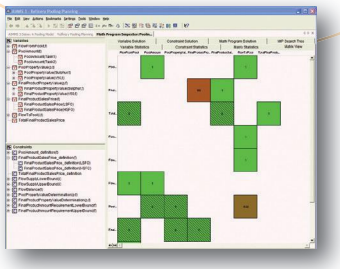
# Newsletter

Operations Research Society of South Africa
Operasionele Navorsingsvereniging van Suid-Afrika

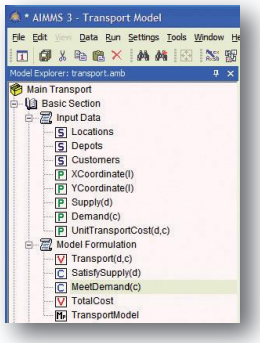
October 2009
www.orssa.org.za

# Experience how AIMMS facilitates interactive optimization modeling

*Perform what-if scenarios or use the Math Program Inspector to visualize the matrix and drill down to individual constraints & variables*



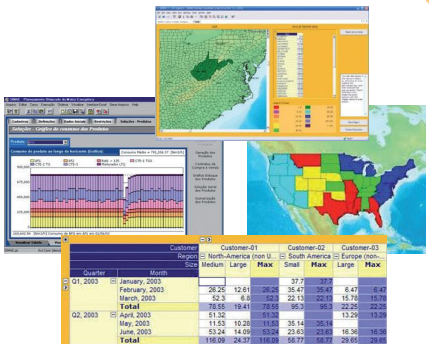
*Create and modify large models in a clear and concise way*





*Import data easily from different sources*

*Visualize the results with the integrated graphical objects*



*Use various solvers and math program types, or construct your own solution approach*

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## FROM THE EDITOR

*Contactable at: zane@sun.ac.za*

**Zane Simpson**

This newsletter will be reaching you a little later than usual, due to including feedback and photos on the September conference.

In this issue, we have some kind words from our current ORSSA president, Sarma Yadavalli, whose term in office as president ends this year, followed by our regular member profile for this issue, being Jacomine Grobler, who is the recently elected chair of the Pretoria chapter.

We have some thoughts on OR and ORRSA, as well as some feedback and photos of the September ORSSA conference which was held in Stellenbosch.

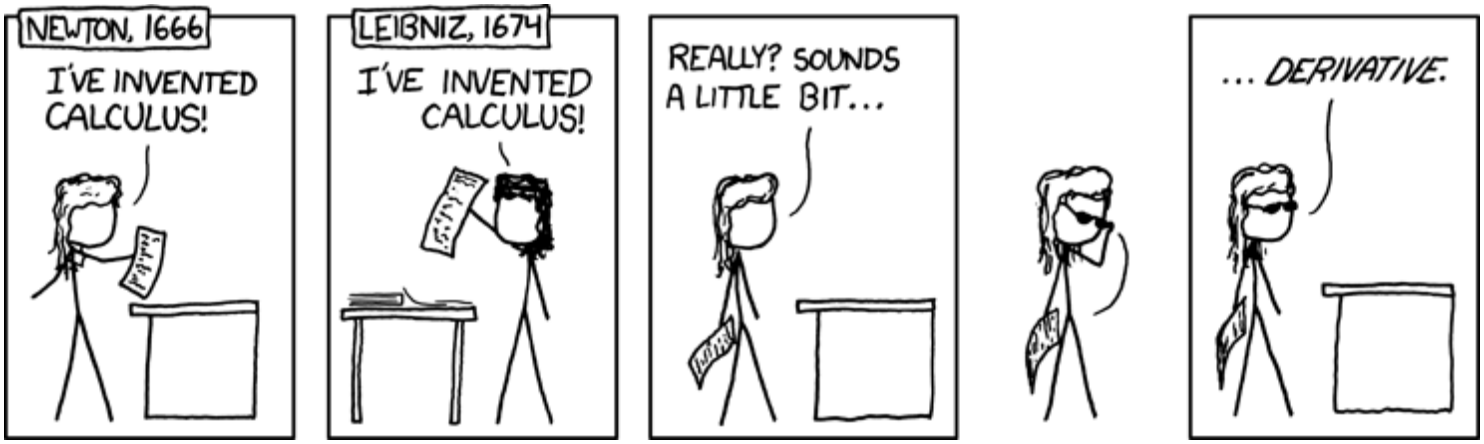
I unfortunately was unable to attend the conference, and after reading and hearing feedback on it, realise I truely missed out on a fantasic conference.

