Operations Research Society of South Africa

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AT THE FOREFRONT OF ANALYTICS IN AFRICA

Welcome
ORSSA
2016

ORSSA Newsletter October 2016

From The Editor

By Bernie Lindner (berndtlindner@gmail.com)
& Brian van Vuuren (brianvv@sun.ac.za)

Bernie Lindner

Welcome to this exciting edition of the Newsleter. Which is jam packed (24 pages of jam to be exact) with articles, pictures, interiviews, and much more from the Conference that I hope most you just attended.

Brian van Vuuren

Jacques is back with his easy reading and witty take on the conference, make sure you read it (and try not to laugh too loud in your office).

Various students from the Industrial Engineering department interviewed a few delegates at the conference. This includes an interview with the opening keynote speaker, Erwin Pesch, did you know he is a huge elephant fan and actually had an elephant tie on during his presentation, read more on page 6.

There is a short article on page 17 on OR for development in South Africa, with a call for further information from anyone who has been involved in any structures related to OR for development in South Africa.

The newsletter ends (on page 24) with an obituary for the Late Dr. John Dean, a dear and missed member of ORSSA

Thank you to everyone who contributed to the information in this Newsletter. Thank you to my co-editor Brian van Vuuren, for all his efforts.

I hope you enjoy the newsletter, sit back relax, grab a coffee (or two it might take a while for you to finish reading) and reminisce on the Conference until we see each other again in 2017 at Champagne showers, Drakensberg!

Bernie Lindner

Features

From The President's Desk

By Winnie Pelser
(winnie.pelser@gmail.com)
ORSSA President

Winnie Pelser

The October edition of the newsletter reminds us that we are in the last quarter of the year. This edition is devoted to the 45th Annual *Operations Research Society of South Africa* (ORSSA) Conference held at Lanzerac Hotel in Stellenbosch. The conference was held from 11-14 September 2016 and was once again a memorable event and an outstanding success.

The conference commenced with a tutorial on agent based modelling presented by Brian van Vuuren. After the onsite registration, a welcome reception in the form of a cocktail function continued in the beautiful setting. It was encouraging to see several active ORSSA members, including many student delegates as well as delegates from industry.

The conference officially started on the Monday morning with a plenary lecture entitled *Optimisation problems in intermodal transport* by the keynote speaker Erwin Pesch from the University of Siegen. The programme continued in the form of four parallel streams of contributed talks on the use of *Operations Research* (OR) to address a large range of applications and developmental issues. The 2016 AGM was held on the Tuesday afternoon and was followed by a very enjoyable banquet. The conference closed on the Wednesday at lunch time after a total of 85 contributed papers and a closing plenary lecture entitled *The use of appropriate technology for tackling OR problems*, by Paul Fatti from the University of the Witwatersrand. Gerhard Geldenhuys and Hans Ittmann gave a reflection on the papers delivered at the conference.

A number of medals and recognition awards were awarded to our members at the banquet dinner. The illustrious 2016 Tom Rozwadowski Medal was awarded to Sheetal Silal from the University of Cape Town for a paper entitled *Hitting a Moving Target: A Model for Malaria Elimination in the Presence of Population Movement*, which appeared in the Plos One Journal. Five recognition awards were presented at the gala dinner:

Category I: To a retired member for outstanding contributions over a long period of time
• Kobus Wolvaardt (formerly a lecturer at the University of South Africa (UNISA))

Category II: To a current member for a single, outstanding achievement

• Danie Payne (Eskom)

Category III: To a non-member for outstanding contributions over a long period of time
• Fulufhelo Nelwamondo (Council for Scientific and Industrial Research (CSIR))

Category IV: To an upcoming member of age 35 or below for excellence in OR practice
• Danie Lötter (University of Stellenbosch)
• Bernard Schlünz (Nuclear Energy Corporation of South Africa (Necsa))

Congratulations to all recipients of these prestigious awards.

This year saw the elevation of a Fellow of the Society to Honorary Life Membership status, the highest honour our Society can bestow, to Hennie Kruger. My congratulations go to him and my thanks for all that he has done for ORSSA and OR over a long period of time.

Our students also excelled and were duly awarded at the conference. There were eight high-quality entries on honours level and four excellent entries on masters level of our annual (written) National Student Competition. The 2016 Gerhard Geldenhuys medal (for best 4th year/honours project) went to Thorsten Schmidt-Dumont (Stellenbosch University). The runner-up was JC van der Walt (Stellenbosch University). The winner of the Theo Stewart medal (for best masters thesis) was Martin Truter (Stellenbosch University). A very close runner-up was Brian van Vuuren (Stellenbosch University). Congratulations to these two awardees on their high-quality projects.

In addition to the National Student competition, prizes are also awarded for the best oral presentation at the conference in three different categories. The winners were as follows:
• Honours/4th year Category - Ghiete van Zyl,
• Masters Category - Samantha Movius, and
• Doctoral Category: Berndt Lindner.
Congratulations to these winners. More details on all the awards and prizes may be found elsewhere in this issue of the Newsletter.

Let me conclude by thanking every ORSSA member who attended the conference, presented a paper and/or helped organise the conference for making our 45th Annual Conference such a noticeable success! In particular, let me thank the Local Organising Committee (LOC) of the conference for their superb and extremely time consuming job of organising the conference so well. The LOC members were: Danie Lötter (Chair), Anton de Villiers, Jancke Eygelaar, Johan Kellermen, Janneke Lötter, Thorsten Schmidt-Dumont, Renier Steynberg, Jan van Vuuren and Lieschen Venter.

Our 46th Annual ORSSA Conference will be held at the Champagne Sports Resort in the beautiful Drakensberg during the period, 10 – 13 September 2017. Fanie Terblanche, our Vaal Triangle Chairperson, will be chair of the LOC. Please diarise the event and join us for another memorable conference. Details of the conference will soon be posted on the official ORSSA website.

Summary of the Conference

By Jacques du Toit, SCSGi & NaN:Data (jackdotwa@gmail.com)

The views expressed here were held briefly at the time of writing.

Jacques du Toit

The 46th Annual conference of the Operations Research Society of South Africa did not start for me at the wonderful welcome reception on Sunday, but rather zipping through the narrow streets of Stellenbosch and coming to the unsettling realisation that I might be late for my presentation. You see, I'm a bit of a procrastinator, and I have decided to busy myself by filling future-Jacques' plate in the hope that he will figure out how to get all the things done that I want to do. Alas, he has not. I'm convinced he's an idiot. He, and I, did attend the welcoming drinks the night before though and were both completely enamoured with the puzzle in the conference bag. It's maximum difficulty rating and description as a 'numerical nightmare' makes me certain that I'd better leave it for him. I'm still waiting for him to solve it.

The chair of the LOC, Danie Lötter, used the words 'idyllic' and 'tranquil' to describe the conference venue in the programme. This assessment was a little off the mark. The location deserved more superlatives and all the synonyms for 'idyllic' that an internet search would provide. I would definitely exclude bucolic though. Not the least because it sounds like a plague that afflicts babies, but also because the venue lay on the very edge of Stellenbosch and was robbed of countryside status by this adjacency (to my mind in any case --- either way bucolic out).

My presentations were both in the FNB sponsored session on machine learning and data analysis. I could tell from their catchy pamphlet that I was probably not included in their target demographic. (I had finally fallen from the tree, but thankfully not that far it seems). Still pepped up on coffee and adrenaline from the drive over, I hurried a presentation on a parser used in automated geocoding. Robert's presentation on evolutionary search stategies in constraint programming was superbly presented and had a wonderful calming effect on me (note to self: perhaps preparation helps; note to future self: read up on what Rob-

ert said). I was quite fond of the email address that he used in the programme on account of the neat suffix (.za) that allowed him not to be robert.bennetto33@gmail.com. It seems, judging by the number of personal addresses offered with the abstracts, that there are quite a few people who are prepared to answer emails about their work regardless of job changes, or student status changes. This is a commitment to reproducible science for sure (future-Jacques will email all of you in a few years asking for data sets). In an effort to assist Anthony Smith with his email address (his birthday may or may not be on the twenty sixth of August), I checked to see if we could apply the same suffix rule. Sorry Anthony, Google says no. It seems that you will have to keep your email address for a while still.

Robert was followed by Esmarie Scholtz who presented an interesting application of a neural networks using Tensor Flow. I expect that we will see many more of these applications in the future. The wonderful Docker was mentioned and she was even talking about Go the night before (the human experience of it, not the recently popularised man-vs-machine story that is Google's Alpha Go --- full disclosure, past-Jacques was a go player). Esmarie leads me to believe that Pivot Sciences may be a great place to work, or she is just making them seem cool.

The meeting of the executive committee meant that I sadly missed the remainder of the afternoon's presentations. My conference had not gotten off to a good start but I had committed future-Jacques to catching Renier Steynberg's research into a framework for identifying the most likely successful underprivileged tertiary bursary applicants somewhere along the line. I have it on good authority that he will be involved in a thesis defence soon.

The end of the meeting heralded the start of a wine hunt social event. After finding our team-mates we set off to solve a series of puzzles at various stations where the wine associated with the station was only 'unlocked' once the puzzle was solved. At least that is how I think it worked. Some of the servers were sympathetic to the parched delegates and prematurely provided the refreshments we so

dearly needed to press on. The team that I was a part of, wonderfully named by Mark Einhorn as the Danzig-zags, received an unfortunate honourable mention for a moderately wayward answer.

Tuesday was my opportunity to finally go 'conferencing'. After a final heave-ho for a project deadline that morning, I just managed to catch the end of Berndt Linder's presentation on a bi-objective problem in generator maintenance scheduling. It was quite evident from the depth of the analysis that Bernie had to tame quite a few beasts to arrive at that point. It was also evident, that he is very, very, very much against weighting objectives.

For the second year running, the national student competition was rightly held in a plenary session. The presentations were inspiring. Congratulations to all four speakers on a superb effort (you can read all about their impressive work in a more serious article on pg. 12). This session also produced the first dedication of a student competition presentation to Hans Itmann (courtesy of Brian van Vuuren).

The time for my first conference lunch had arrived and it lived up to all expectations. I enjoyed the break at a table with three other post-student delegates. It was interesting swapping stories and fishing for information about how things worked (or did not) in their workplaces. As a nearly-newly minted (it has been a while) industry person I had not expected these exchanges; it was a pleasure that I look forward to enjoying again.

