

OBITUARY

Don Noack: (1933–2012)

A profile of a contact lens innovator and pioneer

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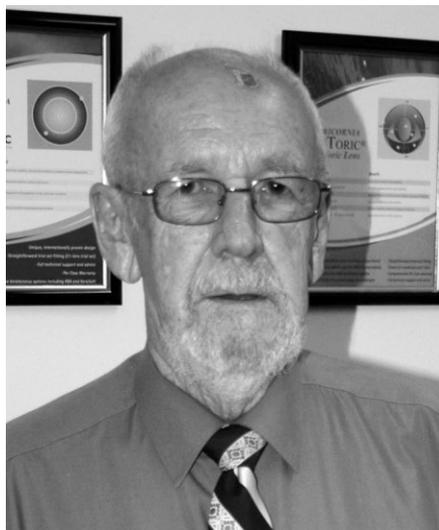
John Mountford Dip App Sci FAAO
FCCLSA FBCLA GradCertOcularTher
Brisbane, Queensland, Australia
E-mail: besty@bigpond.net.au

Donald Bruce Noack was born in Western Australia on the 27th of March 1933 and died in Brisbane on the 28th of June 2012. Don led an interesting life yet was perhaps the most private individual I have ever met. Lewis Williams¹ wrote an amazing obituary for Don, which uncovered parts of his history that I never knew, like the love of rallying and (through further research) being the accredited timekeeper for Sir Donald Campbells' world water speed record on Lake Dumbleyung on 31st January 1964.

He was one of the small number who studied optometry at the University of Western Australia to qualify for the Diploma of Optometry from the State Optometry Board in 1954, after starting the three year part-time course in 1950 and having to repeat third year due to failing the contact lens component of the course, ironically for a person who would make his name as a contact lens specialist. He later told Ian Sim² that he really had not studied for it hard enough but contact lens science then became an over-riding lifetime passion. As a child, he was always referred to as 'very bright' and breezed through school. He also developed an absolute passion and genius for mathematics.

I once asked him the perennial question of the mathematically challenged when faced with a complex formula: 'how do you understand what that means?' The reply was: 'because it is simple, just read it like it's a sentence'. It was this powerful knowledge of mathematics, computer programming and its practical application to the field of contact lens fitting and manufacture that made him a leader and pioneer in the area.

My first meeting with Don occurred one very hot and humid January morning



Don Noack

outside the offices of the International Optical Company in Edward St, Brisbane, in 1973. I was an optometry student employed to do the delivery runs all around Brisbane in a Morris Mini van. He was resplendent in a pinstriped suit, dark wavy hair and even more impressive because he was an optometrist. He was a hard boss and my main memory of that time (which I happily reminded him of regularly) was that he refused to pay my speeding fine.

Dr Joe Barr and I were talking to one of the new graduates at a Bausch & Lomb launch in 2011, when he said that the 'baby boomers' were the most fortunate group in optometry, as we had been involved in the revolution that took place in contact lens practice and research over the past thirty years. Contact lens practice in the 1970s was still considered to be more art than science, with polymethyl methacrylate (PMMA) being the only material of choice with a limited range of lens designs. In Australia, the two most commonly used lenses were the V Contour (Vic

Lowe, Melbourne) and the Conoid (Pen Thomas, Sydney). The basic equipment was a keratometer, a trial lens set and a Burton UV lamp. Soft lenses had only recently become available.

Don Noack spent most of his time in private practice and started the first contact lens only practice in Perth (the Microlens Centre). In 1972, he joined Penrhyn Thomas at the International Optical Company (IOC), where he stayed until 1977. Thomas was the entrepreneurial Sydney-based optometrist, who was driving contact lens enterprise at the time. Thomas had founded the company to make contact lenses to his designs.³ Don Noack's work with Penrhyn Thomas resulted in a patent for the world's first prism-free soft toric lens, the Zero 6 sphere and the sagittal height fitting philosophy used to fit them. At that time, the Zero 6 was the thinnest lathe cut lens with a centre thickness of 0.06 mm and was designed to address the problems associated with corneal oedema.

By far the most frustrating part of contact lens practice at the time was the accuracy and reproducibility of the lenses that were available. In 1978 I was invited to the IOC contact lens laboratory by Pen Thomas and was amazed to see the way lenses were made. An order would come in and the technician would proceed to go to a long high wall with a long stick and a note pad. He would start at the left hand side where the back optic zone radius (BOZR) was tabulated and then follow along the length of the wall noting the lathe settings for each of the peripheral curves. A minor step up or down the tabulated wall would lead to an incorrect lens being made. Accuracy and repeatability were even worse with lathe cut soft lenses.

Don Noack solved these problems by writing a program for the new Hewlett-Packard calculators that had just come on the market. By the early 1980s, he was working in private practice in Adelaide and

came into contact with a young Steve Newman. Steve was working for Hydron and having heard of Don's computing skills, approached him for help with standardising the production of soft lenses. This started a friendship and partnership that would last for life. They developed and patented the 'RP Toric', the first back-surface, reverse prism soft toric lens that was to become the gold standard of soft toric design and is still used today by many manufacturers.