I hope this issue is an enjoyable read! ☺

## Features



## COMIC




**Source: http://www.xkcd.com**

## FROM THE PRESIDENT'S DESK

*by Sarma Yadavalli (yadavalli@postino.up.ac.za)*
ORSSA President

Dear Colleagues. We all witnessed a grand and unique ORSSA event (annual conference) on 20th September 2009, at Stellenbosch University. The event was unique as it coincided with the 40th birthday of ORSSA and the 25th birthday of ORSSA journal, *ORiON*.

Following the tradition of past years, we had a well-attended, scientifically stimulating and interactive annual ORSSA conference at Stellenbosch. Besides many interesting papers from young and senior researchers, and Fellows, there was a very inspiring key note speech by Professor John Bartholdi attended by all the delegates. At the closing plenary lecture, Professor John Bartholdi said `the quality of papers presented at the conference match with the papers presented at any international conference'. He also suggested that the students can present these types of papers at any international conference. ORSSA must be proud of it. We are grateful to the local organizing committee and particularly to Professor Jan van Vuuren and his team for making our stay comfortable and enjoyable. It is time to look forward to the 41st ORSSA conference in Limpopo and our hosts are busy in organizing the same. Please make this event also a great success. It is heartening to note that some of our local chapters are very active and engaging young researchers to get the message of Operations Research across.

As my term of office as President will be over by December 2009, I wish to express my sincere thanks to my fellow executive committee members for their cooperation during this period and I wish the incoming president, Dave Evans, all the best for his two-year term of office, 2010-2011.

Prof Dewald Roode died in the morning of Sunday 27 September 2009.

Prof Roode was a member of the executive commitee of ORSSA in the 70's

He was also the first Head of Department of Informatics at the University of Pretoria and laid the foundation for the department. He was also the supervisor of 7 of the personnel's doctorates.

IFORS 2011
Conference for the International Federation of Operational Research Societies

The 19th Triennial Conference of the International Federation of Operational Research Societies (IFORS) will be held at the new Melbourne Convention Centre in the centre of the city of Melbourne, Australia from the 10th to the 15th July 2011 and will bring operational researchers from around the globe together.

**http://www.ifors2011.org**

## DISCLAIMER

The views expressed in this newsletter are those of the contributors and not necessarily of the Operations Research Society of South Africa. The society takes no responsibility for the accuracy of details concerning conferences, advertisements, etc., appearing in this newsletter. Members should verify these aspects themselves if they wish to respond to them.

## QUERIES AND CONTRIBUTIONS

Any queries and contributions to the newsletter are most welcome, especially article submissions. For any queries and contributions, please contact the newsletter editor:

Zane Simpson
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## *MEMBER INTERVIEW: JACOMINE GROBLER*

*Contactable at: jacomine.grobler@gmail.com*

**Jacomine Grobler**

Jacomine Grobler was born and bred in Pretoria. Although being analytically minded, she loves being creative, solving problems and working with people. This is what motivated her to study Industrial Engineering at the University of Pretoria. While studying, she was introduced to operations research. She was immediately attracted to the field and started experimenting early on with heuristic methods. She went on to complete her Masters degree in Industrial Engineering, while doing research as part of the Computational Intelligence Research Group at the University of Pretoria. Since 2006, she has had the opportunity to speak at a number of national and international conferences. She also publishes regularly and has reviewed papers for various journals including *Swarm Intelligence, International Journal of Operations and Quantitative Management, Journal of Scheduling (special edition), Central European Journal of Operations Research* and *South African Journal of Industrial Engineering*. When she is not working, she can be found paddling, reading, or spending time with friends.

