their own communities, and patients were contacted by cellphones. Consequently, both authors achieved a follow-up that was good enough for analysis of their data and subsequent publication.

Which brings me to the question: should a Telemedicine slot not be part of the routine activities of a Public Sector Health Care Service in South Africa? I am of the opinion that many of our patients are simply too poor to return for repeated visits to satisfy our need for long follow-up times, for a condition that does not bother them. In order to collect publishable data, we need to change our clinical practice to a more patient-friendly system. The resulting research would not only ensure that we are doing no harm, but also enable us to determine the best treatment in resource-poor settings.

Conclusion
There is ample proof of previous retroviral pandemics affecting primates in the past. Eight per cent (8%) of the human genome consists of viral DNA left there by retroviral diseases in our ancestors who have survived such a pandemic.34 There is no reason to doubt that pandemics such as this one will happen again.

With every disease epidemic, people’s ignorance leads to fear, superstition and mindless prejudice, often resulting in wrong and harmful decisions. But by looking at the history of such a pandemic, one also comes across wonderful stories of human intellect and persistence at beating the odds. It is humbling to know that we have managed to stabilise the pandemic by standing on the shoulders of giants, from scientists who discovered organisms and treatments, to politicians whose political will made treatment available to millions, to clinic doctors in rural hospitals who use whatever is at their disposal to collect and publish scientific data; these are people who have changed the world in times when others thought it was not possible.

I acknowledge the support of the University of Cape Town in performing the research using the Internet, library and computer services. I thank Dr James Rice for his help with statistics and all technological matters. And finally, I thank all the registrars, (many of whom are now consultants and teach me more than I can teach them), for completing the data forms during each clinic, even though they grind their teeth sometimes! Without them the databases would not exist and none of this data presented here would have been available.

References
HIV/AIDS: How it has affected my Ophthalmology practice

CPD Article Questions

YES! I would like to receive SA Ophthalmology Journal for FREE monthly.

Questions True or false:

1. An epidemic is an outbreak of a disease across different countries – or in global proportions.  
2. The virus capsid contains about 70 receptors, which bind to the surface receptors of cells that they infect.  
3. HIV binds to the CD4 receptor on killer T cells.  
4. Zoonosis is an uncommon occurrence in the pathogenesis of viral infections in mankind.  
5. HIV-AIDS has killed more people than any other pandemic in the past two centuries.  
6. People that are homozygous for the CCR5 Δ32 mutation are not susceptible to HIV infection.  
7. HAART is any combination of drugs acting at different levels of viral proliferation.  
8. Current HAART therapy in South Africa consists of two drugs that inhibit RNA transferase at different levels in the HIV proliferation cycle.  
9. In South Africa, only half the number of people who are HIV positive are currently on HAART.  
10. Implementation of the ABC programme is more effective in reducing exposure to the disease in the community than by treating everyone who has the disease.  
11. The most effective way to treat Kaposi’s sarcoma is systemic acyclovir, because the tumour occurs in cells infected by Herpes virus 8.  
12. The biggest risk factor for the development of Ocular Surface Squamous Neoplasia is HIV infection.

This is to state that I have participated in the CPD-approved programme and that these are my own answers.

Signature

Date

INSTRUCTIONS: Complete the questionnaire, then either scan and email it to John Woodford at John.Woodford@newmediapub.co.za, or alternatively, fax it to 086-534-1922. For any queries or problems please contact Chantal Adlard at Chantal.adlard@newmediapub.co.za or (011) 217-3126.
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The first Tygerberg Hospital Eye Congress, 1973

From left to right: Dr Basson van Rooyen (registrar), Dr Ellen Ancker (registrar), Dr Fred Küpper (ophthalmologist), Dr René Truter (registrar), Dr Johan van Rensburg (registrar), Prof Freddie Huber (guest speaker from Zürich, Switzerland), Dr Hubrecht Brody (ophthalmologist), Matron (?), Dr Bossie du Toit (ophthalmologist), Dr Awie Ferreira (Head of the Department of Ophthalmology, Tygerberg Hospital), Dr Andrew Neethling (ophthalmologist), Hella Voigt (Dr Ferreira’s private orthoptist), Dr Laubscher (Medical Superintendent of the Tygerberg Hospital) and Dr Anthony Molteno (ophthalmologist).

Successful candidates: August/October 2015

**FC Ophth(SA) Primary IA (no Oral)**
- Abdoola, Faheem
- Bandi, Ntsakisi Dereree Rachel
- Bhikha-Bhana, Devya Deepa
- Dzimbahete, Tsitsi Cherry
- Laheu, Bashir
- Lindeque, Stephanus Johannes
- Makhure, Ishmael Kabelo
- Malinga, Thomas
- Mpanza, Sibusisiwe Micky
- Piek, Leanie
- Rawjee, Kashmira
- Shastrty, Dimile Deepa
- Tladi, Andrius Thabo

**FC Ophth(SA) Intermediate IB**
- Ally, Naseer
- Andreas, Corinna Doris
- Erasmus, Clayton
- Gani, Aboobaker
- Kriek, Jozef Albertus

**FC Ophth(SA) Final**
- Kritzinger, Anine
- Maseko, Ntopi Joseph
- Mbelwa, Samkelo Leon
- Melani, Mahlatse Nancy
- Mthethwa, Sibongile Constance
- Naudé, Malcolm
- Ndlovu, Lungile Thandeka
- Nieder-Heitmann, Norman
- Smith, Suzanne Mari
- Steyn, Anna
- Van Der Merwe, Ernst Baard
- Van Der Westhuizen, Dean Andre
- Van Eck, Elizabeth Catharina

**Dip Ophth(SA)**
- Antwi-Anyimadu, Florence
- Gangai-Singh, Manisharani
- Khumalo, Sphiwe Fabian
- Majola, Nonhlanhla
- Manyeruke, Stephen
- Murudker, Zahier
- Pretorius, Willem Sternberg
- Van Der Colff, Frederich James

**Commercial examiners:**
- Khantsi, Boitumelo
- Mathe, Nombuso
- Mkabile, Pakamisa Kayalethu
- Nozozo, Nkosipendule Richard
- Czeckapotredz
- Mthethwa, Sibongile Constance
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**Examinations results – College of Ophthalmologists**
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Africa takes the lead on accommodation study

Dr Spencer P Thornton, MD
Clinical Professor of Ophthalmology, Department of Ophthalmology, University of Tennessee Health Science Centers, Memphis and Nashville, Tennessee

In May 1924, Lindsey Johnson, of Durban, South Africa, published, in Archives of Ophthalmology, an article (‘A new theory of accommodation’) in which he challenged the widely accepted Helmholtz theory of accommodation.1

In Europe and America, his article was greeted with thunderous silence. Because of Helmholtz’s close friendship with Cornelius Donders, author of the 1864 book On the anomalies of accommodation and refraction of the eye, Helmholtz’s theory of accommodation, published in 1855, was widely accepted and unchallenged.

Johnson questioned the rationality of Helmholtz theory, because it ignored the action of the circular muscle of Müller. Von Helmholtz had theorised that the lens stayed compressed in the eye when it was not accommodating because the ciliary muscles were under constant tension, stretching the zonules. Johnson pointed out the lack of logic in this theory, pointing out that muscle tension in a relaxed state is not normal, and the theory not rational.1

Dr Johnson described compression of fluid in the circumlental space on accommodation, with bulging of anterior lens surface and anterior movement of the lens. Aqueous under pressure is forced into the spaces of Fontana during accommodation, and flows back into the chamber upon relaxation of accommodation. Johnson concluded that the increased curvature of the lens was assisted by hydraulic pressure, not by relaxation of the ciliary muscle’s tension on the zonules as von Helmholtz claimed.

D Jackson Coleman
Johnson’s research was largely ignored for many years, but in 1970 and again in 1986, Dr D Jackson Coleman performed a series of experiments in which he intubated the vitreous and the anterior chamber and showed that contraction of the ciliary body on accommodation produced a rise in vitreous pressure, with a hydraulic effect on lens deformation producing anterior displacement, confirming Johnson’s theory.2 He described the interface of vitreous and lens-ciliary body complex as a catenary (the curve formed by a perfectly flexible, inextensible cable suspended from its endpoints).

In 1970, Coleman proposed the Catenary theory, the theory that the lens, zonules and anterior vitreous, comprise a hammock-like diaphragm between the anterior and vitreous chambers of the eye.3 Ciliary muscle contraction initiates a pressure gradient between the vitreous and aqueous compartments that support the anterior lens shape in the mechanically reproducible state of a steep radius of curvature in the centre of the lens with slight flattening of the peripheral anterior lens, i.e. the shape, in cross section, of a catenary, not a parabola. The anterior capsule and the zonules thus form a trampoline- or hammock-shaped surface that is totally reproducible depending on the circular dimensions, i.e. the diameter of the ciliary body (Müller’s muscle).

The ciliary body directs the shape, like the pylons of a suspension bridge, but does not need an equatorial traction force to flatten the lens. Coleman’s 1970 study showed that contraction of the ciliary body brought about a rise in vitreous pressure, which in turn had a hydraulic effect on crystalline lens with anterior displacement, confirming Johnson’s findings. Again in 1986 Coleman verified the anterior displacement of the lens as a component of accommodation in a study published in the Transactions of the American Society of Ophthalmology.3

Spencer Thornton
Spencer Thornton, in 1985 and 1986 published real-time A-scan ultrasonography showing anterior movement of the vitreous (and IOL) on accommodation. This was the first photographic documentation of power increase by anterior movement of an IOL rather than an increase in sphericity of the natural lens on accommodation (Figure 1).4

Many investigators have verified that the anterior movement of the lens is a component of accommodation, and most...
report restored accommodation with IOL forward movement. Most accommodating IOLs depend on this movement for their accommodative effect. The Thornton accommodating IOL (patent 4,718,904) was based on Johnson’s (and later Coleman’s) observations.

The mechanism of accommodation has been one of the most studied aspects of visual physiology over the last two centuries and remains one of the most debated subjects in modern ophthalmology. It is not the purpose of this article to criticise any theory, but to point out similarities and reasons to celebrate the observations of past scientists that led to our present understanding.

The purpose of this article then, is to honour those, who, through their commitment to science, sought to answer the riddle of a visual function that is multifactorial, and review the physiologic and anatomic basis for changes in focal power and how these changes are affected by presbyopia and aphakia.

Accommodation is the process by which the eye changes optical power to maintain a clear image or focus on an object as its distance varies from distance to near. Though changes in the shape and position of the lens are major components of accommodation in the phakic eye, most now agree on a multifaceted mechanism. With a growing consensus, most researchers now agree on at least three components:

1. Increased asphericity of the anterior surface of the lens
2. Forward movement of the lens
3. Miosis or contraction of the pupil.

The vitreous face presses against the back surface of the solid but malleable lens sandwiched between vitreous and the liquid (aqueous) of the anterior chamber. The iris conforms to the aspheric front of the lens.

On accommodation the pupil (iris) constricts with contraction of the circular muscles of the iris rim. Simultaneously the ciliary muscle contracts and the vitreous pushes forward, moving the lens forward, increasing its effective power. With increased convexity comes increase in power, and the smaller the pupil, the greater the depth of field (the old pinhole camera effect).

Although lenticular-based focusing was first proposed by Descartes, it was Thomas Young, who in 1793 demonstrated changes in the crystalline lens that occurred on changing focus from distance to near, and Hermann von Helmholtz, who in 1855, advanced the first widely accepted explanation of the accommodative process.