I spent the most of the afternoon session in the ecology and conservation session. The first two speakers, Pieter de Wet and Dirk Human, shed further light on the increasingly complex problem of Eldana Saccharina, otherwise known as 'the pest'. Pieter reminded us that this work was noble and Dirk had an uncanny command of the pronunciation of Latin terms. Michael Weaver, the final speaker in the session, discussed his simulation based approach to modeling unmanned aerial vehicles in an effort to combat rhino poaching. The enthusiasm of the audience did not remind me at all of the empty military application sessions that I was often a part of at previous conferences. When discussing this fact with Martin Truter at the banquet, he stated somewhat ominously that "you might not be interested in war, but war is interested in you". Martin has definitely embraced OR's roots. Finally, Danielle Parau's use of graph theoretical measures to tease out relationships in historical data sets seemed very applicable in today's data heavy world. I've signed future-Jacques up to pursuing it further on the many data sets that he is going to collect.

The AGM saw a delightful presentation by Fanie Terblanche who made a good case for holding next year's conference

in an area with more 'green things' and fewer mineshafts. After a brief beautifying break, the "social highlight of the conference" began. In addition to the stirring comments that Gerhard Geldenhuys made during the AGM about the enthusiasm of student presenters at the conference ("It's a joy to listen to young students" he said), he gave an insightful and enjoyable address at dinner. From discussing the rich history of the Lanzerac Estate, to offering the observation that "success is getting what you want [and] happiness is accepting what you get", he revealed that the society's membership fees were once R3.50, and that the early operations researchers were quite fond of a place called Hildebrands. The dinner was delightful and the pace of the evening's events was perfectly timed. The claimant to the master of ceremonies throne, Brian van Vuuren, did a sterling job and ended the evening by asking "Hans, I hope I've done you proud". The president of the society, Winnie Pelser, certainly believed he had when she said that Brian was a "second Hittmann" in the closing plenary session.

I managed to catch Colin Phillips' enjoyable presentation on the final day of the conference (he seems to have a better relationship with his future-self than I). He demonstrated both the advantages (he showed us the lovely interface that he "enjoyed putting together, so I hope you'll enjoy me bragging about it") and disadvantages (private message popups that were fortunately not rude) of using one's own laptop for presentations. The keynote speaker, Paul Fatti, took the audience through problems that he had confronted over his illustrious career (which included world cups, pop shows and a possibly minor case of litigation). I very much enjoyed the clarity with which the details were presented and especially enjoyed the fact that adoption of one of his solutions was ensured once it was "justified as coming from a statistics professor".

The conference drew to a close with the final lunch. I was reminded of many things that I'd forgotten in missing last year's conference. The fact that many people had made a good deal of effort to be there, and that a few had worked hard to arrange for a there to be, was also not lost on me. The LOC did an extraordinary job of arranging an excellent conference - the Stellenbosch contingent seem to be getting better and better with every attempt.

Finally, there were many discussions in the meetings regarding the relative number of delegates from academic instutions at past conferences. This discussions centered around the issue of marketing the society (in this case to university students at other institutions). The conference programmes of nine past conferences yielded to a few useful Unix and Python commands to produce the graph in Figure 1. Delegates which had multiple affiliations, typically students that were working but studying at the same

time, were categorised according to their academic affiliation (they would thus not contribute to the 'Industry South Africa' category). The 2007 conference was held at UCT, whilst the 2010 conference was held in Magoebaskloof near Polokwane (where the largest number of delegates, namely 21, originated from the University of Limpopo (UL)). In the following year, namely 2011, the conference was held in Victoria Falls, Zimbabwe. This fact manifests in the proportion of delegates from international universities which was significantly higher that year. Furthermore, the UL again produced a number of the delegates (9 in total) at that conference. The 2009, 2013 and 2016 conferences were held in Stellenbosch. The 2012, 2014 and 2015 conferences were all held in the north of the country in Muldersdrift (West Rand), Parys and Hartbeespoort, respectively. It may be seen that the University of Cape Town (UCT) has been relatively consistent over the years, whilst the University of Pretoria (UP) showed promise in 2007, 2009, 2010 (4, 4, and 2 delegates, respectively) but dwindled to one delegate in 2012, 2013 and 2014 (in 2015 they produced 2 delegates, but were not represented at this year's conference). The University of the Witwatersrand (WITS) has often been represented by two or three delegates, except for the years 2010, 2013 and 2015 where they contributed a single delegate. UNISA's representation has been strengthening from 5, 3 and 1 delegates in 2007, 2009 and 2010, espectively, to 8, 6, and 9 delegates in the last three consecutive years. Excluding the single delegate of 2011, North-West University (NWU) has contributed between 5 and 9 delegates consistently. Delegates from the University of KwaZulu Natal (UKZN) attended between the years of 2011 and 2014. In this time they contributed a total of thirteen delegates. Lastly (these have all been omitted from the graph), the University of Johannesburg, the Tshwane

University of Technology, and the University of Fort Hare each contributed a single delegate in 2013, 2015 and 2012, respectively. The University of the Western Cape had a dual affiliation with UCT and Nelson Mandela Metropolitan University produced two delegates in 2013 (also omitted from the graph). The chosen graphical representation is not ideal (and the editor denied me colour), but there is a strong possiblity that we will provide a more detailed exposition soon. The suggestions that we should be targeting academic institutions in the Gauteng region, seem to be promising.

Lastly, I've dusted off the prestigious non-citation awards for 2016.

Over-the-top award: Incredible effort was spent in ensuring Tinder is more accessible to mobile phone users (referenced by Thorsten Schmidt-Dumont in his award winning presentation)

Autocorrect award: "Elements! Not elephants. These are Rhinos" - Michael Weaver in response to his slip of the tongue.

Squirming audience award: The effect caused by Danielle Parau's matter-of-fact discussion of slave numbers contained in historical data of the Cape Colony

Funniest presentation award: Fanie Terblanche for his 2017 conference presentation during the AGM - you had to be there.

Funniest quip: Brian van Vuuren's reference to the parallel conference that was running on account of some personalised name badges.

Future-Jacques will be seeing you all next year I'm sure. So long, and thanks for all the fish.
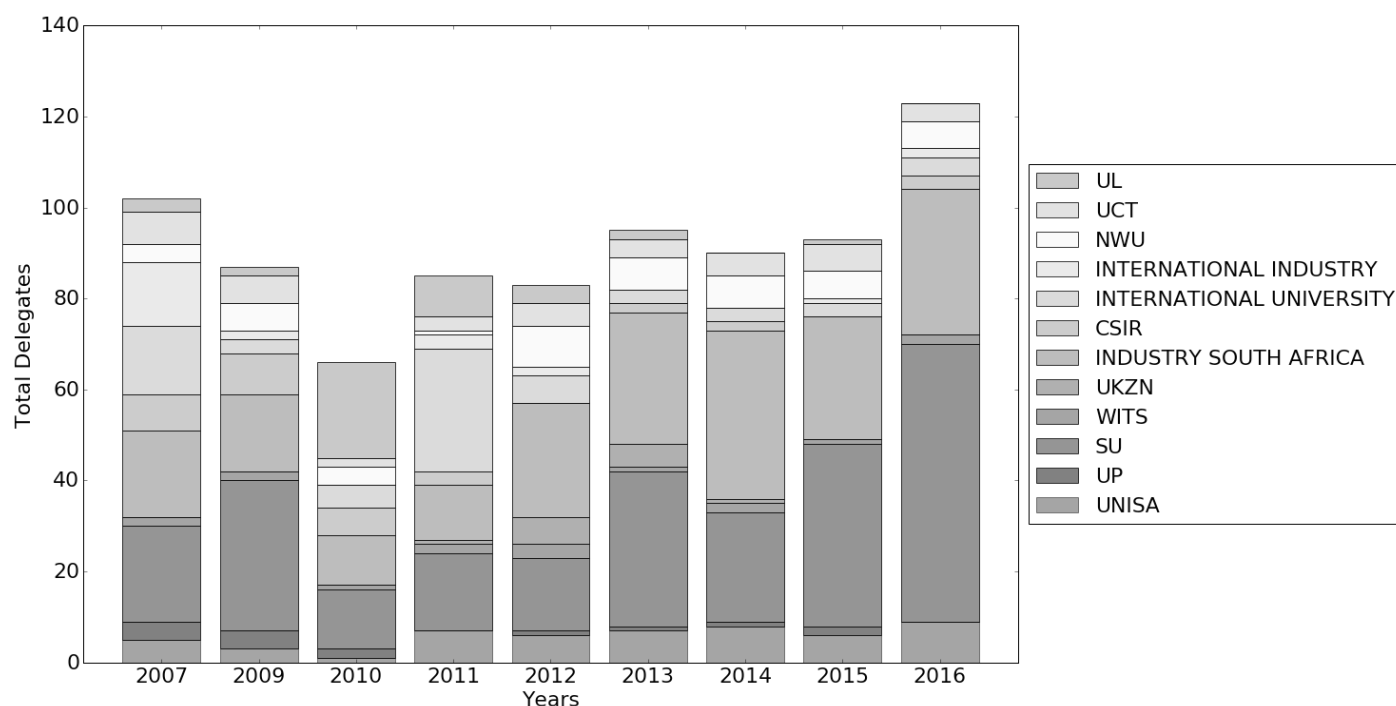

Figure 1: Total delegates (and their affiliations) at ORSSA conferences over the past few years.

INTERVIEW WITH ERWIN PESCH

By Anthony Smith Stellenbosch University (16678591@sun.ac.za)

Erwin Pesch

Anthony Smith

What initially drew you to Operations Research?

I first got into contact with OR in the business school while studying mathematics and computer science at the Technical School of Darmstadt. They didn't offer OR but instead scheduling which I found interesting as the professor provided combinatorial problems which we had to solve and I liked the challenging aspect of it. I specifically enjoyed the problems that had relevancies in practice and decided to remain in this field, later resulting in my PhD position at the university.

You have been involved in numerous projects, having been published in top-ranked peer reviewed journals. What has been your favourite project?

I really enjoyed all the practical problems as they offered their own unique challenges, but the assignment of flights to airport gates was the most fascinating problem. One of the reasons is as you present the problem, people immediately understand the problem as they have had personal experience as opposed to machine scheduling. Another reason is that we did some innovative research in that field as our client, Air Canada, did not believe that we would be able to solve that problem and ending up improving some aspects such as reducing the number of assignments to dummy gates or the number of tows by margins of over 50% and up to 90%, which was even more impressive as the practioners had over 20 years' experience in gate assignments. We worked as a team and with Dr. Dorndorf I had really an excellent PhD student on that project

Relating to the ORSSA problem, which talks that you have attended have you found particularly interesting[1]?