**You recently obtained your masters degree. What was your masters research on, and what is your current research on for your PHD?**

I was very lucky to start working with particle swarm optimization (PSO) when it was still relatively new in the OR world. My masters degree focused on investigating the application of PSO and differential evolution (DE), which are both evolutionary meta-heuristics, to multi-objective multi-machine scheduling problems. The algorithms which I developed ended up working quite well, with improvements of up to 24% being obtained in terms of solution quality when compared to existing algorithms used.

I have to admit that there was, however, one aspect of my research that I found particularly cumbersome. Every time I attempted to solve a different problem instance, I had to customize the algorithms used to obtain the best performance. This is a typical characteristic of evolutionary algorithms and result in their application to different problem instances being a time-consuming activity requiring specialized skills.

For this reason, hyper-heuristics has become an increasingly popular approach to optimization. The purpose of hyper-heuristic research is to develop methodologies that can adapt to different environments without having to customize the search, or its parameters, for each particular problem domain (Burke, 2009). This "automation" of the algorithm design process, has important implications for the cost and effort associated with applying optimization algorithms to a large number of diverse problem types.

Last year I was very fortunate to have the opportunity of visiting the pioneers of hyper-heuristic research at the Automated, Scheduling, Optimization and Planning Research Group (ASAP) at the University of Nottingham, England. While I was there I learnt a lot about the motivation for and application of hyper-heuristics to real-world problems. This visit inspired me to focus on the development and testing of PSO-based hyper-heuristics in the defence industry as part of my studies towards my PhD.

**You lecture to Industrial Engineering students on a part time basis. How did you get involved and do you see yourself remaining as a lecturer in the future?**

In 2006, the third year OR lecturer at the Department of Industrial Engineering at UP, needed to go away for about five weeks on official business during the middle of the semester. He asked me whether I was willing to stand in for him while he was away and that was my first "lecturing position". The subsequent year, I was appointed as junior lecturer in the Industrial Engineering Department, where I taught Facilities Planning to the third year engineering students for the next two years. I especially enjoyed my time lecturing as it provided me with the opportunity to meet and develop relationships with many different people. It also felt like I was "giving something back" and let's face it...I didn't always appreciate it at the time, but it is quite fun, especially if you like to talk!

I am currently working as an Industrial Engineer at Denel Dynamics (Pty) Ltd. I love working in the corporate world with its many opportunities and different kinds of problems to solve. I do, however, sometimes miss the academic life quite a bit, especially

the long holidays (for junior personnel anyway!) and the time and freedom to do research. I definitely see myself going back some time in the future, even if it is only on a part time basis.

**How did you originally get involved with ORSSA, and how long have you been a member?**

My first encounter with ORSSA was at the 2006 ORSSA conference held in Pietermaritzburg. I was sent by the University to present my final year project. At the conference I very quickly got to know ORSSA as a close-knit community of friendly and helpful people who were very welcoming to the new ORSSA members. I've been a member since the middle of that year, making me a member now for about three years.

**What would your commentary be on the role of ORSSA in promoting OR in general, and how do you think the society is doing in terms of achieving this goal?**

Since ORSSA is, to the best of my knowledge, the only professional society in South Africa specifically geared towards promoting the interests of OR practitioners and marketing OR, it is critical to the health of OR in South Africa. The society as a whole obviously has many responsibilities, just some of which includes being responsible for ORiON and the newsletter, presenting conferences and short courses and providing support for OR practitioners. There are many people in our society who have and still are working extremely hard at achieving these goals and I think we can definitely feel very proud of our society.

I do, however, believe we can do much more in the Pretoria area. I have recently been appointed as the chair of the Pretoria chapter, and I hope to, with your assistance, lay the ground work for establishing our chapter as a platform for knowledge dissemination in Pretoria. I also believe our chapters have an important role to play in nurturing and supporting students and young OR practitioners and marketing OR as a feasible alternative in industry.

**Have you recently been involved in any interesting OR related projects, could you give some brief details?**

Over the last year, I have been involved in the development of a PSO-based multi-objective optimization algorithm and have had the privilege of presenting a paper describing this algorithm at the IEEE Congress on Evolutionary Computation earlier this year in Norway.