### Von Helmholtz

The most widely held theory of accommodation was that proposed by Hermann von Helmholtz. When viewing a far object, the circularly arranged Müller’s ciliary muscle is relaxed, allowing the lens zonules and suspensory ligaments to pull on the lens, flattening it in the periphery. The source of the tension is the pressure that the vitreous and aqueous humours exert outwards onto the sclera. According to Helmholtz, when viewing a near object, the ciliary muscles contract (resisting the outward pull of the sclera) causing the lens zonules to relax, which allows the lens to spring into a thicker form.

Frans Donders favoured Helmholtz when he wrote On the anomalies of accommodation and refraction of the eye in 1864. They were colleagues and personal friends, and no one dared question Helmholtz for many years because of Donders’ influence.

The young human eye can change focus from distance (infinity) to 7 cm from the eye in about 350 milliseconds. This dramatic change in focal power of the eye occurs automatically on near fixation. The amplitude of accommodation declines with age, and by the fifth decade of life the accommodative amplitude has declined so that the near point of the eye is more remote than the reading distance. When this occurs the patient is presbyopic.

Once presbyopia occurs, those who are emmetropic (optical correction for distance vision not required) will need an optical aid for near vision; those who are myopic (near-sighted, requiring an optical correction for distance vision), will find that they see better at near without their distance correction; and those who are hyperopic (farsighted) will find that they may need a correction for both distance and near vision.

Accommodation decreases to about 1 dioptre by the age of 70 years. The dependency of accommodation amplitude on age is graphically summarised by Duane’s classical curves.

Duane’s classical curves (Figure 2) show the amplitude or width of accommodation changing with age. Mean (B) and approximate lower (A) and upper (C) standard deviations are shown.

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**Figure 2. Accommodation Amplitude (Dept) versus Age**

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The age-related decline in accommodation occurs almost universally to less than 2 dioptres by the time a person reaches 45 to 50 years, by which time most of the population will have noticed a decrease in their ability to focus on close objects and hence require reading glasses or bifocal lenses for reading.

**Heinrich Müller**

Heinrich Müller in 1854 described the circular muscle of the ciliary body, theorising that the contraction of the ciliary muscle pulled vitreous forward, forcing the lens forward, with resulting power increase (Figure 3).

**Marius Tschernig**

Marius Tschernig is best known for his theory regarding the mechanism of accommodation in which he disagreed with the accommodation theory proposed by von Helmholtz. In 1894 Tscherning proposed that accommodation occurred through an increase of zonular tension at the lens equator with contraction of the ciliary muscle, and therefore a bulging of the lens in accommodation was created by compression rather than by passive relaxation. Furthermore, he stated that during accommodation, while the central part of the anterior surface of the lens is bulged, the peripheral portion of the lens is flattened (this theory was first proposed by Antonie Cramer in 1851). At the suggestion of Donders, Cramer used a microscope to demonstrate that accommodation should be ascribed to an increase in the curvature of the lens. Donders himself had several instruments made for the same purpose. In the 1990s Schachar took up this theory as his own.

**Ronald Schachar**

Ronald Schachar in 1992 proposed a theory (Figure 4) similar to that of Tscherning which indicates that focus by the human lens is associated with increased tension on the lens via the equatorial zonules: when the ciliary muscle contracts, equatorial zonular tension is increased, causing the central surfaces of the crystalline lens to steepen, the central thickness of the lens to increase in anterior-posterior diameter, and the peripheral surfaces of the lens to flatten. While the tension on equatorial zonules is increased during accommodation, the anterior and posterior zonules are simultaneously relaxing.

**Langenbucher**

Langenbucher and colleagues demonstrated the forward shift of an implanted posterior chamber lens optic, showing that its accommodation is measurable subjectively by usual methods (retinoscopy, videorefraction, push-up and defocusing) and objectively by measuring anterior chamber depth decrease with paraxial geometric optics. Their study showed similar theoretical and measured amplitude increase with decreased AC depth.

**Rana and Miller**

A Rana, D Miller and colleagues at Cornea Consultants of Boston, in 2003, demonstrated that good distance and near vision could be achieved with movable IOLs. They state, ‘the stronger the power...
... of movement needed to achieve +2.5 diopters of pseudo-accommodation.\(^{18}\)

**Nawa**

Nawa and associates in Nara, Japan, in a November 2003 article on accommodation obtained with IOL forward movement showed the power increase with 1 mm IOL forward movement to vary with the pre-op length of the eye and steepness of the cornea, varying from 0.8D in a long eye to 2.3D in a short eye, varying inversely with corneal power. They concluded that, ‘short eyes with high power IOLs would obtain relatively large accommodation with any given amount of forward IOL movement.’\(^{16}\)

A number of studies\(^{17-19}\) show that anterior movement of the lens is at least partially responsible for accommodation.

In summary, in contrast to the Helmholtz theory that is limited to the ‘natural’ lens of the eye, it may be that all theories, including those of Helmholtz, Tsherning, Müller, Johnson, Coleman and Thornton, are involved both in the phakic and IOL implanted eye.

The author has no financial interest in the subject matter of this paper.

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**References**


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**Figure 4. The Schachar theory**
This is a short, easy to read book about the modern history of Ophthalmology. It also takes the reader ‘behind the surgeon’s mask’ to see what life is like for a retinal surgeon.

It is written for the layman and so many of the paragraphs explaining basic concepts such as cataracts, retinal detachments, etc., can be skipped. This makes this 222 page book even shorter and it can be read in a weekend.

The main aim of the book is to tell the story about six men who struggled against all odds to change Ophthalmology and improve the lives of countless millions of patients. These men all sacrificed greatly for the benefit of us all and so they all should be remembered and honoured. As the author says: ‘Every day, I appreciate what those who came before me dreamed, discovered, and suffered to enable me, and doctors like me, to save sight today.’

1. Harold Ridley (1906–2001)
   This book gives us a lot of the background to the first IOL implanted in 1949. Ridley, as we all know, noticed that plastic shrapnel pieces caused no rejection reaction in a pilot’s eyes. But the story of how he went from noticing this to developing and implanting the first IOL is fascinating. He had to put up with severe criticism from his peers, especially from Stewart Duke-Elder, almost losing his career in the process. Thankfully for all of us, Ridley kept up the struggle and was eventually vindicated and honoured in his own lifetime. He himself underwent cataract surgery plus lens implants in 1990. He never patented the IOL and never earned a cent from it believing that his invention belonged to mankind.

   He was sitting in a dentist chair having his teeth cleaned with a new machine which used high frequency sound waves when it dawned on him that he could use this same technology to remove a cataract. His first phaco operation on a human was in 1967 and took over 4 hours of which 79 minutes were actual emulsification time!

   Also known as the father of modern retinal surgery, Schepens’ main contribution to Ophthalmology was his invention of the binocular indirect ophthalmoscope. But few people know that besides this, he was a war hero too. In the Second World War, at great risk to himself, he helped many Jews escape from Nazi-occupied Belgium. The Gestapo eventually found out about him and he had to flee on foot over mountains and through forests into France.

   Patz was the person who discovered that excess oxygen given to premature babies was the cause of Retinopathy of Prematurity. This discovery, which Patz made in the 1940s has now saved millions of eyes. But even more importantly, he carried out what was probably the first truly randomised controlled trial in Ophthalmology and perhaps in all of Medicine. This was the trial done in 1948 giving half the premature babies the usual high oxygen levels and the other half a reduced oxygen level.

5. Judah Folkman (1933–2008)
   Folkman was the main driving force behind the discovery of VEGF which led to today’s world-wide anti-VEGF use in cancer therapy and wet ARMD. In the early 1960s he noticed that cancer cells somehow attracted blood vessels towards them but if that blood supply was stopped the cancer cells would die. It was a long hard struggle to find out exactly how the cancer cells attracted their blood supply and another long struggle to produce a substance that could inhibit this process.

6. Louis Braille (1809–1852)
   The inclusion of Louis Braille in this book seems a little out of place; first because Braille lived so long ago and secondly because it has not got much to do with modern Ophthalmology. But no matter, it is still a very interesting chapter describing how the 15-year-old blind boy (blinded by trauma at age 3 years) discovered a way for blind people to write and read.

Chapter 7 of this book deals with the history and evolution of modern refractive surgery. Here we cannot single out one person. The story can be traced back to 1939 when a Japanese ophthalmologist, Tsutomu Sato, made radial cuts in the posterior aspect of corneas to reduce myopia. Then in the 1970s, a Russian ophthalmologist, Svyatoslav Fyodorov realised that the RK incisions should rather be on the front of the cornea. In the 1980s the Excimer laser was developed. Many people have been involved with the development of PRK and LASIK and Dr Lam gives us a brief overview of the history of these procedures.

Intertwined with the history in this book is the day-to-day account of some of the thoughts and activities of this retinal surgeon. I have always had great admiration for my retinal colleagues who operate in such a vital and difficult place. This book has given me new respect and appreciation for my retinal colleagues.

I can highly recommend this book to all ophthalmologists as a light weekend read.
• Skilled hands
• Delicate instruments
• Quality products

iStent for MIGS procedures
Katena Instruments
Katena Disposable & Reusable Diagnostic Lenses

Rayner Advance IOL's
Rayner Visco-elastic range
MST Malyugin Ring
SOS Standard & Customized Procedure Packs
Comparing six multifocal IOLs over six years

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Paper delivered by Dr Johan de Lange at the biennial SASCRS Congress in Cape Town in August 2014

Implanting multifocal IOLs is not only a science. It is an art – an art that goes beyond evaluating only the eyes of the patient to also taking into account the patient’s personality and the specific requirements of the patient’s occupation. Add to this the challenge of explaining the intricacies of the product to the patient in a way the patient can understand and you have the art of implanting multifocal IOLs.

Deciding which eyes are suitable for a multifocal IOL is the first hurdle to overcome. This is followed by evaluation of the patient’s personality. Is this person a good candidate or not? Over the last three decades the science of using multifocals has been greatly developed and expanded by the use of objective scientific methods and means. The more data science can measure, the less art is involved.

The first multifocal IOL that I used was the 3M multifocal in about 1986. In retrospect, this particular lens was ahead of its time, but the art and science of using multifocal IOLs (MF IOLs) was in its infancy. I did not know or understand how to handle the side effects of the product and therefore my flirtation with this particular multifocal was short-lived.

My next venture was with the AMO Array. This was actually a bifocal IOL and was definitely effective, but with side effects. Dr Ivan Marais, then from Johannesburg, was one of the international champions of this IOL and was in its infancy. I did not know or understand how to handle the side effects of the product and therefore my flirtation with this particular multifocal was short-lived.

My next venture was with the AMO Array. This was actually a bifocal IOL and was definitely effective, but with side effects. Dr Ivan Marais, then from Johannesburg, was one of the international champions of this IOL and was widely known and respected for his pioneering work with this very effective product. However, the side effects such as disphotopsia, loss of contrast and poor mesopic vision were still very problematic, even more so than in the present day. To the best of my knowledge, Gary Player and Louis Luyt both received AMO Array implants after cataract surgery. Gary Player’s name was even used as a marketing tool for this IOL.

Over the years I have used a number of presbyopia-correcting IOLs. This included the 3M MF IOL, AMO Array, Alcon ReStor, Lentis Mplus, Physiol Fine Vision Trifocal, Zeiss AT Lisa Tri as well as the Tecnis Symfony which, according to the manufacturers, is not a true multifocal IOL.

I also used two accommodating IOLs, i.e. the Tetralens and the Crystalens. Both these IOLs provided about 1 dioptre’s accommodation but over time this diminished to very little if any. After a few months I decided to discontinue the use of both these IOLs.