Both the maintenance scheduling of Eskom power generators presented by Jancke and Bernie was particularly interesting. Energy is also a topic that we would wish to go deeper into in the future as energy is a hot topic at the moment. I also enjoyed the first talk of the session in which she was modelling the energy problem stochastically but I recommended to approach in deterministic manner due to the size of the problem and it still offers a fair reflection of the nature of the problem.

The field of OR is constantly changing, where do you see the future of OR heading?

The field has changed dramatically since my involvement as a student, it was a kind of a playground as you could deal with toy problems in the sense that most of the practical difficulties offered by real life problems were dropped. The problems were still difficulty in a complexity point of view but not from an application point of view. Thus from my point of view I see a shift from more theoretical work to work with more practical applications. I also agree with the president of the society, Winnie, in that behavioural aspects need more consideration in future work, as there is no point in obtaining an optimal solution but the managers of the company do not wish to implement it. I think behavioural studies is also more important as game theory is a booming topic, with a couple of Nobel prizes being awarded since 1994, as they try to incorporate human behaviour in the solution.

How many times have you visited South Africa and what keeps bringing you back?

South Africa is a beautiful country, I have been here 6 times. The motivation the first two times was to see the animals in the reserves. Following that contact with the local people came automatically as a friend of mine cofounded a school[2], many years ago, in the north of KZN in a really rural location and whenever I visit SA I stay in KZN, with a friend, and visit the school. I really enjoy SA, I like the country, I like the people, I like the nature and I know there are problems but every country has problems, and for now I hope you get rain soon.

What are your plans after the conference?

Unfortunately I have to go back on Saturday, I will stay in Fish Hoek and I visit the Masiphumelele Township as another friend is a founder of Hokisa Foundation, which looks after kids that have lost their parents to the consequences of AIDS. I met DR. Lutz van Dijk when he made a presentation in my country and I asked if it were possibly to visit him. I then have to catch a flight on Saturday but I hope to come back soon, I always try to visit a nature park that I haven't visited before, I am a huge elephant fan and if you watched carefully during my presentation you would have seen that I was wearing an elephant tie.

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[1]   Interview was done on Tuesday morning.

[2]   Bonga High School

Interview with ORSSA President: Winnie Pelser

By Hans-Werner Hueur, Stellenbosch University (16550668@sun.ac.za)

Behalwe vir ORSSA, waarop fokus jy werksgewys?

Ek het onlangs van werk verander. Ek was lank by Armscor gewees waar ons op hoe en strategiese vlakke, besluitsteun gedoen het vir die weermag, hoofsaaklik vir "joint operations" Daar het ons n groot verskeidenheid van werk gedoen. Ons het logistieke optimering en baie multi-kriteria besluitsteun gebruik wat baie nuttig vir ons was. In April het ek by die WNNR begin werk, waar ek werk in die afdeling vir DPSS (Defence Peace Support and Security). Hulle het gevra dat ek n ON groep moet begin. Dis op die oomblik nog nie ver van die grond af nie. Op die oomblik doen ek meer stelsel ingenieurswese werk, maar ons sien uit na interessante werk in die toekoms.

Wat is die aantreklikste aspek van ON vir jou?

Vir my is dit die veelsydigheid. In die praktyk het ons het regtig 'n klomp verskillende "curve balls" gekry waarvoor jy dan ON tegnieke gebruik om probleme op te los. Baie keer was "common sense die oplossing, maar ON tegnieke sal dit altyd bevestig. Die ander aspek wat baie belangrik is, is om die regte stuk gereedskap te gebruik vir 'n spesifieke probleem. Mens sien baie dat iemand baie gemaklik is met een oplossingstegniek, en dan dit in elke probleem wil toepas. Om elke probleem objektief te beskou en dan die regte gereedskap te kies vir die oplos daarvan.

Hoe is jy aan ON bloodgestel?

Ek het begin deur BSc te studeer by Tukkies, Wiskunde en Wiskundige- statistiek, en toe werk gekry by Armscor. Die departement se naam was logistiek en operasionele navorsing. Dit was die eerste keer in my lewe wat ek gehoor het van operasionele navorsing. Jos Grobbelaar, wat 'n groot naam in ON is, was my eerste baas en hy was ook

'n dosent in ON by Unisa. Dit is dus waar my belangstelling vandaan gekom het. Ek is baie dankbaar vir Unisa wat dit moonlik gemaak het vir my om van 'n afstand my studies af te le. Ek was oorsee gedurende meeste van my studietermyn, en daar was ook nog nie internet gedurende daardie tye nie.

Waar sien jy ORSSA in 5 jaar?

As ek kyk na die jong mense by die universiteite kan ek nie anders as om groei te verwag nie. Mense in ORSSA raak al hoe slimmer en beter in wat hulle doen terwyl tegnologie ook verbeter. Ek hoop wel dat ORSSA sal groei in die algemeen ook. Dit voel vir my asof ons net 'n paar nodusse. Ek weet nie hoe ons dit moet doen nie, maar iewers moet ons van die dakke af skree sodat die mense kan besef dat ON 'n verskriklike bruikbare rigting is.

Het jy enige advies vir opkomende ON studente?

Byt vas, hou aan, moenie jou huis in ander plekke gaan vind nie. Dit is 'n baie interessante veld met 'n verskeidenheid van toepassings en ek dink studente moet ons help om die ON veld te adverteer om sodoende die vakgebied te laat groei in Suid-Afrika.

Het jy enige stokperdjies?

Duisende! Ek skilder, maak kaas en hou van hande werk. Ek het meer stokperdjies as wat een person moet hê. Mens kan se my stokperdjie is om stokperdjies te hê. "You can't just sit around all day."

As jou huis besig is om af te brand, en jy kan net een ding gryp terwyl jy uit hardloop, wat sal dit wees?

Ek hoop my kinders en my honde staan alreeds buite… Ek dink ek sal my hardeskyf gryp —al my fotos is daarop.

ORSSA: Category I Achievement Award
Presented to Jakobus Stephanus Wolvaardt

Citation by Winnie Pelser, on behalf of the Executive Committee of ORSSA

Jakobus Stephanus Wolvaardt was born in Pretoria on 8 October 1945 and grew up in Brits where he attended both primary and high school. After compulsory military service in 1963, he studied at the University of Pretoria where he obtained an MSc (cum laude) in mathematical statistics with a focus on operations research (OR) subjects. He held various leadership positions at school and was a junior officer in the South African Army. At university he was both chairman of his residence and a member of the Students Representative Council. He was awarded dux colours in 1969.

In that same year he joined the Department of Mathematical Statistics at the University of Pretoria as a lecturer and enrolled for a course in computer science, then newly offered as a two-year major. During 1971 he completed the preparatory courses for both an MBA and a second MSc (cum laude) at Unisa, again focused on OR. Years later he

followed up on his interest in business and economics by also completing the Advanced Management Program at Unisa's School for Business Leadership.

He joined Unisa's Department of Statistics as a senior lecturer in OR in 1972, obtained his PhD under the supervision of professor Jos Grobbelaar, was himself promoted to professor in 1980 and founded the first South African tertiary department devoted exclusively to OR in 1983. Within this new Department of Quantitative Management, a new generation of operations researchers, such as Hans Ittmann, Winnie Pelser, Thys de Vries, Robert O'Connell, Reiner Fossati, Willie Wagner and Geertien Venter, obtained their master's or doctoral degrees in OR from Unisa. Kobus himself supervised a total of six PhD students in OR to successful conclusion of their studies. Apart from research degrees, the department (now known as Decision Sciences) annually awards degrees to approximately 30 students majoring in OR.

Professor Wolvaardt was active in organised science, serving on ORSSA's executive committee for a number of years before becoming its tenth president in 1979. He was awarded the Tom Rozwadowski medal twice (in 1979 and again in 2003), and was also a member of the South African Council for Natural Science Professions, serving as its vice-president for two terms.

He consulted for a number of companies and organisations, including Armscor and Denel, BHP Billiton, Eskom, Impala Platinum, the KWV, Foodcorp, and Nestle, as well as religious denominations, state departments, a large municipality and the South African Army. Three South

Jakobus Wolvaardt (right) with ORSSA President, Winnie Pelser

African universities used his services for zero-based budgeting of their support services in the late 1990s, and Unisa is still using an updated version of his multi-criteria exam timetable system after more than 30 years.

Kobus Wolvaardt has always maintained a broad field of interest spanning economics, property and farming, and since retiring from Unisa at the end of 2010, he considers himself a part-time pecan farmer, caretaker of property and consultant to his family's growing software business. For his nurturing of a generation of operations researchers, many of whom have gone on to play significant roles in the local OR profession, his founding of the first tertiary department in South Africa devoted fully to OR, his own high-quality OR work over a long period of time, and his service to our Society, Jakobus Stephanus Wolvaardt is, on this 13th day of September 2016, duly awarded a Category I ORSSA Recognition Award.

ORSSA: Category II Achievement Award
Presented to Daniel Frederik Payne

Citation by Hennie Kruger, on behalf of the Executive Committee of ORSSA

Daniel Frederik Payne was born on 31 May 1954. After matriculating in 1972, he enrolled for a Higher Electrical Diploma (Heavy Current) at the Pretoria Technikon. He obtained this diploma in 1979 and, after further studies, also obtained an MSc degree in operations research, followed by a PhD in operations research from the then Rand Afrikaans University (now the University of Johannesburg) in 2004, based on a thesis titled Modelling of different long-term electrical forecasts and its practical applications for transmission network flow studies. Since 2012, Danie has also been a Certified Professional Demand Forecasting Training Master (CPDF). Danie is currently working for Eskom where he is responsible for long-term transmission demand forecasts. He has developed a seven-step demand forecast process for predicting future expected demand

Daniel Payne (right) with ORSSA President, Winnie Pelser.

growths which was implemented by Eskom and which is continuously improved by him through ongoing research. He also has extensive experience in other industry-related operations research projects, including lay-out solutions

for coal-fired power stations, the use of qualitative techniques in forecasting, and the implementation of neural network solutions in forecasting environments.

Danie still contributes to the academic development of operations research and is a regular external examiner for post graduate theses and dissertations. He has also published in the field of forecasting and was the author of the Energy Yearbook of the Free State Region of Eskom's Distribution Group in 1989. He is a regular contributor and speaker at operations research and other conferences. His academic contributions are also visible in industry where he has developed a forecast training programme at Eskom for network demand forecasters. Danie is a registered mathematical scientist at the South African Council for Natural Scientific Professions and has been a member of ORSSA since the early 1980s. He is an active member of the Society who has presented papers at a large number of the ORSSA annual conferences and he plays a considerable role in the area of forecasting in operations research.