I am currently also busy applying six sigma concepts to the Denel Dynamics machine shop where there is a strong focus on data analysis for identifying root causes of poor performance. One of the key problems in the machine shop is inadequate capacity planning. I hope to address this problem through improved scheduling and believe that the work I did as part of my Masters degree can be especially useful for addressing this problem. The idea is to then extend this improved planning and scheduling ability to the other production lines in Denel Dynamics.

**What are your dreams and aspirations as an OR practitioner in South Africa?**

I often hear people around me say that OR is too complicated to be practical, it "over-solves" the problem and even that it "is a waste of money". I believe that we as scientists and engineers have a set of tools, ranging for example, from statistical data analysis to business process re-engineering, and it is our responsibility to apply the right tool, in the right way, to the right problem at the right time. When OR is selected as the most appropriate tool for the current situation, which in many cases it is, I believe that it has the potential to make an enormous impact on the competitive advantage of a company. I would love to see all companies in South Africa considering OR as a viable means for improving the quality of decision making and system design in their organization.

**Do you have a message for other young OR practitioners?**

Work hard, never give up, believe in yourself, never forget the people who got you to where you are today and trust God to bless you.

**Reference:** Edmund K. Burke. (2009). Hyper-heuristics: an emerging paradigm in Evolutionary Computation. Tutorial presented at the *2009 Congress of Evolutionary Computation. Trondheim*, Norway.

# Some Thoughts on OR and ORSSA – Past, Present and Future

*by Dave Evans (DaveE@dbsa.org)*

The after-lunch session on the first day of the Annual Conference, held at Stellenbosch University, was a '40th Anniversary Discussion.' Paul Fatti chaired the event, which started with five minute presentations from each of seven people: two members who were at the 'founding' meeting, forty years ago (Gerhard Geldenhuys and Dave Masterson); two current 'mature' active members and past Presidents (Marthi Harmse and Hans Ittmann) and three of the 'next generation' (Ian Durbach, Jacomine Grobler and Darian Raad).

All had been given 'free reign' as to what to cover on the very broad theme in the heading, above, and this was obvious from the variety and originality of what was said.

Gerhard remarked on the fact that the first President of ORSSA, Herbert Sichel, was at the first ever IFORS conference in England, in 1957, and presented a paper on OR/Statistics in the South African mining industry! The registration fee for the first ORSSA conference, in 1969, was R3,50. Dave described how high-profile OR was in those days, with significant coverage in the press, and special interest groups attracting up to 80 attendees, sometimes twice weekly (Yes, that's not a typo.) The National Management Development Foundation was promoting OR, and some meetings were attended by visitors from as far away as the Zambian copper belt.

As Treasurer, and custodian of our membership database, Marthi was in a position to give us an overview of the state of the Society, which she concluded is quite healthy. She mused on what attracts us to OR; various members had commented in terms of working in teams with clients, the idea of the 'Science of Better', helping people, and wanting to 'make a difference.' She also reflected on our perpetual identity crisis: our difficulties in knowing where our boundaries are, in telling people what OR is; are we a 'discipline', or simply an 'approach', is OR 'hard', or 'soft' (or both), etc. She felt that ORSSA has a huge role to play in the future of OR in South Africa, and she was the first (of many, as the open session was to indicate) to suggest that we need to market ourselves and our 'value proposition' better.

Hans agreed with Marthi on the health of OR and the Society. He talked about the challenges and the opportunities; how much the country needs what we can do, to assist in development, effective service delivery, poverty alleviation, perhaps even in stamping out corruption. He emphasised that just 'doing OR' isn't enough – we also have to 'promote the brand.' He also mentioned the demands which the modern 'wired' world makes on us all, and how little time there seems to be for each of us to contribute to 'extra-curricular' activities such as helping to run the Society. He remarked on what a magnificent job Jan van Vuuren's Stellenbosch team has done in organising this conference – all in their spare time. One hopeful sign he has noticed is that the new Japanese prime minister has a PhD in OR!

Ian focussed on the concept of the Society as a network, and after looking at it from that perspective, reflected on the fact that we seem to have several dangerously 'indispensable' nodes (members), and wondered what we can do to make the network more robust. In a wider sense, does our network have the right sort of characteristics? For his thoughts on the future, he hopes we will get more involved in other disciplines' problems (and vice versa: get behavioural decision making experts to help us, for example) and that we will tackle important practical local problems, such as poverty alleviation, sustainability and climate change.