Since its introduction into SA I have been a tentative user of the Alcon ReStor IOL but as my results improved our utilisation of this IOL gradually increased. Since 2009 we have been analysing the data and results obtained by using this IOL. In 2012 the study of multifocal IOLs was expanded to include the Lentis Mplus. These studies have now been going on for six years and increased to incorporate six different presbyopia-correcting IOLs.

This article is a summary of my experience.

General principles
As will be repeated, multifocal IOLs are not always truly multifocal. Some of them are actually only bifocal, whereas some are continuous-focus IOLs. These two terms, as well as multifocal IOL and also presbyopia-correcting IOL, will be used interchangeably, endeavouring to be correct in all instances.

Patient selection is most critical when implanting MF IOLs. Many talks have been given and articles published about patient selection because it is so important.

Eye selection is equally important. The eyes must be totally normal except for cataracts. The presence of astigmatism is not a contra-indication but should be rectified to achieve acceptable results. Post-op astigmatism of 1.00D or more is problematic and will not be acceptable for the patient.

Excellent biometry is critical. Post-op spherical equivalent should be between +0.50D and −0.50D. Anything more than this and you will have an unhappy patient. Couple this with a required astigmatism of less than 0.75D and it becomes clear that pre-operative and intra-operative accuracy is of the utmost importance.

Post-operative uncorrected distance visual acuity (UCDVA) is the factor that has the most effect on a patient’s satisfaction. If the UCDVA is better than 0.8 in both eyes and 1.0 OU, most patients are happy. They can tolerate other side effects, including average or mediocre
after the operation this patient never needs spectacles and is hyperopic without significant presbyopia and gives the patient spectacle independence. The best candidate for Prelex is a person with the right personality and lifestyle who is hyperopic without significant presbyopia and gives the patient spectacle independence. The best candidate is the laid back, relaxed type who usually loses or breaks his spectacles and can manage rather well without perfect VA. These people enjoy the freedom the MF IOLs give them without the hassle of glasses and they do not constantly try to see a fly at the opposite side of the opera house!

The worst case for a MF IOL would be the −2.00D myopic astronomical engineer at NASA who constantly works on his computer without glasses and does astronomy and birdwatching for a hobby. Beware, especially if his brother is a lawyer!

This article does not discuss Prelex which is Presbyopic Lensextraction in the absence of cataracts. Prelex is done for the specific reason to treat presbyopia and give the patient spectacle independence. The best candidate for Prelex is a person with the right personality, occupation and hobbies who is hyperopic without significant astigmatism. Pre-operatively this patient always needs spectacles and after the operation this patient never needs spectacles. This is a dramatic improvement and these patients are usually very grateful.

The different IOLs are summarised in Figure 1.

As shown in Figure 1 the first study was a retrospective study, but since then the other studies have been prospective.

All studies were performed in my private practice in Vanderbijlpark and except for six Zeiss AT Lisa Tri IOLs, all the IOLs were implanted by one surgeon (the author, JDL).

Problems encountered
Doing the surgery was the easy part. Patient selection is always a challenge, but over time you become rather adept at it. Clinical examination and biometry is usually very easy. All the data measured during these examinations go into the patients’ clinical files which in our case has become electronic since 2012. My biggest problem was setting up a system of data capturing (from the patients’ files) and analysis which is effective and efficient. This presented a learning curve which is still ongoing.

Principles behind the first five multifocal IOLs in our studies (Figure 2)
The main reason why multifocal IOLs are effective is because they simultaneously and always create two or more images of the object the patient is looking at. To achieve this, light rays are divided to create different images for different distances.

Therefore, each image has less available light than an image created by a monofoocal IOL and this will impact on quality of vision. In bright light (photopic conditions), it is not a problem, but as light decreases, so does visual acuity.

Loss of contrast is also a common side-effect and does increase in poor light, mesopic as well as scotopic conditions. Furthermore, the optical qualities of these IOLs are such that some light is reflected or lost and this decreases the available light even further.

The patient must develop the ability to choose between these images to obtain useful vision. This requires a certain flexibility on the side of the patient. Therefore, patient selection is so very important. If you, as the doctor, misjudge the patient, you will have an unhappy patient even if you measure 6/6 UCVA at all distances.

The Alcon ReStor, the Lentis Mplus from OcuLentis and the Hanita Bunnylens multifocal IOLs are actually bifocal IOLs and not true multifocal IOLs. These IOLs do not make adequate provision for intermediate vision at so-called computer distance, about 60 cm. As the MF IOL industry developed and the lenses evolved, some companies produced a trifocal IOL of which the Physiol Fine Vision Trifocal and the Zeiss AT Lisa Tri are included in our series. These trifocal IOLs created a third image for intermediate VA, with good effect.

The following generation of multifocal IOLs came from AMO Tecnis. They claimed to be the first of the next generation presbyopia-correction IOLs, with the Tecnis Symfony IOL. It creates a continuous elongated focus which provides an extended range of vision. This is accompanied by significantly less of the other well-known side effects, such as glare, starburst and halos. This makes for a very good IOL (Figure 3).
Figure 3. Principles behind the next generation of (MF) presbyopia-correcting IOLs

- **Tecnis Symfony** IOL (from AMO).
  - It is the first and currently the only presbyopia-correcting extended range of vision IOL.
  - Because of the one elongated focus it delivers a continuous, full range of high-quality vision.
  - The incidence of halos and glare is comparable to that of a monofocal IOL.
  - Non-toric as well as toric versions are available.

Figure 4. Alcon Acrysof IQ ReSTOR

This is an aspheric, one-piece, hydrophobic, acrylic IOL, 6 mm wide and 13 mm long. As mentioned before, it is actually a bifocal IOL. It has a central diffractive region of 3.6 mm which is apodised. **Apodised is defined as gradual reduction in diffractive step heights.** The central region of the IOL provides near and distance vision when the pupil size is normal such as in photopic light. The periphery of the lens is refractive and is dedicated to distance vision. When the pupil dilates in poor illumination, more light is distributed to the distance focal point (Figure 5).

As seen in Figure 6, ReSTOR IOLs have been produced with +4D, +3D and +2.5D near additions. The +4D add ReSTOR has been discontinued.

Figure 5. ReSTOR characteristics

- **Bifocal** (not truly multifocal).
- Aspheric. Biconvex: Size 6 x 13 mm.
- One piece hydrophobic acrylic.
- Blue filter.
- **Central diffractive** region of 3.6 mm for near and distance vision when pupil size is normal in bright (photopic) light.
- Apodised. It is defined as a gradual reduction in diffractive step heights.
- A **peripheral refractive** region is dedicated to distance vision. When the pupil dilates in poor light more light is distributed to the distance focal point.

**Discussing different MF IOLs**

We shall now take a closer look at six multifocal IOLs.

1. **Alcon Acrysof IQ ReSTOR IOL** (Figure 4)

This is an aspheric, one-piece, hydrophobic, acrylic IOL, 6 mm wide and 13 mm long. As mentioned before, it is actually a bifocal IOL. It has a central diffractive region of 3.6 mm which is apodised. **Apodised is defined as gradual reduction in diffractive step heights.** The central region of the IOL provides near and distance vision when the pupil size is normal such as in photopic light. The periphery of the lens is refractive and is dedicated to distance vision. When the pupil dilates in poor illumination, more light is distributed to the distance focal point (Figure 5).

As seen in Figure 6, ReSTOR IOLs have been produced with +4D, +3D and +2.5D near additions. The +4D add ReSTOR has been discontinued.

Figure 6. Different ReSTOR IOLs

- Available in +2.5D, +3D and +4D add.
- +2.5D adds + 2.0D at spectacle plane. Focus at 50 cm. Has 7 steps (rings).
- +3D adds + 2.5D at spectacle plane. Focus at 40 cm. Has 9 steps (rings).
- +4D adds + 3.2D at spectacle plane. Focus at 31 cm. Has 12 steps (rings). More or less obsolete.

From 2008 to 2010 we implanted 86 patients with a +4D add in one eye and a +3D add in the other eye. These were analysed and the results are reported later in this article.

The ReSTOR IOL is easy to insert and unfolds rather slowly which makes it very safe to insert. I use a 2.5 mm clear corneal incision and introduce the injector into the anterior chamber. This IOL can also be inserted through a smaller 2.2 mm incision using the wound assisted technique of which I am not at all a supporter. When using the 2.2 mm incision and the ‘wound assisted technique’, you do not introduce the cartridge into the AC. **It has been well documented that the incidence of post-operative infection is less when introducing the injector cartridge properly into the AC.**

Centration of the ReSTOR IOL is good but not perfect and varies between zero and 0.4mm (Figure 7).

Figure 7. Comments on the ReSTOR IOLs

- Easy to insert.
- Centres well.
- Slight decentration has no significant effect on patient satisfaction.
- Disphopota always present at night but diminishes over time.
- Light: 41% for far; 41% for near: 18% reflected (lost).
- **Scotopic VA is reduced.**
- Loss of contrast very common.
- Excellent distance UCVA **OU** mandatory.
- +3.0D add better intermediate and +4 add better for near.
- +3D/+4D combination in my series was very effective.

As with all the other MF IOLs, disphopota is always present at night, but diminishes over time.

A very important factor is the distribution of light. The design of the ReSTOR optic causes reflection and therefore loss of 18% of light. The rest of the light is divided equally between near and far visual foci. The division and loss of light is the cause of reduced VA in mesopic and scotopic light conditions, for near as well as for distance vision.

Loss of contrast also occurs with the ReSTOR IOL and can be measured and quantified. As with most things, contrast sensitivity varies between patients.

As for all patients with MF IOLs the patient will be rather satisfied if UCVA for distance is good OU (both eyes), preferably for each eye separately, but it is a very important requisite when both eyes are used. Effectively this means at least one eye must be 0.8 (6/7.5) for UCVA.

Patients tolerate mediocre near UCVA much better than mediocre distance UCVA.

2. **Lentis Mplus (LS 313 MF30)**

This IOL comes in a plate haptic version as seen in Figure 8. This is the model we used. The Mplus is bifocal as seen in the figures and is not concentrically symmetrical for 360° like the other MF IOLs. The distribution of light is 39% for
near VA and 55% for distance VA. This corresponds to the two segments of the IOL as seen in Figure 8.

This configuration of the IOL eliminates classical halos during night vision as described for most of the other presbyopia-correcting IOLs. Six per cent (6%) of incoming light hits the meridional transitional area between near and far vision segments and is reflected and therefore lost for useful vision (Figure 9).

It does, however, create two lines of scatter as can be seen in the point spread function in Figure 10. This disphotopsia is nevertheless less problematic than the disphotopsia experienced with IOLs with 360° concentric diffractive or refractive circles.

An interesting alternative is to insert this IOL upside down (superior goes to inferior, not anterior goes to posterior) to cause upward direction of this scatter where it is supposedly less troublesome. I have not done this but it seems to be a good idea.

Like most modern-day IOLs this lens has a 360° square edge to reduce the development of posterior capsular opacification (PCO). The IOL has a hydrophilic inside and a hydrophobic surface.

Insertion of the Lentis Mplus is easy because unfolding is slow and safe. Initially we were instructed to insert the IOL with its reading add inferior but this has now changed. Something far more important has emerged. The distance segment of this IOL MUST be in line with the visual axis.

If the near segment of this IOL ends up in front of the visual axis it induces myopia and the patients complain of blurred vision even if they see 6/6 for distance. With autorefraction these eyes also show about −1.50D myopia (but ironically has 6/6 distance VA). These patients are often unhappy and this phenomenon was the main cause of the four explants in our series of 108 eyes.