Danie has served the operations research community and the energy sector in a variety of ways, and he continues to play a key role in the well-being and development of operations research, particularly in industry within the realm of forecasting. For his long and significant role and service to the profession of operations research, Daniel Frederik Payne is, on this 13th day of September 2016, duly awarded a Category II ORSSA Recognition Award.

ORSSA: Category III Achievement Award Presented to Fulufhelo Vincent Nelwamondo

Citation by Hans Ittmann, on behalf of the Executive Committee of ORSSA

Fulufhelo Vincent Nelwamondo is the Executive Director of the CSIR Modelling and Digital Science (MDS) business unit. He was appointed in this position on 1 April 2016, a position he has been acting in since 1 April 2014. Dr Nelwamondo joined the MDS unit in May 2008 where he previously was a principal researcher and a competence area manager for Information Security. He remains the youngest recipient ever of the Harvard-South Africa Fellowship Programme, awarded in 2008, which allowed him to complete a post-doctoral research fellowship at Harvard University. Since 2009, he has also been a visiting professor of electrical engineering at the University of Johannesburg and has successfully supervised and co-supervised several students who pursued masters and doctoral degrees in electrical engineering. Dr Nelwamondo grew up in the deep rural area of Lwamondo in the heart of Venda, near Thohoyandou, where he learnt "courage" from his mother, a teacher, on their long daily walk to school and back. After matriculating from the Mbilwi Senior Secondary School, he obtained a bachelor's degree in engineering from the University of the Witwatersrand and in 2008 completed his doctoral thesis in electrical engineering on the topic Computational intelligence techniques for missing data imputation at the same university. Dr Nelwamonda is a registered professional engineer and a senior member of the Institute of Electrical and Electronics Engineers. Apart from winning a number of CSIR awards, he was awarded the National Science and Technology Forum award in 2009/10 for outstanding research completed during the previous 2–5 years and also featured in the Mail and Guardian's 200 Young South Africans in 2008, 2010 and 2012. In addition, he is a founding member of the South African Young Academy of Science and currently serves on the Department of Home

Fulufhelo Nelwamondo (right) with ORSSA President, Winnie Pelser.

Affairs ministerial advisory committee for modernization. His research and practical experience covers a wide spectrum of areas, including software engineering and computational intelligence applications, and he has interests in exciting and emerging areas of software application, including biometrics-based systems, data mining, modelling of complex systems using machine learning tools and mechanism design. He has also been an editor and a reviewer for a number of international journals, including the Journal of Computers and the International Journal of Digital Content Technology and its Applications. He has furthermore served in programme committees of several international conferences and he has published over 100 research papers in international peer-reviewed journals, conferences and book chapters. Many of his papers involve the application of operations research methods, approaches and techniques, such as dynamic programming, genetic algorithms, principle component analysis, Markov models, neural networks, and ant colony optimisation. For his support of and contributions to the profession of operations research in South Africa, Fulufhelo Vincent Nelwamonda is, on this 13th day of September 2016, duly awarded a Category III ORSSA Recognition Award. .

ORSSA: Category IV Achievement Award
Presented to Daniel Petrus Lötter

Citation by Jan van Vuuren, on behalf of the Executive Committee of ORSSA

Daniel Petrus Lötter was born on October 1st, 1986. sAfter matriculating from Sasolburg High School with an A-aggregate in 2004, he enrolled for a bachelor's degree in commerce at Stellenbosch University in 2005. After being awarded this degree in 2008, he went on to obtain an honours degree in operations research from the same institution cum laude in 2009. The following year he enrolled for a master's degree in operations research, also at Stellenbosch University. He obtained his master's degree in 2012, based on a thesis entitled Modelling weapon assignment as a multiobjective decision problem, and enrolled for doctoral studies the following year. He is currently in the process of finalising his doctoral dissertation in operations research at Stellenbosch University on a part-time basis. The title of his dissertation is Design of a weapon assignment subsystem within a ground-based air defence environment.

Dani Lötter (right) with ORSSA President, Winnie Pelser.

In 2015, Danie was appointed lecturer in operations research within the Department of Industrial Engineering at Stellenbosch, a position he still occupies within the Stellenbosch Unit for Operations Research in Engineering, or SUnORE Group. He plays an important part in the organisation of activities and research outputs of this group. His research area is combinatorial optimisation and the design of decision support systems. He has supervised seven fourth-year industrial engineering students in respect of their final-year research projects, or skripsies, and he has also co-supervised two master's students in respect of their theses. He teaches the underlying theory and algorithmic solution methodologies related to transportation and assignments problems, as well as dynamic programming, as part of the third and fourth year operations research courses within the industrial engineering curriculum at Stellenbosch University. In these capacities he is making a meaningful contribution to the training and nurturing of a new generation of operations researchers.

Danie is well-known in the local operations research community, and regularly attends ORSSA conferences where he presents his work. In addition to his activities as a student and as a lecturer, he has served on the Executive Committee of ORSSA in various capacities since 2010. He was the editor of the ORSSA Newsletter in 2010 and 2011. During the period 2012–2015 he served on the Executive Committee of the Western Cape Chapter of ORSSA, first as additional member, and then as chapter chair in 2014 and 2015. In addition, he has been the business manager of the ORSSA Newsletter since 2012, serving in this capacity while simultaneously being chair of the Western Cape Chapter of ORSSA. As if this is not enough, he has also twice headed the local organising committees of ORSSA annual conferences, in 2013 and again this year, doing a superb job in each case. This afternoon he was elected vice president of ORSSA for 2017. When he takes office as the 31st ORSSA president in 2018, he will be the youngest serving president in the history of our Society.

In recognition of the excellent quality of sustained service to the profession of operations research in general and to our Society in particular in various capacities over the last six years, Daniel Petrus Lotter is, on this 13th day of September, duly awarded a Category IV ORSSA Recognition Award.

ORSSA: Category IV Achievement Award Presented to Evert Barend Schlünz

Citation by Jan van Vuuren, on behalf of the Executive Committee of ORSSA

Evert Barend Schlünz was born on April 12th, 1987. After matriculating from Garsfontein High School with an aggregate of 106% in 2005, being named dux litterarum and being awarded academic colours by his almamater, he enrolled for a bachelor's degree in the mathematical sciences at Stellenbosch University in 2006, majoring in applied mathematics and operations research. Upon being awarded this degree cum laude in 2008, he went on to obtain an honours degree in applied mathematics, again cum laude and from the same institution, in 2009. The following year he enrolled for a master's degree in operations research, also at Stellenbosch University. He obtained this master's degree cum laude in 2011, based on a thesis entitled Decision support for generator maintenance scheduling in the energy sector. During his fulltime studies, Bernard placed within the top three students of the entire Faculty of Science at Stellenbosch University, and hence was twice awarded the Rector's Award for Excellent Academic Achievement — in 2010 and again in 2012. Thereafter, he was employed at Pelindaba by the Nuclear Energy Corporation of South Africa, or Necsa. In 2013, however, he enrolled for part time doctoral studies in operations research at Stellenbosch University, while remaining in the employ of Necsa. He is currently in the process of finalising his doctoral dissertation titled Multiobjective in-core fuel management optimisation for nuclear research reactors.

Shortly after joining Necsa as a graduate in training in 2012, Bernard was appointed permanently as scientist in 2013 and promoted to senior scientist last year. He is well-known in the local operations research community, and regularly attends ORSSA conferences where he presents his work. In 2011, he won the prize for the best presentation by a masters student at the 40th ORSSA annual conference at Victoria Falls.

At Necsa, Bernard has been responsible for the design of a decision support system for nuclear scientists and engineers in respect of loading configurations for uranium fuel cells into the core of the SAFARI-I nuclear reactor situated

Bernard Schlünz (right) with ORSSA President, Winnie Pelser.

at Pelindaba, which is used for research purposes and to irradiate medical isotopes. He has succeeded in modelling this difficult problem as a tetra-objective combinatorial optimisation problem (in which the objective functions and constraints cannot be specified in closed form, but are instead evaluated by a computationally expensive simulator). Since the problem cannot be solved exactly, he has over the last four years designed a suite of metaheuristics, as well as a hyperheuristic, capable of returning high-quality trade-off solutions to this notoriously difficult fuel assembly reloading problem. The fuel reload configurations recommended by his decision support system are better in all objectives than manual solutions determined by experienced nuclear scientists and engineers. He is now involved in the process of integrating these metaheuristic and hyperheuristic solution methodologies into the control systems of the nuclear reactor, after which fuel assembly reload decisions at Necsa will be based on recommendations by his decision support system rather than having to depend on manual, heuristic solutions based on experience.

In recognition of this outstanding operational research work, which is a shining OR success story and a clear example of excellence in OR practice, Evert Barend Schlünz is, on this 13th day of September 2016, duly awarded a Category IV ORSSA Recognition Award.
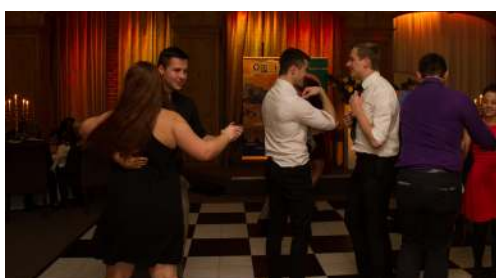
ORSSA: Fellowship Award Presented to Hendrik Kruger

Citation by Winnie Pelser, on behalf of the Executive Committee of ORSSA

"The methodology of scientific research will be influenced by big data. In the literature, there is already talk of a so-called fourth paradigm, called data-intensive scientific research, that will not only change the way of scientific research, but will also change the way people think."

Hendrik Kruger was born on December 18th, 1955. He holds a master of commerce degree in information systems, obtained in 1989, as well as a master of science degree in mathematical statistics, obtained in 1999 — both from the University of the Orange Free State. In addition, he also holds a doctorate in information systems, obtained in 1994 from the then Potchefstroom University of Christian Higher Education (now North West University). As if this is not enough, he is currently enrolled for a third master's degree, this time in philosophy at North West University. In 1989 Hennie started working as an information technology auditor at AngloGold Ashanti, after which he joined the School of Computer, Statistical and Mathematical Sciences at North West University in 1999, where he currently holds the position of associate professor of computer science at the Potchefstroom campus. His fields of expertise are linear programming, decision support, and information and communications technology security. Locally, he has published in the South African Statistical Journal, the South African Journal of Business Management, and ORiON, while international papers of his have appeared in Computers and Security, the Journal of Information Privacy and Security, and Information Management and Computer Security. Hennie holds a rating by the South African National Research Foundation and is a registered mathematical scientist at the South African Council for Natural Scientific Professions.