Jacomine came at the question as an Industrial Engineer, who sees the issue as being how to balance manpower, machines and money; delivering the most impact for the least cost. A key common factor is problems with resource limitations. Quite often, a major contribution is simply helping the client to a correct and comprehensive characterisation of what his

problem really is. She believes all the characteristics which originally defined good OR are still valid.

Darian ended the formal inputs with a breathtaking proposal to set up the ORNET – an on-line facility for Modelling, Optimisation & Decision Support to act as a marketing channel for OR, as well as being a serious business venture. One feature would be standard 'templates' to give users an easy entry into the use of OR. It would follow the Facebook/Google model, with basic functionality free, with more complex support such as consulting, charged for. He recognised that the character of what he was describing probably needs to be 'arms length' from ORSSA, as a commercial entity, but certainly with the opportunity for a significant involvement from the Society and members.

Discussion was then opened to the floor, and only stopped when Paul Fatti, the chair, felt we had eaten into the tea break far enough. There was general support for the idea that OR as a means of aiding the 'optimal' allocation of scarce resources still has a huge role to play in South Africa, in areas such as those mentioned above: poverty alleviation, development, service delivery, etc. There was also widespread support for more effective marketing of OR, and for the multidisciplinary aspect – even to the extent of brain-storming with fashion designers, for example. Should we establish a presence on Facebook? Twitter? It's important to sell our success stories, and the role we can play, whilst at the same time, avoiding anything that creates an image of 'back room boffins.' We should talk about our approach to problem solving and better decision making; NOT about what a wonderful tool goal programming is.

Incoming president, Dave Evans, undertook to follow up on the various ideas which had been tabled; he commented that the National Executive Committee meeting the previous day had also identified marketing, and the role of OR in service delivery and development as three areas needing more attention.

Paul Fatti thanked the panel and members from the floor, for their contributions to the debate. The audience appeared to regard this session as one of the most stimulating we have held for some time. There is clearly considerable energy to move forward in the areas discussed, and it is important that the Executive Committee makes that happen.

# Prioritising Social Service Delivery with Cost-Benefit Analysis

## Cost-Benefit Analysis combined with effective Monitoring and Evaluation helps prioritise social service delivery.

By Tshepo Riba, Analytics Intelligence consultant at SAS Institute

In the past Monitoring and Evaluation programmes tended to assess the value of projects based on the costs of the social services delivered per province and per department and not on the actual impact, and short or long term benefits of a project.

Now more than ever government needs an accurate reading of the overall benefits and reach of its projects. This includes the benefits for the people, for the economy and for the environment. And while these impacts may seem intangible variables for evaluation, they are actually more measurable than you think, and can be achieved with effective Cost-Benefit Analysis.

**Cost-Benefit Analysis**

For any organisation to go ahead with a project, the benefits must outweigh the costs, but accurate benefit measurements depend on what is judged as benefits and what variables can be given a monetary value.

Cost-Benefit Analysis (CBA) effectively measures the desirability of a project by weighing up the total expected costs against the expected benefits. The aim is to measure efficiency of interventions, relative to a particular situation. The costs and benefits of a project are in turn evaluated in line with the benefits, ensuring sustainability and avoiding the threats of not investing in these.

Through CBA government best practices can become reliant on prioritisation that will show the benefits of each level of a programme and how to improve the quality of life of citizens and overall government performance.

By highlighting long term intangible or social benefits in terms of monetary value, projects that were previously discarded can be revisited using CBA, which may reveal the actual value, as governments have the opportunity to look deeper and measure true benefits, down to the very last individual.

This allows government to predict the benefits of future projects, and measure human welfare in monetary terms. By placing a price on the positive effects of a project, government can more effectively measure the positive impact of its projects.