Because of the division of incoming light, about 60% of Lentis Mplus eyes show a reduction in contrast. This is not a constant finding and is also dependent on the refraction, IOL position and illumination. Scotopic and mesopic VA is generally reduced.

In our series the Lentis Mplus IOL provided the best intermediate UCVA, slightly better than the ReSTOR +3D add. If biometry and surgery is good the UCDVA will be excellent.

As with all the other presbyopia-correcting IOLs, the patient is most likely to be satisfied when the UCDVA is 6/6. The opposite is also true. If the patient attains excellent UCNA but poor UCDVA he will most likely be unhappy with the result.

### 3. Physiol Fine Vision Trifocal

The name of this lens is an acronym based on its trifocality and its ability to provide Far, Intermediate and NEar (FINE) vision (Figure 11).

This point spread function post-op closely resembles what patients see at night if the lens is inserted with the reading segment inferior.
The characteristics of the PhysIOL Fine Vision Trifocal IOL

- **Diffractive Trifocal IOL.**
- 360° diffractive rings.
- Size: 10.75 mm height x 6.15 mm optic.
- Biconvex and aspheric posterior surface.
- Angulation 5°.
- A constant 118.9.
- 360° square edge all around the optic and even at the haptic junction.
- Hydrophilic acrylate with 25% water content.
- Power range 10D to 30D in 0.5D steps.

The lens is very soft and easy to insert. Being as soft as it is, it is slightly more prone to tearing of a haptic than the other IOLs. It centres well and without a problem. Slight decentration of less than 0.5 mm has no significant effect on the visual outcomes. The characteristics of this lens are summarised in Figure 12.

Trifocality is achieved by combining two sets of diffractive rings. One set creates a focal point for intermediate VA with +1.75D add and the other provides near VA with a +3.50D add. These rings alternate with each other as shown in Figure 13.

Our results obtained with the Physiol Fine Vision Trifocal showed excellent UCVA at all distances. Side effects are the usual, i.e. reduced VA in poor light as well as some loss of contrast. Disphotopsia is always present at night but in time this diminishes and patients do not find it very bothersome. The fact that about 15% of light is reflected obviously contributes to the reduced scotopic and mesopic VA as well as loss of contrast. Once again, UCDVA is of the utmost importance. If patients cannot see far they do not appreciate the near vision (Figure 14).

4. Hanita Bunnylens multifocal IOL (Figure 15)

This lens is actually one of the bifocal presbyopia-correcting IOLs. The name Bunnylens apparently refers to the shape of the haptics which look like the ears of a bunny. These haptics have a 5° anterior angulation. The IOL is 11 mm long with a 6 mm optic. It is aspheric and has a 360° square edge to reduce posterior capsular opacification (PCO). The IOL is made of hydrophilic acrylate HEMA/EOEMA copolymer and has a UV blocker and violet light filter. The refractive index of the lens is 1.46 and the A constant is 118.16.

The characteristics of the Hanita Bunnylens multifocal IOL is summarised in Figure 16.

The apodised diffractive steps are only present in the central 4 mm zone. It creates a +3D add which gives +2.4D add at spectacle plane.

The lens comes in 0.5D increments from +10D to +30D and in 1D increments from +31D to +35D.

Figure 12. Characteristics of the PhysIOL Fine Vision Trifocal IOL

Figure 13. Diffractive characteristics of PhysIOL Fine Vision Trifocal IOL

(Courtesy Dr D Gatinel)

Figure 14. Comments on the PhysIOL Fine Vision Trifocal IOL

- Very easy to insert, very soft.
- Centres well.
- Slight decentration has no significant effect on patient satisfaction.
- Disphotopsia always present at night but diminishes with time.
- Loss of contrast very common.
- 15% loss of light.
- Reduced scotopic VA.
- Excellent distance UCVA OU mandatory.
- Good intermediate and excellent near vision achieved.

Figure 15. The Hanita Bunnylens multifocal IOL

- Bifocal diffractive apodised multifocal.
- Diffractive steps only in central 4 mm zone.
- Aspheric with 360° square edge.
- 6 mm optic; 11 mm length.
- +10D to +30 in 0.5 dioptries; 31-35D in 1 dioptr.
- 5° haptic angulations.
- UV blocker and violet light filter.
- Hydrophilic acrylic HEMA/EOEMA copolymer.
- +3D add provides +2.5 diopetre at spectacle plane.
- Refractive index 1.46; A constant 118.16.
- Power range 10D to 30D in 0.5D steps.

Figure 16. The characteristics of the Hanita Bunnylens multifocal IOL
The Hanita MF is easy to insert and centres well due to the four-point haptic design. Slight decentration has no effect on patient satisfaction. Disphotopsia is always present at night but diminishes with time.

Scotopic as well as mesopic VA is reduced. Loss of contrast is comparable to the other IOLs we have studied. Light distribution is 65% for far and 35% for near VA. Loss of light is measured to be between 10% and 15% which means true light distribution of all incoming light is about 58% for far and 32% for near VA.

Our experience with the Hanita Bunnylens multifocal IOL is summarised in Figure 17.

Our results showed excellent UCDVA and UCNVA, and, surprisingly enough, also very good intermediate UCVA. Once again, patients are willing to tolerate imperfect NVA as long as the DVA is more than 0.8 OU. This IOL is also the most affordable of the six IOLs and excellent quality and value for money.

5. Zeiss AT Lisa Tri 839 MP
(Figure 18)

This IOL is also a true trifocal based on diffractive optics. It has +3.3D diffractive rings for near and +1.66D diffractive rings for intermediate VA. Light distribution is 50% for far vision, 20% for intermediate vision and 30% for near vision according to the manufacturers. Other authors state that 12.5% of light is reflected and therefore lost. That leaves approximately 44% for distance, 18% for intermediate and 26% for near vision. In spite of these figures the visual results are good for all distances, but side effects are still present.

Figure 18. Zeiss AT Lisa Tri (Toric) 839 MP IOL

The IOL has a plate haptic design, it is very easy to insert and centres well. Slight decentration of the IOL has no significant effect on the visual outcome.

The characteristics of the Zeiss AT Lisa Tri 839 MP IOL is summarised in Figure 19.

As with the other trifocal and bifocal IOLs with 360° concentric circular diffractive or refractive rings, this IOL also causes disphotopsia at night which will diminish over time. These include halos, glare and starburst. Due to division of incoming light, mesopic and scotopic VA is reduced.

Loss of contrast is minimal and is similar to that of the Tecnis Symfony which has virtually no loss of contrast sensitivity. Contrast sensitivity is claimed to be equal to normal adults in the same age group. UCDVA is a function of many factors and was excellent in our series. It is mandatory to achieve excellent UCDVA to attain patient satisfaction. Near and intermediate UCVA was very good.

An unexpected side-effect of this lens may follow the treatment of PCO. Because the AT Lisa Tri is based on a plate haptic platform, care should be taken not to do a very large YAG posterior capsulotomy to treat PCO. The reason for this is that the plate haptic IOL may not be 100% stable and may dislocate into the vitreous after a very large posterior capsulotomy.

Our experience with the Zeiss AT Lisa Tri IOL is summarised in Figure 20.

6. Tecnis Symfony presbyopia-correcting lens from AMO

AMO rightfully claims that this lens represents the next generation of presbyopia-correcting IOLs. The Tecnis Symfony merges two complementary technologies to create distance, intermediate and near vision. A proprietary diffractive echelette design feature extends or elongates the range of focus. (Echelette is derived from the French word ‘échelle’ which means ‘ladder’) (Figure 21).

Figure 21. The Technis Symfony from AMO IOL

Principles behind the Tecnis Symfony IOL: It merges two complementary technologies:

- A (proprietary) diffractive echelette design feature extends the range of vision. (echelette – from French echelle = ladder) Also called extended vision or elongated focus.
- The proprietary achromatic technology corrects chromatic aberration. This creates improved contrast sensitivity.

The Tecnis Symfony has nine diffractive steps (rings) and creates this elongated or extended focal pattern as seen in Figure 22.

Figure 22. The Tecnis Symfony IOL

Light patterns as created by different Tecnis IOLs are shown in Figure 23. It is clear that light is divided as with all other multifocal IOLs.

The second technology used by the Symfony is that of achromatic diffractive technology which corrects the chromatic aberration. Chromatic aberration is a result of the different refractive effect of lenses on light with different wavelengths (or colour).

As can be seen in Figures 24 and 25, these two technologies produce a lens
with an elongated focal area which creates multifocality as well as achromatic focus which gives very good contrast sensitivity. The Tecnis Symfony lens is easy to insert and unfolds very slowly which makes it very safe. It centres exceptionally well and is very stable in the capsular bag.

Contrast sensitivity is normal or even better than what is regarded as normal for people over 50 years (Figure 26).

Scotopic VA is slightly reduced as with all other multifocal, bifocal or trifocal IOLs.

Disphotopsia is always present, although patients tolerate it well. Patients often do not mention it until specifically asked about it. The disphotopsia gradually diminishes over time.

In our series decentration of more than 0.5 mm did not occur. However, within the range of 0–0.5 mm the centration did not have a significant effect on the outcome.

Our patients achieved excellent UCDVA (mean of 0.82) as well as mean UCIVA of 1.0. We were alerted that the near VA might be less perfect but were very satisfied with the UCNVA results. Mean UCNVA was 0.8 which was better than the At Lisa Tri as well as the Hanita MF Bunnyless (Figure 27).

Comments on the Tecnis Symfony IOL are summarised in Figure 28.

Summary
As mentioned before, the implantation of multifocal IOLs is as much an art as a science.

Patient selection is of prime importance. This includes ocular features, occupational requirements, as well as personality traits.
OU. Patients who do not have better than 0.8 uncorrected distance VA will not be happy even if they have good uncorrected near VA.

Whether micro-monovision was targeted or inadvertently achieved, the results are often excellent with no more side effects than when both eyes achieved emmetropia. The distance OU UCVA is once again the crucial value.

Post-op residual astigmatism should be less than 1.00 dioptre. This astigmatism is the culmination of a number of factors, including pre-op astigmatism, surgical technique, limbal relaxing incisions as well as the possible use of toric IOLs.

The presence of even the slightest PCO will decrease UCVA and increase side effects. Early YAG laser capsulotomy is more important than with monofocal IOLs.

The take-away messages are summarised in Figure 29.

Scotopic visual acuities are always diminished due to the inherent characteristic of the MF IOL to divide light. After all is said and done somebody has to be the funder of the surgery.

The cost of these so-called premium lenses is a major factor in patient selection.

If cost was not a factor, we would probably implant MF IOLs in more than 50% of patients’ eyes after cataract surgery. Presently this number is between 5% and 10%.

In 2015 we compiled a list of MF IOL prices which varied between R3 695 and R10 231 per MF IOL. These were the Nappi prices and included VAT.

Conclusions

Multifocal IOLs represent excellent technology and definitely have a place in refractive lens surgery, whether for cataracts or clear lens extraction.

If all the criteria as discussed above are met, patients can expect very good results and surgeons can expect high levels of patient satisfaction.

Bibliography


Comparing six multifocal IOLs over six years

CPD Article Questions

INSTRUCTIONS: Complete the questionnaire, then either scan and email it to John Woodford at John.Woodford@newmediapub.co.za, or alternatively, fax it to 086-534-1922. For any queries or problems please contact Chantal Adlard at Chantal.adlard@newmediapub.co.za or (011) 217-3126.