Hennie is a member of the Statistical Association of South Africa and is also a long-standing member of ORSSA. He regularly attends the annual ORSSA conferences where he, as well as his colleagues and their postgraduate students, have been presenting their work over an extended period of time. He has edited two recent peer-reviewed proceedings of these conferences and also served for many years as the chair of the Vaal Triangle Chapter of ORSSA. He is currently vice president of ORSSA, in the final year of his four-year cycle as the 29th president of our Society, serving during the period 2014–2015. He is also the driving force behind an ongoing initiative to write up the history of our Society over the past close to fifty years. As part of this initiative, he chaired a session on the history of operations research in South Africa this morning.

For his services to operations research in general, his services to ORSSA in particular, and his nurturing of a new generation of operations researchers at the North West University over many years, Hennie Kruger is duly inducted as Fellow of the Operations Research Society of South Africa on this 13th day of September 2016.

Hennie Kruger receiving a fellowship award

ORSSA Student Competition Awards 2016

By Marthi Harmse (kmharmse@mweb.co.za)

2016 ORSSA Student Award Co-ordinator

The Operations Research Society of South Africa (ORSSA) organises a student competition in two independent categories on an annual basis, namely an honours or fourth-year level of study category, and a masters level of study category. The prestigious Gerhard Geldenhuys Medal is awarded to the winner of the honours or fourth-year category, while the prestigious Theodor Stewart Medal is awarded to the winner of the masters category. The objectives of the competition are to propagate the use of Operations Research (OR) in higher education, encourage the inclusion of project work in OR courses, and to market ORSSA among students and staff at South African universities.

This year, supervising lecturers nominated written projects completed by honours or fourth-year level students

Marthi Harmse

as indicated in Figure 1. Five projects were recieved from the University of Cape Town, one from the University of Pretoria, and two from the University of Stellenbosch. Supervising lecturers also nominated written projects completed by masters level students as shown in Figure 1: one from the University of Cape Town, one from the University of Pretoria, and two from the University of Stellenbosch. Other institutions of higher education are encouraged to also submit nominations in future...maybe chapter executive committees could assist in this process?

Thank you very much to the competition coordinator and her assistant for ensuring that all nominations were time-ously available for adjudication. The convener requested the assistance of three ORSSA adjudicators for each category. As indicated in Figure 2, two of the adjudicators were from institutions of higher education while four were from industry, all with at least a masters degree in a relevant field. Two of the adjudicators were from the Johannesburg chapter, one from the Pretoria chapter, two from the Vaal Triangle chapter and one from the Western Cape chapter. A deep appreciation goes to the adjudicators who have invested a lot of time and energy in assessing the sub-missions. Thank you for the enthusiasm with which you encouraged our upcoming OR practitioners. Thank you also to previous selection committee conveners Machteld Strydom and Margarete Bester for their assistance. We also thank the ORSSA president, Winnie Pelser, who entrusted us with this enlightening opportunity.

Figure 1: Nominations received for the 2016 ORSSA student competition

Thorsten Schmidt-Dumont (right) receives the Gerhard Geldenhuys (right) Medal

Entries were ranked according to the rubric of criteria and quality descriptors as accepted by the ORSSA executive committee in March 2016. All entries were of a very high standard which caused the adjudicators to judge them quite rigorously. Feedback from the adjudicators indicate that the projects were most impressive, well constructed, and a pleasure to read with the results well publishable. Students managed to cover impressive scopes of work and had a

Louw Truter (left) receives the Theodor Stewart (right) Medal

Ghiete van Zyl (right) of Stellenbosch University receives her award for the best presentation by a 4th year/honours student from ORSSA President, Winnie Pelser

good grasp of the statistics at play, the pitfalls of models used, validation of models, user interfaces, and practical applications. They could become excellent practitioners in the analytics space with the tools used in the projects. Still the finalists stood out as more mature and complete than the others. Aspects that could receive some attention in future are selection of a challenging topic, thorough literature review, style of referencing, quality of manuscript, critical consideration of alternatives, consistency throughout the report, longer is not always better, utilisation of real data even if it is not published in detail, and interpretation of results.
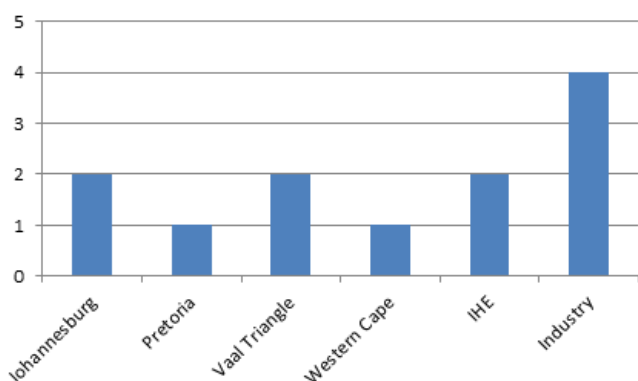

Figure 2: Adjudicators for the 2016 ORSSA student competition

The selection committee decided on a winner in each category solely based on the written projects, but finalists were invited to present their projects at the annual ORSSA conference to provide the OR community an opportunity to appreciate the quality of work. A special ORSSA student competition plenary session was scheduled just after the morning tea break on Tuesday 13 September 2016. Although nominated projects were completed during the previous academic year, the conference was honoured that all finalists could present in person.

The winner in each category was announced during the magnificent awards ceremony at the conference gala dinner on Tuesday evening. The winner in the honours category was Thorsten Schmidt-Dumont with the project titled *A*

decision support system for the placement of radio transmitters in mobile communication networks, presented in partial fulfilment of the requirements for the degree of Bachelor of (Industrial) Engineering in the Faculty of Engineering at the University of Stellenbosch under supervision of Jan van Vuuren. The runner-up was Christiaan van der Walt with the project titled *Decision support for the selection of water release strategies at open-air irrigation reservoirs*, also presented in partial fulfilment of the requirements for the degree of Bachelor of (Industrial) Engineering in the Faculty of Engineering at the University of Stellenbosch under supervision of Jan van Vuuren.

The winner in the masters category was Martin Truter with the thesis titled *Development and demonstration of a performance evaluation framework for threat evaluation and weapon assignment systems*, presented in partial fulfilment of the requirements for the degree of Master of (Industrial) Engineering in the Faculty of Engineering at the University of Stellenbosch under supervision of Jan van Vuuren. A very close runner-up was Brian van Vuuren with the thesis titled *An agent-based simulation model of Eldanasaccharina Walker*, presented in partial fulfilment of the requirements for the degree of Master of (Industrial) Engineering in the Faculty of Engineering at the University of Stellenbosch under supervision of Linke Potgieter and co-supervision of Jan van Vuuren.

In addition to the annual ORSSA student competition, there were also awards for the best presentation by an honours or fourth-year student at the conference, masters student and doctoral student. This competition was coordinated by Georgina Rakotonirainy. Presentations typically covered work in progress but novel approaches and original topics excited the audience. Each student presenter could choose to compete for an award with at least three impartial members in the audience judging the presentation according to set criteria. The recipient of the award for the best presentation by an honours or fourth-year student was Ghite van Zyl, for the best presentation by a masters student Samantha Movius, and doctoral student Berndt Lindner.

Samantha Movius (right) of Stellenbosch University receives her award for the best presentation by a Masters student from ORSSA President, Winnie Pelser

Berndt Lindner (right) of Stellenbosch University receiving his award for the best presentation by a PhD student from ORSSA president, Winnie Pelser

The Tom Rozwadowski Award 2016

By Winnie Pelser (winniep@armscor.co.za)

The Tom Rozwadowski Award is made each year to the best written contribution to operations research published by a member of the Society during the previous year. The medal is awarded in memory of Tom Rozwadowski, a founder member of the Society who died tragically with his family in an accident.

The selection committee consisted of nine members. Fifteen papers were received that qualified for the medal. The criteria used for evaluation are: originality, the quality of any theory developed, interaction between theory and practice, new areas of application, new opportunities created for operations research, and clarity of exposition. The quality of the papers was very high and it was difficult to decide on the winner. After a first round of evaluation, nine papers remained for further evaluation. All the papers were of a very high standard and it was difficult to choose a winner. The winning paper was: *"Hitting a Moving Target: A Model for Malaria Elimination in the Presence of Population Movement"* by SP Silal, F Little, KI Barnes and LJ White. The paper appeared in the Public Library of Science (PLOS ONE) Journal, Volume 10 (12), 21 December 2015.

The abstract of the paper reads: South Africa is committed to eliminating malaria with a goal of zero local transmission by 2018. Malaria elimination strategies may be unsuccessful if they focus only on vector biology, and ignore the mobility patterns of humans, particularly where the majority of infections are imported. In the first study in Mpumalanga Province in South Africa designed for this purpose, a metapopulation model is developed to assess

Sheetal Silal (right) receives the Tom Rozwadowski medal from ORSSA President, Winnie Pelser

the impact of their proposed elimination-focused policy interventions. A stochastic, non-linear, ordinary-differential equation model is fitted to malaria data from Mpumalanga and neighbouring Maputo Province in Mozambique. Further scaling-up of vector control is predicted to lead to a minimal reduction in local infections, while mass drug administration and focal screening and treatment at the Mpumalanga-Maputo border are predicted to have only a short-lived impact. Source reduction in Maputo Province is predicted to generate large reductions in local infections through stemming imported infections. The mathematical model predicts malaria elimination to be possible only when imported infections are treated before entry or eliminated at the source suggesting that a regionally focused strategy appears needed, for achieving malaria elimination in Mpumalanga and South Africa.

Congratulations to the winners. My thanks go to the selection committee members for their time and expertise.

Interview with Brian van Vuuren

By Shane van Heerden from Stellenbosch University (17683068@sun.ac.za)

Brian van Vuuren

You completed your undergraduate in Mechatronic Engineering in 2013. What drew you to the world of simulation?
I did not enjoy Mechatronics at all, but I was tied into a bursary with Mercedes Benz and I decided at the end of my undergrad that I did not want to go ahead with the compulsory work-back period. This was because I felt that when I finished my work-back period and started looking at my future career path, I may not have a skill that I actually want to apply for the rest of my working life. In light of this, I tried to get the bursary obligation postponed for a while. This didn't work and Mercedes rather insisted I terminate the bursary agreement and take on the study debt, which I felt comfortable with. Well - not comfortable, but I decided it was worth it.