In the late 1970s, Ron Geake started Capricornia Contact Lenses in Brisbane and I became their clinical consultant. This involved a lot of time talking with Don on solving problems of contact lens fitting. He was still a tough boss and would take no excuses if I got something wrong, which was often. He had a simple rule: he would tell you how to do something once and if it was not immediately stored in memory for instant retrieval later, there would be 'all hell' to pay, if the same question was asked at a later date.

Don had a share of Capricornia with Ron Geake and by the late 1980s, Don and Steve took over the running of the business. This led to the development of the Nu-Toric lens, which was based on the reverse prism but manufactured with one of the new computer numeric control lathes that could cut toric surfaces without crimping. Don wrote the software that ran the whole manufacturing process and it was this technology, as well as the lens designs, that attracted interest from Igel International (UK) and its gregarious CEO, Pravin Patel. Steve was sent to the UK and then Singapore to start the manufacturing process for Igel and Don was sent to the UK in 1991 to oversee the UK plant. He spent the next five years there, running the company and lecturing on all facets of contact lens design, manufacturing and fitting throughout the UK and Europe.

It was at the British Contact Lens Association (BCLA) conference in 1995 that our paths crossed again. We had become good friends through our involvement with Capricornia and it was great to find Don the same as ever, even though he had now grown a beard to protect himself from the British chill. South Australian contact lens guru, Tony Phillips, had volunteered to give two workshops at the BCLA on orthokeratology, which was just beginning to come back into clinical use following the development of reverse geometry lenses by Wlodgva and Stoyan.⁴

Don Noack was fascinated by orthokeratology and especially the application of sag theory to the fitting philosophy instead of the old 'flatter-than-K' approach. The practical application of corneal topography was also an absolute attraction to him. He said that he would soon be back in Australia and that we should do some work on it.

THE BE ORTHOKERATOLOGY LENS

He returned to Australia in 1996 and we started work on some of the problems associated with orthokeratology. First, Don asked me to organise the large database I had on all the patients that had been fitted with orthokeratology lenses. The second thing was to teach me the mathematics and theory of contact lens design, for which I will be eternally grateful.

We analysed the start and finish points and then tried to correlate that with the fitting relationship of the lens. There were too many variables, so Don came up with the idea of using an 'idealised' tear layer profile so the fit of the lens would be identical irrespective of the shape of eye, to which it was fitted.

Part of the fun in working with Don was thinking up names for the various lenses we tried. They had to be quirky. The 'ideal' lens design had an apical clearance of 10 μm and a maximum tear layer thickness of 50 μm at the edge of the back optic zone. Basically, it caused a 2.00 D refractive change on everyone, even in those with corneas with high eccentricity, which in theory, should have changed by more than that. Low myopes (up to 1.00 D) were always over-corrected and high myopes under-corrected but it taught us that the tear layer profile under the lens exhibited some control over the refractive change.

Those times were characterised by either my going over to his practice at Runcorn, a suburb of Brisbane, or his coming over to my house on Wednesday evenings with a fine bottle of red wine and working on spreadsheets with the accumulated data from all the lens fittings. As you can guess, the Wednesday night with red wine option became the favourite and that is when we started looking at the squeeze film forces generated in the post-lens tear layer as a driving force for corneal shape change.

Don was an avid cat lover and my son Chris had a black and white cat called Besty (short

for Sylvester), which approved of only one other human being outside the family, namely, Don. It was love at first sight for both of them and every Wednesday night when Don unpacked his laptop, uncorked the wine and sat at the dinner table, Besty would jump up and lie on the table beside him. The tear layer profile of the first squeeze film force based design looked like Besty's ears, so that is what it became. The BE was the first and only orthokeratology lens that did not use the Jessen Factor as a means of selecting the back optic zone radius. Instead, it used variations in apical clearance with a constant tear layer thickness at the back optic zone diameter to control the fluid forces based on the Conway formula.⁵ The commonly held belief at the time was that orthokeratology lenses applied apical pressure to the cornea, leading to corneal flattening. The Conway formula and other papers we found in the literature,⁴ showed conclusively that this was not the case, and that a far greater negative pressure at the back optic zone diameter/reverse curve junction was the main driver of the shape changes.

We published three papers on orthokeratology;⁶⁻⁸ the first on a mathematical model for corneal shape changes and two in conjunction with Pat Caroline on corneal topography and orthokeratology. These were the first papers to show the variation in corneal shape change with the accuracy of the lens fit and resulted in the terms 'bull's eye', 'central island' and 'smiley face' becoming part of the orthokeratology lexicon.

DON NOACK: SOFTWARE WRITER AND PROBLEM SOLVER

The software that Don wrote was simply amazing. I would come up with an idea for design variations and he would produce a program that would allow us to 'virtually' fit those lenses to any ocular shape and then calculate what would happen based on the squeeze film forces. The BE software is very complex but was designed to be as user friendly as possible. It was dependent on the data from corneal topography, which became an essential in all the lens designs we developed. The BE was followed by the KBA (keratoconus bi-aspheric), which had a variable back surface eccentricity determined by an optimum tear layer profile constructed over the corneal shape as determined by the Medmont topographer. The front surface needed to be corrected for radial astigmat-

tism due to the high back surface eccentricities and the effects of decentration, so Don bought ray tracing software, taught himself how to use it and developed an algorithm to solve the problem.