Questions True or false:

1. The Alcon Restor IOL is apodised.  
2. The Lentis Mplus IOL is trifocal.  
3. The Alcon Restor loses or reflects 18% of incoming light.  
4. The near vision segment of the Lentis Mplus must be in line with the visual axis.  
5. The Physiol Fine Vision trifocal IOL is a diffractive IOL.  
6. The Hanita Bunnylens MF is a trifocal IOL.  
7. The Zeiss AT Lisa Tri is also available in a toric version.  
8. The Tecnis Symfony is a bifocal IOL.  
9. Patients with MF IOLs are very insisting on good Uncorrected Near VA (UCNVA).  
10. All presbyopia-correcting IOLs cause side effects.

This is to state that I have participated in the CPD-approved programme and that these are my own answers.

Signature

Date

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<td>OCT angiography</td>
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<tr>
<td>12:30</td>
<td>Refreshments</td>
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<tr>
<td>12:30</td>
<td>Interactive OCT and angiography quiz</td>
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</tr>
<tr>
<td>16:00</td>
<td>Adjourn &amp; Refreshments</td>
<td>Exhibition Hall</td>
</tr>
</tbody>
</table>

**Pentacam & Refractive Workshop**
Exploring anterior segment tomography

*Chair: Dr Bill Nortje*

<table>
<thead>
<tr>
<th>Time</th>
<th>Event</th>
<th>Location</th>
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</thead>
<tbody>
<tr>
<td>16:30</td>
<td>Welcome</td>
<td>Room 1</td>
</tr>
<tr>
<td>16:30</td>
<td>Anterior segment tomography in cataract and refractive surgery</td>
<td></td>
</tr>
<tr>
<td>16:30</td>
<td>New advances in cataract surgery using corneal tomography</td>
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<tr>
<td>16:30</td>
<td>Interactive diagnostic quiz</td>
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<tr>
<td>18:45</td>
<td>Adjourn</td>
<td>Exhibition Hall</td>
</tr>
</tbody>
</table>

**OPHTHALMIC PROGRAMME**

**THURSDAY, 10 MARCH 2016**

**SESSION 1 (Plenary)**

*Chair: Dr Pieter Odendaal*

<table>
<thead>
<tr>
<th>Time</th>
<th>Event</th>
<th>Location</th>
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</thead>
<tbody>
<tr>
<td>08:00</td>
<td>Official Opening &amp; Welcome</td>
<td>Room 1</td>
</tr>
<tr>
<td>08:10</td>
<td>Opening speaker: Back to basics: “San Solutions”</td>
<td></td>
</tr>
<tr>
<td>09:00</td>
<td>Plenary adjourns</td>
<td>Exhibition Hall</td>
</tr>
</tbody>
</table>

**SESSION 2A**

*Chair: Prof Trevor Carmichael*

<table>
<thead>
<tr>
<th>Time</th>
<th>Event</th>
<th>Location</th>
</tr>
</thead>
<tbody>
<tr>
<td>09:15</td>
<td>Sam and Dora Cohen Lecture DALK: What it has taught us about corneal ultrastructure</td>
<td>Room 1</td>
</tr>
<tr>
<td>09:40</td>
<td>Endophthalmitis after intravitreal drug application: how much prophylaxis is needed: What is different to post-cataract infections?</td>
<td>Room 1</td>
</tr>
<tr>
<td>10:05</td>
<td>Discussion</td>
<td></td>
</tr>
<tr>
<td>10:15</td>
<td>Refreshments &amp; Exhibition</td>
<td>Exhibition Hall</td>
</tr>
</tbody>
</table>

**SESSION 2B**

*Chair: Dr Wayne Marais*

<table>
<thead>
<tr>
<th>Time</th>
<th>Event</th>
<th>Location</th>
</tr>
</thead>
<tbody>
<tr>
<td>09:15</td>
<td>Detecting glaucoma progression with imaging</td>
<td>Room 2</td>
</tr>
<tr>
<td>09:35</td>
<td>New progress in retinal imaging</td>
<td></td>
</tr>
<tr>
<td>09:55</td>
<td>A classification of image artefact in split-spectrum amplitude decorrelation angiography of the choroid in macular disease</td>
<td>Room 2</td>
</tr>
<tr>
<td>10:03</td>
<td>Discussion</td>
<td></td>
</tr>
<tr>
<td>10:15</td>
<td>Refreshments &amp; Exhibition</td>
<td>Exhibition Hall</td>
</tr>
</tbody>
</table>

**SESSION 3A**

*Chair: Dr Linda Visser*

<table>
<thead>
<tr>
<th>Time</th>
<th>Event</th>
<th>Location</th>
</tr>
</thead>
<tbody>
<tr>
<td>11:00</td>
<td>Successful vitrectomy for retinal detachment, but unhappy patients: Monocular problems may cause significant binocular disturbances.</td>
<td>Room 1</td>
</tr>
<tr>
<td>11:20</td>
<td>Choroidal melanoma: Endo versus exoresection?</td>
<td></td>
</tr>
<tr>
<td>11:28</td>
<td>The journey into DMEK: Challenges and rewards</td>
<td></td>
</tr>
<tr>
<td>11:48</td>
<td>Management of infectious keratitis after corneal graft surgery in the immediate post-operative period</td>
<td>Room 1</td>
</tr>
<tr>
<td>Time</td>
<td>Session</td>
<td>Speaker(s)</td>
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<tr>
<td>11:55</td>
<td>Lipid Keratopathy: Diagnostic and management challenges</td>
<td>Prof Trevor Carmichael</td>
</tr>
<tr>
<td>12:03</td>
<td>Discussion</td>
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<tr>
<td>12:30</td>
<td>Lunch &amp; Exhibition (Until 14:30)</td>
<td>Exhibition Hall</td>
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<td><strong>SESSION 3B</strong></td>
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<td><strong>Room 2</strong></td>
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<td></td>
<td><strong>SASPOS</strong></td>
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<tr>
<td></td>
<td><strong>Chair:</strong> Dr Gideon du Plessis &amp; Prof Tony Murray</td>
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<tr>
<td>11:00</td>
<td>Introduction</td>
<td>Prof Tony Murray</td>
</tr>
<tr>
<td>11:05</td>
<td>The surgical management of strabismus in Duane retraction syndrome</td>
<td>Prof Stephen Kraft, University of Toronto, Canada</td>
</tr>
<tr>
<td>11:35</td>
<td>A practical approach to vertical strabismus: It is not a “black box”!</td>
<td>Prof Stephen Kraft, University of Toronto, Canada</td>
</tr>
<tr>
<td>12:05</td>
<td>Panel discussion: Current concepts &amp; controversies</td>
<td>Prof Stephen Kraft, Dr Gideon du Plessis &amp; Prof Tony Murray</td>
</tr>
<tr>
<td>12:30</td>
<td>Lunch &amp; Exhibition (Until 14:30)</td>
<td>Exhibition Hall</td>
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<tr>
<td></td>
<td><strong>Workshop 1</strong></td>
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<td><strong>Sponsored by Investec Bank</strong></td>
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<td><strong>Investec wealth and investment</strong></td>
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<tr>
<td>13:30</td>
<td>An overview on wealth management</td>
<td>Ms Ronelle Hutchinson</td>
</tr>
<tr>
<td>14:10</td>
<td>Discussion</td>
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<tr>
<td>14:20</td>
<td>Adjourn</td>
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<tr>
<td></td>
<td><strong>Workshop 2</strong></td>
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<td><strong>Room 2</strong></td>
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<td><strong>Sponsored by MedeQuip</strong></td>
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<tr>
<td></td>
<td><strong>New Modalities of Laser Treatment of the Retina</strong></td>
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<td></td>
<td><strong>Chair:</strong> Dr Jan Niemandt</td>
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<tr>
<td>13:30</td>
<td>Welcome</td>
<td>Mr Bassem Bouhabib</td>
</tr>
<tr>
<td>13:35</td>
<td>MicroPulse™ Laser Treatment: A paradigm shift in management of Macular Disorders</td>
<td>Dr Ajay Aurora, Vision Plus Eye Centre, India</td>
</tr>
<tr>
<td>14:05</td>
<td>Discussion</td>
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<tr>
<td>14:15</td>
<td>Closing remarks</td>
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<td>14:20</td>
<td>Adjourn</td>
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<tr>
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<td><strong>SESSION 4A</strong></td>
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<td><strong>Room 1</strong></td>
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<tr>
<td></td>
<td><strong>Chair:</strong> Dr Priscilla Makunyane *Registrar presentations</td>
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<tr>
<td>14:30</td>
<td>Selection of treatment for diabetic retinopathy</td>
<td>Prof Gisèle Soubrane, Hotel Dieu, University of Paris V, France</td>
</tr>
<tr>
<td>14:50</td>
<td>Ossa Diabetic Retinopathy system report back</td>
<td>Dr Stephen Cook</td>
</tr>
<tr>
<td>14:58</td>
<td>Pseudoexfoliation: What do I need to know?</td>
<td>Prof Stephen Vernon, University Hospital, Nottingham, UK</td>
</tr>
<tr>
<td>15:18</td>
<td>The success rate of express valve implantation for the treatment of intraocular pressure of glaucoma patients</td>
<td>Dr Johan de Lange</td>
</tr>
<tr>
<td>15:26</td>
<td>Pharmacological correction of Presbyopia</td>
<td>Prof Claes Feinbaum, Israel</td>
</tr>
<tr>
<td>15:34</td>
<td>24-Month dynamic range of visual outcomes after LaserACE Procedure</td>
<td>Dr Sheri Rowen, California, USA</td>
</tr>
<tr>
<td>15:42</td>
<td>Barriers to cataract surgery in Africa: A systematic review</td>
<td>*Dr Shaheer Aboobaker</td>
</tr>
<tr>
<td>15:50</td>
<td>Retinal double homicide with an unexpected assailant</td>
<td>*Dr Daemon McClunan</td>
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<tr>
<td>15:58</td>
<td><strong>Discussion</strong></td>
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<tr>
<td>16:15</td>
<td>Refreshments &amp; Exhibition</td>
<td>Exhibition Hall</td>
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<td><strong>SESSION 4B</strong></td>
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<td><strong>SASPOS continues</strong></td>
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<td><strong>Chair:</strong> Dr Nicola Freeman &amp; Prof Ismail Mayet</td>
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<tr>
<td>14:30</td>
<td>Case presentation</td>
<td>Dr Hemant Kana</td>
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<tr>
<td></td>
<td><strong>Workshop:</strong> Difficult ROP cases. Treat or not to treat? Avastin or Laser? More laser? More Avastin?</td>
<td>Dr Nicola Freeman, Prof Ismail Mayet, Dr Linda Visser, Dr Christopher Tinley, Dr Bernard Wolff &amp; Dr Pieter Odendaal</td>
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<tr>
<td>15:40</td>
<td>SASPOS AGM</td>
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<tr>
<td>16:00</td>
<td>Refreshments &amp; Exhibition</td>
<td>Exhibition Hall</td>
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<td>16:45</td>
<td>Ossa AGM</td>
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<td>17:45</td>
<td>OMG AGM</td>
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<td><strong>Free evening</strong></td>
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<td><strong>FRIDAY, 11 MARCH 2016</strong></td>
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<tr>
<td>06:30</td>
<td>SOS Fun Run / Walk</td>
<td>Meet behind the Cascades’ swimming pool</td>
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<tr>
<td>07:00</td>
<td>Registration</td>
<td>Congress Office</td>
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<td></td>
<td><strong>SESSION 5A</strong></td>
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<td><strong>Room 1</strong></td>
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<td></td>
<td><strong>Chair:</strong> Dr Kgao Legodi</td>
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<tr>
<td>08:00</td>
<td>Impact of pseudo reticular drusen on AMD progression</td>
<td>Prof Gisèle Soubrane, Hotel Dieu, University of Paris V, France</td>
</tr>
<tr>
<td>08:20</td>
<td>Anatomic retina reattachment after surgery for inferior break retina detachment: How did eyes with advanced PVR perform?</td>
<td>Dr Olufemi Oderinlo, Nigeria</td>
</tr>
<tr>
<td>08:28</td>
<td>Multimodality imaging in Mac Tel 2</td>
<td>Dr Lihteh Wu, Costa Rica</td>
</tr>
</tbody>
</table>
SESSION 5B
Chairs: Dr Johan de Lange & Dr Jerome Bovet
Presbymania joint meeting with OSSA