The Industrial Engineering department at Stellenbosch had been doing some marketing at the time and there were some things that I was quite interested in. I wasn't quite sure what field, but I was interested gaining some diversity in my skillset. So I started my Masters, did a couple of the compulsory courses (one of with was Analytics and Synthesis - the basics of OR). I enjoyed the subject matter, as well as Prof van Vuuren's teaching style. I decided I would have a meeting with him, amongst other supervisors. He had a couple of projects he was looking to get off the ground and one of them happened to be in simulation based on *Eldana saccharina* which decided to take on. So, in short - by chance!

Shane van Heerden

You have recently been appointed as a lecturer at the Department of Industrial engineering at Stellenbosch University. What has the experience been like for you?

To be honest, it has not been that different from being a postgrad student for me, which I really enjoy. I think, as a student, you underestimate the pressure involved in teaching other people even if you understand a subject - it's very testing when someone ask insight into a problem or methodology. Supervising students is also a stressful situation because, suddenly, you are the last point of call for that student. You have to learn quickly to give surety to your students. It's a lot to take on your shoulders because you're dealing with young minds and trying to make sure they get the most out of there year. But it's also really rewarding: I enjoy the camaraderie of the students, I love the different personalities, love seeing students feel comfortable to come chat or have a joke - so that aspect has been great which feels a lot like when I was a postgrad student. But all of a sudden, you're not only responsible for your own success in your studies, you now have the weight of other students on your shoulders.

On to the ORSSA conference, you kicked it off with a tutorial in AnyLogic. What was the general perception towards this simulation environment?

The perception towards it is always basically the same in that people experience it as quite a steep learning curve. The tutorial was obviously set up to help facilitate that as best as possible during the short time. There are some people as part of ORSSA that are very experienced programmers and even modellers, so I think they didn't have a problem. Others are maybe in a completely different field. So the beginning of the tutorial was very slow and methodical to try and get everyone on the same page to at least get some value . As we moved on, time started to become as bit short so we increased in pace. I'm not sure everyone kept up at that part but, all in all, I think there was a general consensus that it's got great potential as a software and people enjoying the visual application of simulation. Ultimately I think it varies from person to person as to how they experienced it personally.

You have been an ORSSA member since 2014. Do you feel agent-based simulation is gaining more ground in the OR community?

I think as long as I hang around at ORSSA, I can force that agent-based modelling gains traction in the community! I think there are a couple of people at ORSSA working in the field of agent-based modelling and obviously my students add some weight, but I think what I have seen is that the general perception towards simulation (I don't mean necessarily animated simulation, I mean towards predictive analysis and generating different scenarios and observing stochasticity in models) that kind of thing is certainly growing. I think that's consistent with the rest of industry and research. I also believe computers are becoming increasingly powerful tools, so your options become vast so there are a variety of applications. The type of work being done then also becomes really interesting and I'm seeing that there are fields that are starting to merge. I think simulation would be hollow, for example, without the understanding and implementation of metaheuristics because one complements and can enhance the other. And then there's things like machine learning and neural networks which are far more powerful in application which can also feature in simulation. So there's a good trade-off. That's what I really enjoy about ORSSA - you get to present your own work but you get to see where your own work could be improved, as well as potential people to collaborate with.

Lastly, what would you say was the highlight of the conference, for you?

I always look forward to the conference every year. I think, now that I've been a part of the society for more than two years, the best part is being able to see some of your old friends again - some of the people you met during studies or at previous conference - to see where they are at and to catch up with them both socially and 'academically' or 'professionally',. That part I really enjoy. This year, I really enjoyed hosing the banquet as well. I always enjoy the banquet and it was good fun to be a part of the evening's formalities (and not-so-formalities...). I think the atmosphere was fantastic at Lanzerac and everyone had a good time. Danie and the LOC did a sterling job. That's the crux of the social aspect I was talking about - when people are happy and comfortable and you're in such a beautiful location, it's easy to chat and catch up late into the night. And the wine helps the process too!

ORSSA 2016 Wordcloud on Abstracts

By Berndt Lindner, Stellenbosch University (berndtlindner@gmail.com)

A word cloud was made using all the abstracts presented at the 2016 Annual ORSSA conference and is presented in Figure 1. The online word cloud generator site http://www.wordclouds.com/ was used to create the image. Action and verb words such as "is, and, ..." were removed. Table 1 represents the frequency of the top cited words. As may be expected the word *model* occurred the most frequently (115 times), other noteworthy words include *simulation, water, food,* and *support* amongst others.

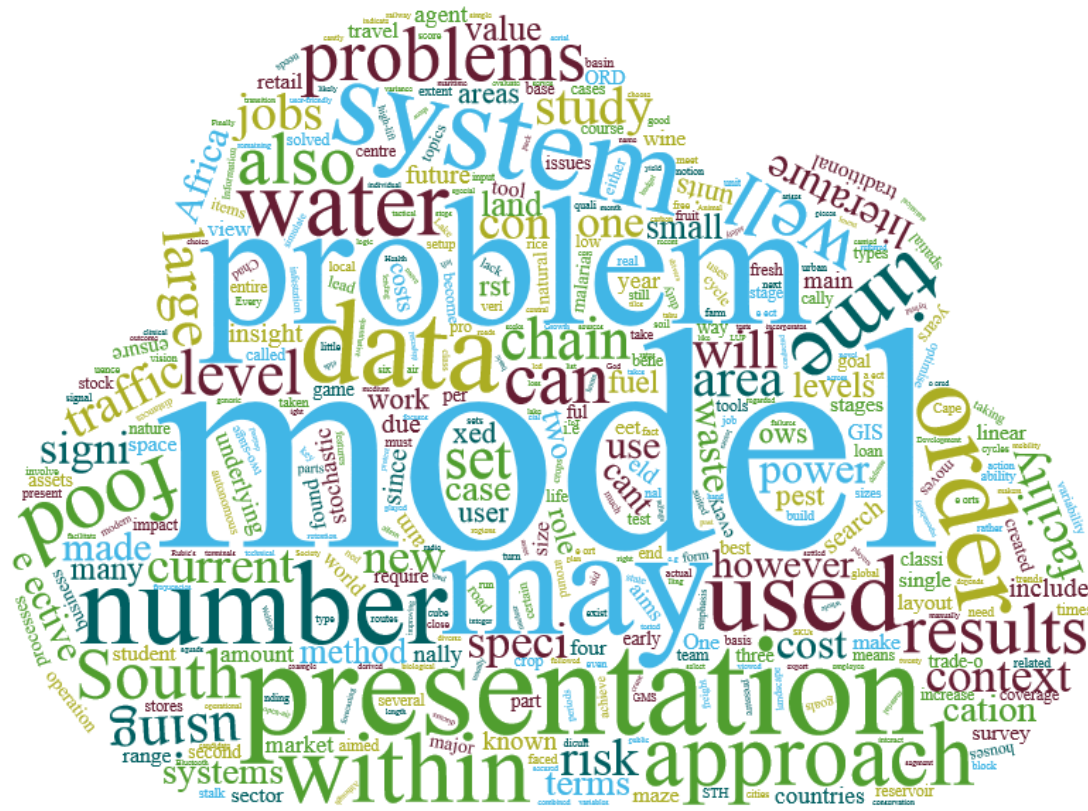Figure 1: Word cloud from all the abstracts presented at the 2016 Annual Conference.

Table 1: Frequency of most used words in Figure 1.

115	model	44	data	34	proposed	28	solution	25	management
67	problem	42	simulation	34	time	28	problems	25	process
62	decision	41	order	33	approach	28	can	25	demand
58	may	39	used	32	food	27	also	24	strategies
51	presentation	36	different	30	support	26	various	24	analysis
47	system	36	within	30	supply	26	results	24	research
44	number	35	water	29	well	26	South	24	control

OPERATIONS RESEARCH FOR DEVELOPMENT IN SOUTH AFRICA

By Marthi Harmse (kmharmse@mweb.co.za)

Marthi Harmse

Currently the Operations Research Society of South Africa (ORSSA) endeavours to document in a book format the history of Operations Research in South Africa. One chapter is earmarked for Operations Research for Development, which is a wide topic with much detail not documented. This short article tries to give some context.

Development has many synonyms and many attempts were made to define it over the centuries [4]. Nowadays reference is often made to the Millennium Declaration Goals [13] and the idea of corporate social responsibility started being promoted as part of international integrated development [14]. In general, definitions of development refer to aspects such as the following:

- Eradication of hunger and poverty
- Education and employment
- Equality
- Reduction of child mortality and maternal health
- Fight against diseases such as HIV/AIDS, malaria, etc.
- Sustainability
- Global partnership for development

South Africa was granted its request to be downgraded to a developing country in 1997 [12]. In 1994 the Reconstruction and Development Programme Fund Act [8] was accepted in parliament. Government introduced a macroeconomic policy framework called the Growth, Employment and Redistribution Strategy [2] to stimulate faster economic growth required to support the Reconstruction and Development Programme in 1996, the Accelerated and Shared Growth Initiative for South Africa [11] in 2005, the New Growth Path [1] in 2010, and the National Development Plan [6] in 2013.

There is not a single agreed-upon definition for Operations Research in Development or Operations Research for Development, but definitions have the following common features [3, 10, 15]:

- Development goals
- Developing countries
- Contextualisation and problem structuring
- Participative and transparent, recognising the role of government
- Praxis involving innovative methodology and practical applications, often involving action research
- Scarce resources

Operations Research for Development is also similar to Community Operations Research [9] which focuses on human emancipation, similarly to Community Action, Participatory Research and Action Research, with the aim to decrease dependency on external agents, decrease inequality among internal agents and increase the measure of collective autonomy. The client is involved, practitioners are clear on their reasons for involvement and different available methods are applied including problem solving methods and problem structuring methods [7]. Many examples of Community Operations Research are available from developing countries [5].

If you were involved in the past or currently are involved in any structures concerned with Operations Research for Development, the author would be much obliged if you could contact her. This also holds for any events you might have been involved in or plan to be involved in, any documents in your possession, or any references or contacts you might have. If you are not involved yet, maybe the reference list below might entice you to do so? With your support ORSSA could accomplish the documentation of the history of Operations Research in South Africa - including Operations Research for Development.

References

[1] DEPARTMENT OF ECONOMIC DEVELOPMENT, 2010, The New Growth Path: Framework, [Government Programme], Government Publications, Pretoria.

[2] DEPARTMENT OF FINANCE, 1996, Growth, Employment and Redistribution: A Macroeconomic Strategy, [Government Programme], Government Publications, Pretoria.