All the rigid gas-permeable (RGP) designs we developed were based on the concept of an optimal tear layer profile linked to corneal topographic data and we were fortunate to have a good working relationship with Medmont, so that all the designs could be accessed through their software. BE Enterprises was set up to oversee the lens designs and licensing.

At the same time, Don was still heavily involved with Steve Newman working for UltraVision developing moulded soft lens technologies in Singapore. He did the design and calculations for the moulds, and could talk for ages about the intricacies of radial and linear swell and shrinkage in the moulds and the other technological problems they had to solve. Don also designed the EpiCon, a semi-rigid carbosilfocon material with a Dk of 52 designed for keratoconus. It had a 13.5 mm diameter and was designed to be more comfortable than a standard RGP lens. Tony Phillips, Ron Corbett and I did the clinical trials, which were relatively successful, as the lens was comfortable to wear but it had an extremely short life span of about one month before it began to break down. It could not be produced as a disposable lens and was never released. Don converted the basics of the design, so that it could be made as an RGP lens and it is still available from Capricornia.

The loss of the ownership of Capricornia due to Igel being sold to Ultravision (a Canadian-based contact lens company) was always a disappointment for Steve and Don and he was delighted when they regained control of the laboratory in 2005. He had always worked at Capricornia on his return from the UK, as well as seeing patients at his Runcorn practice. He also found time to work with me on different projects and as a contact lens clinician at the Queensland University of Technology (QUT). The workload became too heavy, so he decided to close his practice in 2002. As was typical of Don, he gave all his patient records to Lucy Hsieh and his practice fittings to Paul Brand, both young graduates he had befriended while a clinician at QUT. Don had a natural affinity with both young and old practitioners and was always on hand to help solve those difficult fitting problems.

The day we helped him clear it all out was unforgettable, as he suffered a heart attack that evening.

In 2009, we were invited to Menicon Headquarters in Japan to discuss a possible collaboration in lens designs. We were told that we would be given fifteen minutes to meet with the legendary Chairman and contact lens pioneer Mr Kyoichi Tanaka. Prior to this, we had both read 'Kaigen: Kyoichi Tanaka's half century with contact lenses',⁹ which detailed his development of rigid lenses in Japan. Don asked some very interesting questions about those early days and a lively discussion took place. The meeting was extended time and again as the two pioneers talked about contact lens developments from their own perspectives. Eventually, after a long lunch and a guided tour of Tanaka's famous portraits of the Buddha, the fifteen minutes that had turned into six hours came to an end. Later, we were told that the Chairman had never before extended a meeting to such an extent, and that it was his fascination with the conversation and respect for Don that had been the cause.

Don made so many friends from all over the globe. The Global Orthokeratology Symposium became his favourite conference, as he would look forward to catching up with all his overseas colleagues. Along with Capricornia, he was a great supporter of the Australian Orthokeratology group (OSO). He also had a penchant for picking up nicknames, from the ubiquitous 'Uncle' from all of us that he mentored, to 'Dongle' for his love of security keys for his software, 'old grumpy' and 'old forgetful'.

His other passions were a good joke (of which he had thousands, thanks to friends and the internet) and T-shirts. We were at an orthokeratology symposium in Hawaii in 1999, when he met Scott Schacter, a young American optometrist with the same sense of humour. The next day, Scott presented Don with his favourite T-shirt, with the motif 'NO ACK!!!' on it. The translation from Hawaiian suits Don exactly. It retains pride of place in the Capricornia boardroom. His other prized T-shirt was the 'ROK Star' one presented to him by Helen Swarbrick when she set up the famous 'Research into OrthoKeratology' group. Don took great pride in the fact that BE Enterprises and Capricornia were research partners with Helen's group from the very beginning, as it continues to this day.

As a way of saying thanks for all he had taught me, I set aside funds from my share of the BE Enterprises profits to initiate the Don Noack Award which, for a time, was presented to the final year QUT optometry student, who was outstanding in the field of contact lens studies. Three of the recipients went on to be leaders of the next generation of contact lens practitioners: Celia Bloxson, Kate Johnson and Lachlan Scott-Hoy.

In 2010, The Cornea and Contact Lens Society of Australia awarded Don the inaugural Lifetime Achievement Award. He was also awarded the prestigious Paul Harris Fellowship by the Rotary Club. The Orthokeratology Society of Oceania renamed its life membership the Don Noack Award, with Helen Swarbrick being the first recipient.

Don's legacy was the development of intricate and complex software that drove the manufacturing of advanced RGP and soft lenses that is still in use today. I, like Steve Newman and so many others, was fortunate to have a mentor and friend of Don's calibre.

In hospital, it annoyed him that the nurses kept calling him 'Donald', as it was the name written on the sign near his bed. I rubbed it out and wrote:

'Don Noack, Dip.Opt. W.A.

One of the world's GREAT contact lens designers'

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