All about presbyopia

08:00 Visual acuity, resolution and tests
Dr Jerome Bovet, Switzerland

08:12 The rescuer
Prof Claes Feinbaum, Israel

08:24 3D computational model of mechanism of human ocular accommodation
Dr AnnMarie Hipsley, California, USA

08:36 Limits in hyperopic corneal refractive surgery
Dr Klaus Ditzen, Germany

IOL for presbyopia correction

08:48 Visual analysis for a large series of Trifocal IOLs
Dr Gilles Lesieur, France

09:00 The first results after the implantation of the Lentis Comfort toric
Dr Magda Rau, Germany

09:12 Mix of Lentis mplus, Lentis comfort, Mplus toric, Comfort toric to achieve higher satisfaction
Dr Magda Rau, Germany

09:24 Experience with a fluid filled accommodating IOL
Dr Frik Potgieter, South Africa

09:36 Comparing six different multifocal IOL’s over a period of six years
Dr Johan de Lange, South Africa
Umbilical Cord Blood Serum Eye Drops

Used in the treatment of eye disorders to accelerate the regeneration of the corneal epithelium

OptiSerum

Invest in your future health
SESSION 6B

**Chairs:** Dr Johan de Lange & Dr Jerome Bovet

**Laser excimer for presbyopia correction**

<table>
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<tr>
<th>Time</th>
<th>Title</th>
<th>Presenter</th>
<th>Location</th>
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<tbody>
<tr>
<td>11:00</td>
<td>100 Cases with advanced isovision formula, wavefront laski surgery</td>
<td>Dr Jerome Bovet, Switzerland</td>
<td>Room 2</td>
</tr>
<tr>
<td>11:12</td>
<td>ISOVISION: A new standard of Presbylasik</td>
<td>Dr Frederic Hehn, France</td>
<td>Room 2</td>
</tr>
<tr>
<td>11:24</td>
<td>Aspherical PresbyCor treatment</td>
<td>Dr Charles Ghenassia, France</td>
<td>Room 2</td>
</tr>
<tr>
<td>11:36</td>
<td>How to preserve the corneal endothelium when performing refractive lens exchange</td>
<td>Prof Claes Feinbaum, Israel</td>
<td>Room 2</td>
</tr>
<tr>
<td>11:48</td>
<td>Comparison of 4 multifocal IOLs in a series a 1200 consecutive cases: Functional and anatomical outcome</td>
<td>Dr Michael Assouline, France</td>
<td>Room 2</td>
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<tr>
<td>12:00</td>
<td>Discussion</td>
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**Presbyopia correction: New technology**

<table>
<thead>
<tr>
<th>Time</th>
<th>Title</th>
<th>Presenter</th>
<th>Location</th>
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</thead>
<tbody>
<tr>
<td>12:15</td>
<td>SMILE-Procedure for Myopia and Myopic astigmatism</td>
<td>Dr Klaus Ditzen, Germany</td>
<td>Room 2</td>
</tr>
<tr>
<td>12:27</td>
<td>Analysis and effects of LaserACE Procedure dysfunctional lens syndrome using ray tracing Wavefront analysis after laser anterior ciliary excision on presbyopic eyes</td>
<td>Dr AnnMarie Hipsley, California, USA</td>
<td>Room 2</td>
</tr>
<tr>
<td>12:39</td>
<td>Managing Presbyopia with an implantable Phacic Contact Lens Implant</td>
<td>Dr Johann Krüger, South Africa</td>
<td>Room 2</td>
</tr>
<tr>
<td>13:01</td>
<td>A risk-benefit analysis of the PresbyEyedrop</td>
<td>Dr Sudi Patel</td>
<td>Room 2</td>
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<tr>
<td>13:13</td>
<td>Discussion</td>
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<td>Room 2</td>
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<tr>
<td>13:30</td>
<td>Lunch &amp; Exhibition (Until 14:00)</td>
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<td>Exhibition Hall</td>
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**SESSION 7B**

**Chair:** Dr Marissa Willemse

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<th>Location</th>
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<tbody>
<tr>
<td>08:00</td>
<td>Pearls and pitfalls in strabismus diagnosis and management</td>
<td>Prof Stephen Kraft, University of Toronto, Canada</td>
<td>Room 4</td>
</tr>
<tr>
<td>08:20</td>
<td>When should I do provocative tests in glaucoma?</td>
<td>Prof Stephen Vernon, University Hospital, Nottingham, UK</td>
<td>Room 4</td>
</tr>
<tr>
<td>08:40</td>
<td>Imaging of ocular rectus muscles - with OCT and UBM</td>
<td>Prof Stephen Kraft, University of Toronto, Canada</td>
<td>Room 4</td>
</tr>
<tr>
<td>09:00</td>
<td>Techniques and results in external cycloidiode treatment of glaucoma</td>
<td>Prof Stephen Vernon, University Hospital, Nottingham, UK</td>
<td>Room 4</td>
</tr>
<tr>
<td>09:20</td>
<td>How does Sevoflurane Induction, followed by Intravenous Ketamine Infusion, affect intraocular pressure? A protocol for paediatric glaucoma examinations under anaesthesia</td>
<td>Dr Christopher Tinley</td>
<td>Room 4</td>
</tr>
<tr>
<td>09:28</td>
<td>Primary congenital glaucoma: Pathogenesis and genetics</td>
<td>Dr Susan Williams</td>
<td>Room 4</td>
</tr>
<tr>
<td>09:36</td>
<td>Congenital stationary night blindness</td>
<td>Dr Irene Freed</td>
<td>Room 4</td>
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INJECTION

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### Programme

**SESSION 9B**  
**Room 4**

<table>
<thead>
<tr>
<th>Time</th>
<th>Event</th>
<th>Speaker/Institution</th>
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</thead>
<tbody>
<tr>
<td>14:00</td>
<td>The functional benefits of adult strabismus surgery: It is not cosmetic!</td>
<td>Prof Stephen Kraft, University of Toronto, Canada</td>
</tr>
<tr>
<td>14:30</td>
<td>3 years results after the implantation of the Microstent Cypass</td>
<td>Dr Madga Rau, Germany</td>
</tr>
<tr>
<td>14:40</td>
<td>Finding Schlemm’s canal: A video guide</td>
<td>Dr Jeshal Patel</td>
</tr>
<tr>
<td>14:50</td>
<td>Innovative soft contact lens to treat Corneal Edema</td>
<td>Prof Claes Feinbaum, Israel</td>
</tr>
<tr>
<td>15:00</td>
<td>Outcomes and patient satisfaction with Sub-Tenon’s Anaesthesia for intraocular lens implantation in 500 patients using a novel technique</td>
<td>Dr Dagobert Lerch, Switzerland</td>
</tr>
<tr>
<td>15:10</td>
<td>Cataract surgery combined with PCCC and anterior vitrectomy for asteroid hyalosis</td>
<td>Prof Zsolt Biró, Hungary</td>
</tr>
<tr>
<td>15:20</td>
<td>Endoscopy of the Lacrimal System and introduction of a Silicone Cannula</td>
<td>Dr Jerome Bovet, Switzerland</td>
</tr>
<tr>
<td>15:30</td>
<td>Discussion</td>
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</tbody>
</table>

**SESSION 8**  
**Room 1**

**DJ Wood Lecture**  
**Chair:** Dr Andrew Boliter

<table>
<thead>
<tr>
<th>Time</th>
<th>Event</th>
<th>Speaker/Institution</th>
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</thead>
<tbody>
<tr>
<td>11:00</td>
<td>National health: Back to the future</td>
<td>Dr Kgosi Letlape</td>
</tr>
<tr>
<td>12:00</td>
<td>Lunch &amp; Exhibition (Until 14:00)</td>
<td>Exhibition Hall</td>
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**SESSION 9A**  
**Room 1**

**Chair:** Dr Jan Talma

<table>
<thead>
<tr>
<th>Time</th>
<th>Event</th>
<th>Speaker/Institution</th>
</tr>
</thead>
<tbody>
<tr>
<td>14:00</td>
<td>Interactive case presentation: Rare cases and unusual clinical courses</td>
<td>Dr Silvia Bopp, Eye Clinic Universitaetsallee MVZ, Bremen, Germany</td>
</tr>
<tr>
<td>14:30</td>
<td>Case Report of PPV and epiretinal membrane removal combined with Macular Buckle for macular schisis in a posterior staphyloma</td>
<td>Dr Alic Jacobsz</td>
</tr>
<tr>
<td>14:38</td>
<td>Clinical evaluation of the PrecizionToric IOL</td>
<td>Prof Mike Holzer, Germany</td>
</tr>
<tr>
<td>14:46</td>
<td>Regular Astigmatism: Adjusting your aim</td>
<td>Dr Niel Cornelius</td>
</tr>
<tr>
<td>14:54</td>
<td>Astigmatism management with toric IOL</td>
<td>Dr Jerome Bovet, Switzerland</td>
</tr>
<tr>
<td>15:02</td>
<td>A customized solution for high degree of Astigmatism in cataract surgery (Ultima Smart Toric IOL, caregroup)</td>
<td>Dr Johann Krüger</td>
</tr>
<tr>
<td>15:10</td>
<td>Indications for intraocular lens explant in patients with multifocal IOL</td>
<td>Dr Jan Venter</td>
</tr>
<tr>
<td>15:18</td>
<td>Bilateral experience with a novel fluid filled hydrophobic acrylic accommodative intraocular lens</td>
<td>Dr Frik Potgieter</td>
</tr>
<tr>
<td>15:26</td>
<td>Refractive laser: Where in the pupil do I centre my ablation?</td>
<td>Dr Bill Nortje</td>
</tr>
<tr>
<td>15:34</td>
<td>Long-term outcomes OFi-Lasik: A South African study</td>
<td>Dr Johann Krüger</td>
</tr>
<tr>
<td>15:42</td>
<td>Discussion</td>
<td></td>
</tr>
<tr>
<td>16:00</td>
<td>Refreshments &amp; Exhibition</td>
<td>Exhibition Hall</td>
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**SESSION 10**  
**Room 1**

**Ethics Session**  
**Chair:** Dr Pieter Odendaal

<table>
<thead>
<tr>
<th>Time</th>
<th>Event</th>
<th>Speaker/Institution</th>
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<tr>
<td>08:30</td>
<td>Ethics 2016: A potpourri</td>
<td>Prof Andries Stulting</td>
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<tr>
<td>09:00</td>
<td>The World and South Africa beyond 2016: The latest scenarios, flags and probabilities</td>
<td>Mr Clem Sunter</td>
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<td></td>
<td>- How to think about the future like a fox</td>
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<td>- The flags transforming the global game; and</td>
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<td>- The possibilities for South Africa</td>
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<tr>
<td>10:30</td>
<td>Discussion</td>
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<td>10:45</td>
<td>Congress closure</td>
<td>Dr Andrew Boliter, President: OSSA</td>
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<tr>
<td>11:00</td>
<td>Adjourn &amp; Refreshments</td>
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<tr>
<td>11:15</td>
<td>Shuttles depart to OR Tambo Airport</td>
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GYC-500 Vixi / GYC-500

The Small, Incredibly Versatile Green Laser Photocoagulator

The GYC-500 Vixi / GYC-500 is a solid state green laser that achieves stable treatment outcomes for multiple applications including, retinal photocoagulation, trabeculoplasty and iridotomy.