[3] FOURIE PDUT, 1999, Community OR and OR for development: A South African perspective, ORiON, 15, pp. 53–66.

[4] GREGORY D, JOHNSTON R, PRATT G, WATTS MJ & WHATMORE S (ED), 2009, The Dictionary of Human Geography, 5th Edition, Wiley-Blackwell, Chichester.

[5] ITTMANN HW, 1996, The RDP - What can OR offer?, ORiON, 12, pp. 21-35.

[6] NATIONAL PLANNING COMMISSION, 2013, National Development Plan 2030, [Government Programme], Government Publications, Pretoria.

[7] PIDD M & WOOLLEY R, 1980, A Pilot-Study of Problem Structuring, Journal of the Operational Research Society, 31(12), pp. 1063-1068.

[8] RECONSTRUCTION AND DEVELOPMENT FUND ACT OF 1994, South Africa, [Statute], Government Gazette, 7, Cape Town, pp. 1-81.

[9] ROSENHEAD J, 1996, Enabling Analysis: Across the Development Divide, ORiON, 12, pp. 69-103.

[10] STEWART TJ, 2006, Operational Research for Development in Africa, Paper presented at the International Conference on Modelling, Simulation and Optimization, Gaborone.

[11] THE PRESIDENCY, 2005, Accelerated and Shared Growth Initiative – South Africa, [Government Programme], Government Publications, Pretoria.

[12] UNITED NATIONS, 1997, Report of the Sixteenth Meeting of the Open-Ended Working Group of the Parties to the Montreal Protocol.

[13] UNITED NATIONS, 2000, Resolution adopted by the General Assembly Session 55 Number 2: United Nations Millennium Declaration.

[14] UTTING P, 2003, Promoting Development through Corporate Social Responsibility - Does it Work?, Global Futures, 3, pp. 11-13.

[15] WHITE L, SMITH H & CURRIE C, 2011, OR in Developing Countries: A Review, European Journal of Operational Research, 208(1), pp. 1-11.

Interview with Fanie Terblanche

By Nicholas Jonker, Stellenbosch University (17579198@sun.ac.za)

Fanie terblanche

How long have you been involved with ORSSA?
I attended my very first ORSSA conference in 2012 and later that same year I was elected the vice-chairman of the Vaal Triangle Chapter. It is a real pity that I only became involved in ORSSA later during my academic career, despite being active in the field of OR since the completion of my M.Sc in 2001.

Having been at a few ORSSA conferences, what is it that draws you back every time?

Although I have attended very few ORSSA conferences, I really feel at home and enjoy interacting with fellow OR academics and practitioners. Apart from the great opportunity to engage with others professionally, it also provides opportunity to catch up with old friends and to meet others that have similar interests in OR topics.

Nicholas Jonker

Have there been any noticeable trends that you observed since you attended your first conference?
One of the trends that I have noticed during the last couple

of conferences is the involvement of local businesses. There is definitely an increased awareness and renewed interest in OR, specifically around themes like machine learning and combinatorial optimisation. The interest from industry is not just in the form of sponsorship, but also in sharing experiences and knowledge.

I see that you have done extensive work in the telecommunications field. What has led you to that specific field?
I started my career in the mining industry where I was involved in the development of scheduling and optimisation systems. On my return to the North-West University, as part of my plan to pursue a PhD, I became involved in the Telkom Centre of Excellence. The funding opportunities within the centre of excellence enabled me to spend several months at the Zuse Institute Berlin, Germany, doing research on telecommunication network planning. It was during that time that I developed a deep appreciation for the theory and solution approaches underlying network optimisation models.

Which industries or organisations in South Africa do you think could benefit most from collaborations with operations research academia?
The potential business value in applying OR may be realised across all major industries. But since OR is predominantly data driven, data rich industries will most likely draw the most benefit. My involvement in the finance sector since my appointment at the Centre for Business Mathematics & Informatics in 2008, opened up a new world of OR opportunities that I wasn't aware of before. Although a large group of our students graduate annually with the necessary OR skills, I believe there is still a large demand for OR professionals in the finance industry.

What area of research are you interested in at the moment?
My main research interest involves the formulation of mixed integer linear programming models and algorithm development for applications in mining, telecommunications and finance. The computational effort in solving these models requires innovative algorithmic ideas and my main research focus is on the use of decomposition and column generation approaches, for the goal of improving tractability.

What do you think is necessary to garner more interest in the field of operations research among young people?

I am convinced that OR training at universities should have a much stronger practical component in order to keep students interested. Instead of jumping into theory, it may be a good idea to first let students discover simple ways of doing "optimisation" before introducing them to formal OR techniques. As an example, let them write a few lines of programming code that will enumerate all possible solutions to a knapsack problem. They will soon discover that such an approach is only viable for small problem instances and this will hopefully serve as motivation to explore better suited techniques.

Many OR endeavors focus on providing solutions to government or industry, do you think there is a market for OR-based products for personal use, for example in financial planning?
I guess there might be a market for OR based products for personal use, for example, just think of the well-known "diet problem" used in many introductory linear programming courses… But, in all seriousness, isn't it true that most of us already have access to OR-based products? For example, when one calculates the shortest travel route using some application on your smart phone or GPS. On the other hand, financial planning through some portfolio optimisation model could definitely make for an interesting application. Unfortunately, populating the model with the required financial market data and information on other financial instruments may be out of reach for most of us.

Moving back to this year's conference, what has been your most memorable talk?
I really enjoyed the keynote address by Paul Fatti. He managed to show enough technical details to appreciate the approaches he followed, but also shared some really good advice when it comes to client engagement and understanding the real problem.

As chair of the LOC for next years conference, what can the prospective guests look forward to? Any potential surprises?
The fact that next year's conference will take place in the Drakensberg should serve as a nice change of scenery for most of us not living in the Western Cape. We are planning to have some interesting keynote talks and a tutorial on the use of IBM's optimisation technology. And yes indeed, there will definitely be a few surprises - make sure to register for ORSSA 2017 not to miss out on any of them!

Interview with Ian Durbach

By Ghiete van Zyl Stellenbosch University (17734681@sun.ac.za)

In your opinion, what was the highlight of the conference?
I really enjoyed the opening plenary. I think it showed how useful OR can be but also that standard methods will only

get you so far. The speaker and his team had to develop, and it sounded like are still developing, a number of new approaches to deal with the full problem. It was also nice to see how focusing on one applied problem can lead to

a whole lot of interesting research projects and lots of papers, students, etc. I guess these are the lessons to take away too.

Which OR field do you think will experience the most growth in the next 50 years and why?
Vehicle routing, since the days of human drivers are numbered.

Ian Durbach

What are the characteristics or personality traits of a good operations researcher?
You need some technical skills as a starter, but then what-

ever makes a good "problem solver". Inquisitiveness, an ability to listen and put oneself in someone else's shoes, being able to simplify a problem, think in different ways, that kind of thing.

Do you have any insights or final comments you would like to share?
I thought the venue and organ-sation of this year's conference was great. Networking and social interaction are big parts of ORSSA conferences and it's just so much easier and nicer when you are in nice surroundings. Danie and his team did a great job.

Ghiete van Zyl i-

Conference Highlight Quotes

Johan Kellerman (16550757@sun.ac.za) and Ryan Reed (ryan4reed@gmail.com), Stellenbosch University asked a few of the conference attendees what their (possibly more social) highlight of the week was?

The presentation by Sheetal Silal about malaria elimination, the food, and getting ideas for future work. Flora Hofmann

Wine hunt and banquet. Gerhard Geldenhuys' afterdinner speech. Danie Lötter

The welcoming get together. Hano Smith

The exceptional way the conference was organised. Christa de Kock

Hans wat dink Bernie is middeljarig. Lieschen Venter

Die entusiasme en vreugde wat studente kry uit die werk wat hulle doen. Om hierdie jongmense te sien wat 'n innerlike bevrediging het met dit wat hulle doen en voel hulle maak 'n bydra, dit is fantasties. Gerhard Geldenhuys

Brian's MC jokes. How "flou" they were and in how quick succession they were. Nicholas Jonker

Die ontvangs funksie sondagaand. Hennie Kruger

The food and the scenery. Gavin Le Roux

Alles wat na my presentation gebeur het! Stefaan Swarts

The fact that one had the choice in following various streams. Plus one had the opportunity to even opt out from one stream to another stream while a whole session was running; giving you the freedom of choosing exactly what topic you want to follow. Also the grouping of certain topics. Jonathan Winnaar

The students presentations and of course the venue. Prof van Vuuren

Die netwerk van mense wat jy opbou. Die klomp jongmense waaraan jy blootgestel word. Hier is ongelooflike potensiaal en dit is eintlik net verstommend om elke jaar hierdie room van student te sien wat hier deurvloei. Dit gee mens hoop vir die toekoms. Hans Ittmann

The wine hunt was very nice. Georgina Rakotonirainy

The Banquet was very nice. Nicholas Trankle

Dit was lekker om weer die mense te sien wat jy by die vorige konferensie ontmoet het. Janneke Lötter

Die kos was baie lekker. Veral die nagereg — soos die tertjies. Johannes Scribante:

Interview with Robert Bennetto

By Jacques Taljaard (16490746@sun.ac.za)

Who initially introduced you to the field of operations research? What was the conditions around this (why)?
I was quite lucky to get a taste of OR in my Honours year in Math. Stats. at Wits. It was offered as a semester course given by Prof. Lubinsky and I thoroughly enjoyed it. It was completely different to anything I had studied before, mainly because statistics is all about predicting, not prescribing.

I think this is why I really enjoyed it. I also managed to get an Honours topic in Genetic Algorithms, so learning about meta-heuristic optimisation techniques at the same time was complementary to the OR coursework. Optimisation still feels a bit like magic to me - there are so many moving parts and somehow they all just fit together.

Robert Bennetto

You are currently doing a doctoral dissertation in Constraint Programming and Deep Learning. What lead you to this field and why did you choose to specialise in it?

I've been very fortunate to work on and with a variety of solvers over the years in a professional capacity and as a result I'm generally very focused on what technique is best for the optimisation task being handled. Sometimes it's a Linear Program, which is great. I'd say that 90% of the time, it's just really hard to map the real world into a LP (or resulting Integer Program) that can actually be solved. So Metaheuristics are normally what people turn to when they can't solve the IP, and I'm a big advocate of these techniques, but for really hard problems you have to invest a lot of time understanding the structure of the problem, adding local search operators and whatnot – and at that point it feels like the technique didn't work that well. Well, that's my feeling anyway. Constraint Programming is this nice middle ground between highly productive LP world and the highly flexibly meta-heuristic world. So you can get local search efficiency but still have modelling flexibility. CP has a few vices, one of which is that since it's very general it can't be maximally efficient on all problems (no-free-lunch theorem). My thesis is around how to adapt the search structures to the problem class at hand so that you can still get efficient optimisation.

So the thesis touches on the learning side of things because we want to learn general ways of solving all kinds of problems without actually solving a specific problem per say (which is the way LPs work) and claw back that efficiency in a flexible space. Saying this out loud makes me realise that I'm trying to automate a key part of my job - effectively bypass the expertise needed by a skilled practitioner and let the computer work it out instead. Maybe it's too good to be true, maybe not – either way it's a fun thought experiment.

What piece of advice would you give students, or anyone that is new to the field of operations research, or anyone that is interested in the field, that you wish you had at the start of your OR career?

Ah, this is something I had to learn the hard way. Learn a programming language immediately – preferably Python or R, but if you want to make life harder something like C, C++, Fortran, Java or C# are all perfectly acceptable. Once you know any well-structured programming language you can pretty much work in any of them (not that productively at first but you'll get there). Having programming agility changes your life – and it allows you to take the mathematics and techniques you've been taught and put them into action. I had a revelation in 3rd year when a lecturer demonstrated how to get a near-exact solution to a really hard combinatorial problem in 3 lines of R code by just simulating millions of random samples, rendering 3 years of exams and distribution theory I had been taught completely needless. All I could think about was; "wow, if he can do that in 3 lines, image what he can do in 30".

Jacques Traljaard

What piece of advice would you give veteran or returning operations researching for them to ensure they stay relevant in the field?

RB: I think each subset of OR has its own direction or specialties which are important to stay relevant in. It's difficult to say unilaterally which advice could apply across all of them (i.e. soft vs hard OR). I can only really comment on the hard OR side of things. I get the feeling the field is maturing rapidly out of the theoretical and into the "anything is possible" space. More so than before due to the jump in compute capability in the last 15 years or so. It's exciting and scary because we're really spoilt for choice in terms of the tools you can use to solve certain problems and approaches one can take - there are fewer guidelines but also more interesting things one can do. I think one of the big paradigm shifts people may struggle with is conceptualizing the cloud and how it fits in that set of tools – and that's not going to change from this point forward, so I guess my advice would be to familiarize oneself with the cloud and how to get the most out of it.

In terms of research and / or activities, what direction would you like to see the society heading?

It would be great if the society could diversify more in the coming years. The society has a lot to offer and there are many African countries that are starting to mature in terms of their education that could really use an affiliate that's able to guide them in terms of nurturing that growth. That's obviously an easy thing to say, and a hard thing to do. One of the ways to start this process is just by being more inclusive of all the universities around South Africa - I know that it's a target for the executive committee in the coming year and I hope they manage to make some progress on that frontier.

Off the record question: I officially applied for postgraduate studies in 2017.

While I do understand the difference between a Bachelors and a Masters degree in academics, and understand that a Masters degree gives one a greater degree of credibility in research societies. Yet there is on aspect of the Masters argument that ALWAYS comes up; the value of a postgraduate degree in industry. Some people, specifically academics, reason that a Masters degree will automatically offer you an immediate advantage in industry. Some industry specialists, however, reason that anything over a typical Bachelors is unnecessary for all

practical purposes. What is your take on the debate?
Perhaps the best way to discuss this question is to rather ask why one studies in the first place. For some people, they're aiming to get the required skills to demonstrate they're equipped to work in industry and be further refined to the task they're employed to do after their study. In this instance, I would agree, you don't need more than a bachelors (generally speaking, there are exceptions). A large part of industry is structured this way and there's absolutely nothing wrong with this line of thinking. University cannot prepare you for the specifics of the industry you ultimately end up working in and that is something exciting because you still end up mastering your trade over time. (no free lunch yet again?)

So why study further? I think you refine a new set of skills doing a postgraduate degree, and in the same way some value a bachelors in industry, other segments of industry value a Masters or PhD. A postgraduate degree demonstrates you care about the knowledge itself and for some companies this is also valued. In the same way that academia contributes to the body of knowledge, some industry segments also drive from this angle. A lot of cutting edge research is being done at the likes of Facebook, Google, Baidu to name a few. In these kinds of environments,

the academic rigor that gets applied in postgraduate study is expected because that's the tried and tested process that produces good research. Yes, it is for profit (shareholders are a necessary evil without government funding) but it also advances the field through open-source channels so it's not all doom and gloom.

So it depends on the individual and how their personal value system is aligned. If you are curious to dig into all the abstract nuts and bolts for the sake of it, without it ever having to benefit anyone (potentially), then postgraduate study might be for you. Hopefully when you're done studying you end up with like-minded people in academia or in industry. Either way, you shouldn't have regrets because you learnt something (which aligns with your values). If however, you don't place value on potentially meaningless knowledge, you should consider getting stuck into industry to start getting your hands dirty. Some people don't want to know why - they want to make a difference starting now - and many do! So I think there's no right answer - just some introspection on what your own value system suggests you should do. Whatever you decide will probably give you an indication of the kind of places you may want to end up working one day.

Interview with Lieschen Venter

By Jancke Eygelaar (16516885@sun.ac.za)

Lieschen Venter

After joining industry as an operations researcher at Sasol, why did you decide to return to Stellenbosch University and start your PhD?
I found industry quite frustrating. The constant pressure of the financial bottom-line means that a monetary value had to be assigned to any research performed and it is difficult in some instances to find the funding required for exploration and innovation. I think the main reason for returning to academia is because I missed the freedom to do interesting research which is a great advantage of being employed by the University.

You are currently doing your PhD part time, how has that been for you so far?
I am finding it quite challenging to make time for my PhD with all the other responsibilities that I have. Even with the allowed study leave I still feel that I can't just leave my Department understaffed especially during this difficult time where there are financial demands on the University from various student movements.

What is your favourite aspect of working at Stellenbosch

University?
Definitely the freedom I have to do research in any interesting field after seeing that there isn't really so much freedom in industry. If I feel that some technology might be beneficial to what I am currently doing, I am allowed to spend a week or two on researching different aspects to improve my current studies or even

Jancke Eygelaar

help with some of the courses I am teaching, even at the risk of the exploration possibly not yielding anything useful.

You have been a member of ORSSA for nine years and have been serving on the Executive Committee since 2012. What keeps you motivated and dedicated to the Society and why do you like serving on the Executive Committee?
I actually have no idea. Typically it is difficult to find people to serve the Society as it is mainly based on volunteers and most of the members of the Society spend their energy on either their studies or their careers. I am a very sentimental person and ORSSA has such a feeling of family about it. I was quite emotional after attending the presentation by Prof Jan van Vuuren and Prof Gerhard Geldenhuys on the

history of OR in the Department of Applied Mathematics at Stellenbosch University, and I don't even know why. I suppose it's because Prof Geldenhuys spoke with so much authority as our Society's honourable patriarch.

What was your favourite presentation during the 2016 ORSSA conference at Lanzerac?

I really enjoyed Dr Sheetal Silal's presentation on mathematical modelling for malaria eradication. I have, however, also read the paper that she wrote about the work in the presentation which gave me a greater understanding of what it was about. Another talk that I really enjoyed was the presentation by Esther Basson, where she showed her fun technical abilities with the flash video included in her slides.

What was your favourite social event during the 2016 ORSSA conference at Lanzerac?

I really enjoyed watching Danie Lötter on the dance floor after the Banquet on Tuesday evening. I also enjoyed Hans Ittman's comment during the AGM meeting where he tried to discern whether or not Bernie Lindner was, in fact, still young.

What topics, outside of your current research field, do you currently find interesting?

I have a heart for community OR. That is why I also enjoyed Marthi Harmse's presentation of the history of community OR in South Africa. Two of my honours students did projects in this field and I would like to develop these further for actual implementation. The four areas that I am currently working on is in the area of low-income housing, the scheduling of outreach teams for faith-based organisations, scenarios for increased diversity in university graduates, and improved basic education in South Africa.

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Obituary for Dr. John Dean

By Dave Evans (davevans@gmail.com), on behalf of the Society.

Dr John Dean succumbed to cancer and passed away on 21st December 2015. He was a member of ORSSA, and more specifically the Johannesburg Chapter, for many years. He served on the chapter committee on several occasions throughout his membership, and was the vice-chairman at the time of his death.

John was an integral part of the Eskom fraternity, where he served as a Specialist in Ancillary Services at the System Operator. He was instrumental in the optimisation of generation and demand dispatch tools. He used his immense knowledge in various fields, including OR, to formulate philosophies and tools to assist with the determination of reserves requirements for the System Operator.

John Dean (right) receiving ORSSA's Category I Award in from the then President of ORSSA, Hennie Kruger (left) in 2014.

John Dean (middle), with Dave Evans (left) and Jacques du Toit (right) at ORSSA's 41st annual conference (2012), held at Aloe Ridge Hotel.

He was passionate about his work and contributed enormously to training young engineers, without holding back on his knowledge. The legacy he has left behind is still clearly visible in the workplace.

John's other enthusiasms included a keen interest in astronomy and activities that looked at multiple sclerosis.

He was a very valued member of the Society throughout his membership, and was a presenter of papers at conferences, as well as hosting chapter events at the Eskom headquarters, at Megawatt Park.

John leaves behind his wife Ann, a son and daughter, and grandchildren. He will be missed by all of us who knew him. We extend our condolences to his family.

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Paul Fatti
Emeritus Professor of Statistics
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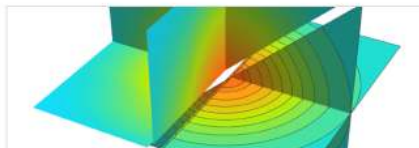**Computational Photography »**

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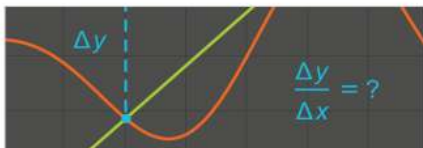
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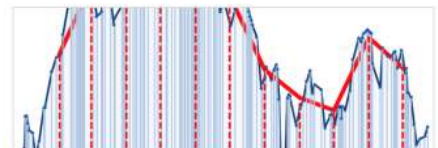**Enhanced Geo Visualization »**

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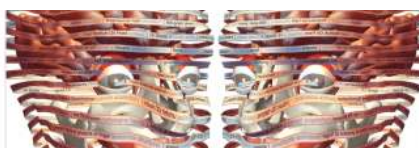**Quantities in Probability & Statistics »**

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