The user-friendly features include a compact and lightweight design, and a wide range of delivery options allowing versatility for in-office use and the surgical suite.
The ARVO Annual Congress began as a research meeting where all basic scientists working on eye or vision-related topics could meet and discuss and collaborate on future work. The networking and synergy is a fundamental component. This is the cutting edge of eye research and it helps to have some knowledge of the language of basic science to fully or even partly understand the discussions.

The first congress was held in 1968 in Sarasota, Florida and had 150 delegates. By 1979 there were 2,000 delegates and it largely stayed in Sarasota until 1995 when attendances had reached 7,000 and a larger venue was required. It then remained in Fort Lauderdale, Florida for 17 years until hotel costs and venue size forced it to rotate the venue within the USA from 2013, when Seattle was first used followed by Orlando, Florida, in 2014. The 2015 meeting we attended was in

ARVO was founded in 1928 in Washington, DC, by 73 ophthalmologists. Today it has 12,000 members with 45% living outside the USA. Currently 29% are MDs, 27% are PhDs while 35% are optometrists, osteopaths and veterinarians.
Denver, Colorado. The city lies close to the Rocky mountains which are invariably snow-capped, providing interest for South Africans. Profs Tombran-Tink and Barnstable were keen to show off the snowy peaks.

The heart of Denver Downtown is the 16th Street Mall, a vibrant and colourful stretch of bookstores, restaurants and coffee shops peppered with mimes, buskers and occasionally an impromptu piano performance. There is also the intermittent reminder that marijuana use is legalised in the state of Colorado, with little cannabis-laden air pockets along the street.

Parallel to, and a couple of streets away from the 16th Street Mall lies the Colorado Convention Centre, instantly recognisable by its iconic blue bear situated at the entrance and peering into the upper level of the building.

The Congress Centre in Denver is world-class and easily catered for the 11 000 delegates attending from all parts of the globe. About 80% of the 6 215 presentations were in poster form and they are changed daily so you would need to look at about 1 000 posters a day to just get through the posters on display.

Most people are focused on a small subject area and only interact with sessions or posters in their area of interest. The posters are arranged by topic so you can look, for example, only at cornea posters and attend only cornea lectures if you choose.

**Imaging in the eye conference**

The Imaging Conference is held a day before ARVO officially begins, and is a great way to ease into the meeting (and battle jetlag). This year the day appeared to be largely focused on the recently introduced OCT Angiography (OCTA) function and exciting developments and novel applications in this area.

Essentially the technology involves sequential and repeated OCT cross-sectional scanning to image the motion of light-scattering particles such as erythrocytes, creating a 3-dimensional representation of perfused retinal microvasculature. It appears to be particularly useful for demonstrating areas of non-perfusion and correlates well with fluorescein angiography. Some of the technological advancements discussed that have had a significant impact on image quality include motion-tracking or...
correction technology and optimisation of the Split-Spectrum Amplitude-Decorrelation Angiography (SSADA) algorithm. Motion correction software has improved the reliability and repeatability of images, while the optimised SSADA algorithm involves the use of 11 spectral slits rather than the full spectrum of light to achieve a crisper image.¹

Novel applications of this imaging modality include assessment of glaucomatous damage where loss of peripapillary vessel density correlates well with visual field change;² and retinal vascular perfusion density mapping in diabetics which provides a quantitative assessment of macular perfusion, enabling better risk assessment and monitoring for ischaemia, and allowing for more timely intervention.³

**Ageing and anti-ageing**

This year the ageing/anti-ageing topics were interesting and thankfully there was some progress at last. Dr Ilene Gipson reviewed the diseases of ageing that occur with ageing including dry eye disease and endothelial failure.⁴ In dry eye disease there is epithelial injury that leads to chronic inflammation, like a chronic auto-immune disease, and this causes the changes of ageing on the ocular surface. Controlling this chronic inflammation, she said, was key to controlling ageing processes.

Prof Kazuo Tsubota was very animated when discussing their work in Japan. There are two sides to the anti-ageing approach: One is to prolong life itself and the other is to improve quality of life or use the longevity approach to fight ageing conditions. We are aware of cataracts, open angle glaucoma and macular degeneration being age-related but there are a host of other common problems that might be amenable to this approach.⁵

Tsubota has pointed out that dry eye disease is age-related and he is testing anti-ageing approaches to prevent and treat it.¹ Calorie restriction (dieting) may prolong the life span by up to about 50% in animals. The diet supplement Resveratrol is being tried to produce the same effect in humans as has been demonstrated in animals by upregulating the Sirtuin (anti-ageing) gene.⁶ Calorie restriction has also been shown to reduce the incidence of ageing diseases like cancer, diabetes and vascular complications such as myocardial infarcts. Resveratrol acts as an anti-oxidant mopping up free radicals (ROS), which are damaging to cells. Tsubota has been able to show some success in alleviating dry eye in an animal model and is trying the approach in humans.

**Myopia**

There is currently a boom in myopia in the East.⁷ There has been an increase in prevalence from 10–20% some 60 years ago to 90% in young Chinese now. The genetic factors are being explored and genes involved are those involved in emmetropisation, the mechanisms that control eye growth and prevent abnormal axial lengthening.⁸ Abnormal length is produced, it appears, by local influences in the eye (not the brain) where retinal blur stimulates the genetic pathways in the retina to increase eye length. Where this continues, pathological myopia results.

But what factors other than genetics are involved? Near work and higher education levels have been strong associations but the mechanism now is thought to be too little time spent outdoors in sunlight. It is suggested that outdoor play, in addition to reduced near accommodation, might be important because sunlight may stimulate the release of dopamine, which in turn may inhibit eye lengthening. Retinal dopamine is diurnally produced, peaking in sunlight hours, and three hours per day are required under lighting of 10 000 lux. This is equivalent to ‘someone under a shady tree, wearing sunglasses, on a bright summer day’. The use of appropriately powerful indoor lighting may be able to replace this but it is not known if this will be successful.

**Epigenetics**

In addition to genetic risks for myopia, humans may carry ‘risk alleles’ for many diseases and, depending on how many risk alleles you carry, the risk for developing the specific disease might increase until it occurs. Epigenetics is regulation of DNA activity without a change in the DNA sequence. Dr Caroline Klaver from Rotterdam, Netherlands, spoke on how it is possible to ‘eat away the genetic risk’ by a good diet. This is essentially the basis for the AREDS 2 study where lutein and zeaxanthin replaced beta carotene and were shown to reduce the risk for developing advanced AMD. The AREDS 2 results were reported at ARVO 2013.

Dr Klaver also said that reduced risk of AMD could be achieved by a diet of 200 grams of vegetables per day, two pieces of fruit per day and eating fish twice a week. Only 3.5% of individuals studied did all three of these and their risk reduction was 44%.

**Award Lectures**

One of the highlights of the conference, and seemingly attended by most of the thousands registered, were the Award Lectures held late on many of the evenings. The Champalimaud Vision Award Lecture is probably the most prestigious of these. The Champalimaud Foundation was established in 2005 and is based in Lisbon, Portugal. The Foundation’s focus is the support and stimulation of new discoveries and knowledge that serves to improve the health and well-being of people around the world (http://www.fchampalimaud.org).

The Antonio Champalimaud Vision Award is the highest distinction in Ophthalmology and Visual Science, and the recipient(s) receive €1 million towards their field of contribution. On even-numbered years the award is given for contributions towards overall vision research and on odd-numbered years for contributions to the alleviation of visual problems, particularly in developing countries.
Previous award recipients include Aravind Eye Care System (2007), Helen Keller International (2009) and in 2012 to six individuals for contributions towards the development of OCT imaging technology. The 2014 award was presented to seven researchers for their role in the development of anti-angiogenic therapy for retinal disease, and recognised the entire scientific process which had a significant impact not only in Ophthalmology but in Oncology as well.

The Award Lecture was presented by two of the recipients, Joan Miller and Napoleone Ferrara, who took us through a scientific journey spanning more than three decades from conception to development of the anti-angiogenic factors we are so familiar with in clinical practice today. They also identified current challenges which include the identification of predictive biomarkers, optimal treatment combinations and duration, as well as mechanisms for resistance.

**Take home message**

It was wonderfully inspiring to listen to those at the forefront of discovery, to learn from their research processes and to acknowledge their contributions. Clinician scientists play an essential and distinct role in the advancement of medical research and technology and have been responsible for some of the most defining and significant advancements in health care. They are now very few in number however, and make up only a small proportion of the profession.

The most significant barriers appear to be overwhelming clinical demands, lack of research funding and low financial remuneration. Research collaborations are key to addressing some of these issues, and ARVO provides an excellent opportunity to engage with those in your field of interest. There is ample opportunity for networking (quite unapologetically, and completely expected), and always a flurry of ideas for new and existing research development that will certainly leave you inspired and motivated to connect with the scientist within.

**References**

Small group learning

Do you attend your local Journal Club meetings regularly? If not, you are missing out on a great way to keep up your CPD. Don’t have a local Journal Club? No problem! It’s easy to set one up.

I set up the Optiklin Journal Club in Benoni in 1996 and we have been going non-stop every month for 20 years!

You just need one responsible person in charge (the Chairman) and the rest is easy. You simply meet once a month for two hours and discuss Ophthalmology.

We meet on the second Monday of every month from 18h30 to 20h30 in the boardroom of Netcare Optiklin Eye Hospital. Here are some photos taken in 2015:

The first hour is usually devoted to case presentations. These are cases of interest or difficult cases that colleagues have seen in their practices during the last month. We have a small examination room with slitlamp next door to the boardroom and sometimes real live patients are brought in for all attendees to examine. This is a great way to deal with difficult cases that you are battling to manage in your private practice. The patients are always very grateful that you have taken the trouble to get all these other opinions. The patients are also grateful that they have got all these extra opinions for free! Of course, a prominent note must be made in the patient’s file about this for medico-legal purposes. There can be few better ways of covering yourself legally than presenting a patient live at an academic meeting.

The second hour is then devoted to the journals. Journal articles are presented and discussed. Some Journal Clubs devote an entire meeting to one or two journal editions or even just to one or two articles; these articles are then discussed in great depth and criticised as a referee would do for a peer-reviewed article. But at Optiklin we prefer to skim through many articles from many different sources. In this way we cover a wide variety of issues in Ophthalmology ranging from basic sciences, to clinical applications, ethical issues, political, and financial issues, etc. If an article is particularly important then we may discuss that article in more depth or even defer it till the next meeting while more investigation is done in the interim.

We try to stick to topics that concern all general ophthalmologists. For example, there may be only one or two refractive surgeons attending a particular meeting in which case we will not discuss LASIK techniques. Of course, cataract surgery is the topic most often covered with most of our articles coming from The Journal of Cataract and Refractive Surgery (‘the orange journal’) which is the official journal of the American Academy of Ophthalmology (AOS) and Ophthalmology (‘the blue journal’) which is the official journal of the American Academy of Ophthalmology.

We also have frequent report-back talks. These are talks given by one of us local ophthalmologists about congresses that they have recently attended.

Sometimes we have ‘special guests’ from other areas to give us talks. For example, Prof Trevor Carmichael gave us a talk on steroid use in corneal ulcers, Prof Grant McLaren gave us a talk on current issues in glaucoma, Pierre Vercueil gave a talk on dry eye disease, Sue Williams on genetics, Frik Potgieter on corneal lamellar procedures, etc.

We are always looking for new special guests. If you have a favourite topic, special interest, or new technique that you would like to share please let me know if you would be prepared to come over and present it at one of our meetings. It would make good practice before a congress presentation! One proviso is that the special guest must not be a paid consultant of a pharmaceutical or medical supply company.

Representatives from pharmaceutical and medical supply companies are always keen to sponsor our meetings. We allow only a minimal sponsorship which is basically just providing a basic meal (usually pizza as you can see in the photos) and soft drinks. The reps are present only at the beginning of the meetings to greet the doctors and to maybe say a few words about a new product. Thereafter the meetings are completely free of any corporate influence. We also change the sponsoring company for each meeting so as not to allow any one company too much influence. Netcare, however, is a constant sponsor of the actual journals that we receive and the venue of the meetings.

The number of attendees varies from five to 20. Of these, the majority are senior doctors (over age 45). Some time back we even had the privilege of having the regular attendance of the then most senior practicing ophthalmologist in the country, Dr Harry Gelman, until he retired a few years ago. It is strange that we do not have more junior doctors attending as they certainly have the most to learn from their senior colleagues. I guess the stress of being in practice and looking after a young family takes its toll on our junior colleagues.

In the beginning the number of attendees was quite low because those were the days
The proven penetrating quality of VIGAMOX® solution allows it to go where pathogens live,¹ with proven potency against both gram-positive and gram-negative bacteria.²,³


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before compulsory CPD came into effect. In approximately 1998 CME (Continuing Medical Education) became compulsory for Medical Practitioners and this was great for our Journal Club because attendance figures doubled!

Getting CPD recognition for a Journal Club is quite an issue but easily accomplished. We use the CPD department of SAMA run by the very capable Lisa Reid for our points. We pay R600 per year for this service and we have to abide by certain rules and regulations. Attendees, at the discretion of the Chairman, get three non-ethical CPD points per meeting. To earn these points they are supposed to be on time for the meeting, participate actively, and stay till the end. Of course it puts the Chairman in an awkward position when certain colleagues always come late!

Above is an example of a CPD certificate. An attendance register also has to be kept and signed by all those present. This register must then be sent to the SAMA CPD Department after each meeting.

Small group learning has some distinct advantages compared with attending large congresses. Unless you are a speaker or chairman at a large congress you are much more involved at a small meeting. Everyone can have their say and give their input at a small meeting. Asking questions, disagreeing with speakers, criticising, etc., is much easier at a small meeting. A good chairman tries to get everyone’s opinion at a small meeting making ‘round table’ questions popular. For example: the chairman (or anyone) may ask: What is your preferred post-op drop regimen for pterygium cases? and then he gives each person around the table a chance to respond.

But of course the main advantage of having these meetings is for bonding with your local colleagues. And bond you should because these are the colleagues who are most likely to see your unhappy patients for second opinions!

All ophthalmologists and ophthalmology registrars are welcome to attend our meetings free of charge! For seating and catering purposes please email me beforehand.

Dr Clive Novis
Dip Optom, MBBCh(Wits),
MMed(Wits), FCS(Ophth)
clivenovis@mweb.co.za
**multicolor™ - Scanning Laser Imaging**

MultiColor™ - Scanning Laser Imaging brings a new dimension to the SPECTRALIS multi-modality platform by combining simultaneous SD-OCT and selective color fundus imaging in a single device.

MultiColor™ images are illuminated simultaneously with three select color wavelengths: infrared, green and blue, providing diagnostic information originating from different retinal structures within a single examination, revealing diagnostically relevant details at different depths within the retina.

The resulting color images are clear, finely detailed, and include structural information from different retinal layers, even in difficult to image patients such as those with advanced cataracts or eye movement disorders. The image clarity and detail is a result of SPECTRALIS core technologies: confocal scanning laser opthalmoscopy (cSLO), TruTrack™ active live eye tracking and Heidelberg Noise Reduction™ technology.

![Fundus Camera and MultiColor™](image)

The area of geographic atrophy is clearly demarcated in the MultiColor™ image. In addition, the peripheral reticular drusen are more easily identified.

![Infrared Reflective, Green Reflective, Blue Reflective](image)

The versatility to view images of the individual laser colors in addition to the MultiColor™ image can provide a deeper understanding of anatomic and pathologic detail.

**INFRARED REFLECTIVE**
The infrared laser penetrates the deepest providing images of the retinal pigment epithelium (RPE) and the choroid and is particularly useful for imaging drusen.

**GREEN REFLECTIVE**
The green laser is highly absorbed by haemoglobin and provides details on blood vessels, blood and eudemoids.

**BLUE REFLECTIVE**
The blue laser captures details of superficial retinal structures such as epiretinal membranes, the retinal nerve fiber layer (RNFL) and macular pigment.

"The benefit of MultiColor™ in clinical practice is its capability of highlighting diseases found to be more difficult to recognize in traditional colour fundus photographs."

Sebastian Wolf, MD, PhD

"The detail and contrast in the MultiColor™ images has helped me identify pathologies which were unclear on the corresponding color fundus images."

Sebastian Wolf, MD, PhD

This innovative new imaging modality expands the diagnostic portfolio of eyecare professionals with a tool that further improves the diagnosis and management of patients. Adding MultiColor™ imaging to standard examinations of patients has found its entry in daily practice routine.

Sebastian Wolf, MD, PhD

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Willie Trollip - 083 602 6839  
Rowan Emslie - 083 290 2528  
Bernhard Volschenk - 083 602 6861

Johannesburg:
Jacaranda Symposium October 2015

Dr Helen de Jager (left) is seen here with Dr Gideon du Plessis (right)

Dr Hennie Scholtz (left) is seen here with Dr Jan Talma (right)

From left to right: Dr Robert Reid, Dr Wouter Smith and Dr Pieter Olivier

From left to right: Dr Julie Conradie, Dr Jan Talma, Dr Linda Visser and Dr Thalitha Maritz (Namibia)

From left to right: Drs Etienne le Roux, Gerhard Koh, Linda Visser, Aritha du Bruyn and Johan de Lange

Dr Shabir Hussain (left) is seen here with Dr Karsten Visser (right)
Prof Edward Buckley was one of the Invited Guest Speakers.

From left to right: Dr Karsten Visser, Dr Themba Ndlovu and Dr Clive Martin.

From left to right: Prof Ismail Mayet, Dr Farouk Adamjee and Dr Shashi Kassen.

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Congress news

Prof Tony Murray, one of the Invited Guest Speakers, is seen here surrounded by many beautiful ladies.

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1. Lester M. Brinzolamide. Expert Opin
H. Soysal K. et al. Intracerebral pressure lowering
effect of brinzolamide 1.5% as adjuncive therapy to
labetalol 0.085% in patients with open angle glaucoma
or ocular hypertension: an uncontrolled, open-label study. Curr

Alcon Laboratories (SA) (Pty) Ltd, P.O Box 3100, Randburg, 2125
Human placental membranes are used in various reconstructive surgical procedures as biological dressings, which aid in healing and act as a foundation material for the re-growth of soft tissue.

The amniotic membrane is the innermost layer of the placenta and consists of layers of cuboidal epithelium, collagen, cell-adhesion bio-active factors (fibronectin, laminins, proteoglycans and glycosaminoglycans) and growth factors.

**Next Biosciences produces 2 forms of amniotic membrane:**

**AmnioMatrix Cryopreserved Membrane** - freshly processed, cryopreserved amniotic membrane tissue graft that retains the vital cytokines and growth factors of the amniotic membrane. AmnioMatrix® is stored frozen and distribution is done by transport of samples on dry ice (-80°C). Samples can be stored for up to 3 months in a standard home freezer (-20°C). Once thawed this tissue product must be used immediately.

**AmnioMatrix Dehydrated Membrane** - dehydrated lightweight, gamma-sterilized, amniotic membrane tissue graft. It can be stored at room temperature and has a shelf life of 5 years.

Both forms of AmnioMatrix serve as potent facilitators in wound healing due to the many growth factors and cytokines found in the membranes and the basement membrane serves as a substrate for cellular growth. The membranes have been shown to reduce scarring and pain and have anti-inflammatory and anti-microbial effects. They show little to no HLA-A, B, C antigens or β2 microglobulins and are therefore immunologically inert.

The membranes are easily applied surgically using sutures or tissue glue.

**Available Product Sizes**

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- Band Keratopathy

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- Filtering surgery
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- Fornix Reconstruction
- Socket Reconstruction
- Entropion correction
- Scleral Melt

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www.nextbio.co.za
Tarek M Shaarawy – Guest Speaker

Tarek M Shaarawy is the Head of the Glaucoma unit and the Glaucoma surgery research group at the University of Geneva Hospitals. He obtained both his medical Bachelor and Masters Degree in ophthalmology from the University of Cairo, and his Doctorate in Medicine degree from the University of Lausanne. He trained in ophthalmology at the Cairo Research Institute of Ophthalmology and completed two glaucoma fellowships at the Universities of Lausanne and Basel.

He is currently the president of the International Society of Glaucoma surgery as well as the associate vice president of the World Glaucoma Association.

His main research interests are surgical techniques of Glaucoma surgery, normal pressure glaucoma, and glaucoma patterns of practice in developed and developing countries. He is the author and editor of six textbooks on Glaucoma, and more than 100 book chapters and publications in peer-reviewed journals.


Tarek Shaarawy is a founding member of the Baladi foundation providing glaucoma care in the south of Egypt. He is also active in a number of NGOs dealing with the global prevention of blindness.

Events

Congresses/Meetings 2016

March 2016
09–13 March
46th Annual National Congress of the Ophthalmological Society of South Africa (OSSA), Sun City Resort, South Africa.

Congress Organisers: Mr Heyns du Preez, Ms Amelia Koch and Mr Rhyno Kriek, tel: 051-436-7733, cell: 083-265-0265, fax: 086-6060-555
Email: ossacongress@telkomsa.net
Website: www.ossa2016.co.za
Postal address: PO Box 286941, Danhof, Bloemfontein 9310
Congress Convener: Dr Pieter Odendaal: 082-923-3466 or email: poden@mweb.co.za

May 2016
27–29 May
Annual Congress of the South African Glaucoma Society (SAGS)
Invited guest speaker: Dr Tarek Shaarawy from the University of Geneva hospitals
Venue: Spier Wine Estate, Stellenbosch, Western Cape
Contact: Congress Organiser: Lauren Ferreira: webmaster@dipity.co.za or fax 086-260-3594 or cell no 076-605-4175

June 2016
16–19 June
Annual Congress of the South African Vitreo-retinal Society (SAVRS)

Invited guest speaker: Dr Phillip Moradi from Moorfields Eye Hospital, London, England
Venue: Cathedral Peak Hotel in Kwazulu-Natal.
Contact details: Visit www.savrs.co.za to register.
Organiser: Dr Enslin Uys, cell no: 082-325-4913

23–25 June
The 4th International Thyroid Eye Disease Course and Symposium (ITEDS)
Registration: ITEDS Website: http://thyroideyedisease.org/
Queries: Contact Samantha Womack at Samantha.Womack@aesculap-academy.com
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ONSET IN THE MORNING

References:

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