**The Challenges**

Creating models to measure "social" benefits of projects is difficult and in practice analysts need to estimate costs and benefits using different analytical methods, either mathematical or statistical. Once applied, these will allow government to derive a plausible CBA and place financial value and social value on even footing. Economically these models are built using a "discount rate", which takes all future costs and benefits in present-value terms, places them on a sliding scale which is weighted against the inflation or interest rate at a given time and then adjusted over a period to give a future view of expected costs.

The challenge comes in when high discounted rates imply a low value on the welfare of future generations and then cast doubt on the real value for the people and environment it is supposed to have an impact on. This may cause government to not buy into certain programmes, due to the perceived value based on the interest rates, used as the method to measure the viability of the project at a given time.

During CBA, monetary values may also be assigned to various risks which could contribute to partial or total project failure or long-term governmental goals.

**Effective comparisons**

Allocating different revenues to the provinces is of critical importance for the delivery of social services in South Africa, as it leads to comprehensive and effective social service delivery.

The use of equitable and conditional grants for provinces can also be measured and better managed. For example the cost to build a kilometre of road in Gauteng is not the same as it is in KwaZulu-Natal. Knowing this will allow government to better pool resources and

in turn social services delivery can be expedited.

Using CBA to analyse delivery methods allows one to evaluate the actual costs of delivery. The cost of health care delivery in sparsely populated areas is greater than in highly density areas as one must look at logistics, information infrastructure and accessibility, as well as the costs of medical equipment. CBA allows these to be mapped back to social benefits for a long term view of costs incurred should services not be delivered.

**In Conclusion**

When deciding the value of projects, one can only justify the expense of these when true value can be anticipated through the long-term benefits and effects, of not only the real costs but the sometimes intangible social impacts they will yield. Using more advanced monitoring and evaluation methods combined with CBA, government will be able to achieve a more conclusive view of the true potential of their projects.

To learn more about how to meet the requirements for real-time decision making, contact SAS on +27 11 713 3400 (Johannesburg and Pretoria) or +27 21 912 2420 (Cape Town) or visit our website, www.sas.com/sa

# ORSSA Conference 2009: A Personal Perspective

*by Lieschen Venter (14363240@sun.ac.za)*
**Department of Logistics, University of Stellenbosch**

Like someone trying to recall the details of a complicated dream, I find myself piecing together all the parts of the ORSSA Conference 2009 that tickled my fancy most. In an effort to produce a quality report as commissioned by our intrepid newsletter editor, I replay the events in my memory only to find that the tempo with which the entire conference proceeded makes this process rather tricky. To use the semi-famous analogy, recalling especially the preparation period that led up to this great conference is much like recalling a car crash. I remember a lot of screeching, clenching of teeth and facing in the wrong direction at some point before finally being thrown clear. But, adventure is discomfort in retrospect, and thinking back, I'm certain we would do it all again in a heartbeat.

As a postgraduate student of the Department of Logistics at Stellenbosch University, I presented myself able and willing to assist in the conference organisation. I found myself tasked with the registration details and by Registration Sunday, I was well acquainted with every delegate. I knew exactly who was attending what, where they lived and who was allergic to walnuts and this made finally meeting everyone great fun. The welcome reception kicked off the conference in style as we explored the facilities of the Stellenbosch Institute for Advanced Study (STIAS) and enjoyed an introduction to the taste explosions that would be presented by the institute's in-house caterers during the following three days.

Partners in crime: Dariaan Raad, Lieschen Venter and Elias Willemse.

The Monday morning saw the presentations commence as we gathered in Auditorium 1 to experience an amazing plenary presentation by one of our department's extra-ordinary professors of operations research, Professor John J Bartholdi, III, who was the keynote speaker at the conference. After a tea break the first set of delegates, some a little nervous, stepped up to present their work and so all attending began their not too complicated shuffle between two, sometimes three presentation rooms.

Lunch was always something to look forward too. Anything from the freshest salads to the most succulent beef stews where served and we were never left disappointed with the offering of something sweet to complete the meal. Special kudos must go to the catering staff who were able to treat even the most ingredient intolerant delegate to something special.

But all slides and no wine makes for a dull delegate, and the wine tasting that was presented by Simonsig that evening was exactly what was required after a long day of academics. The strict time allowance for facility occupation set by the institute created the interesting combination of eight wines and sixty minutes. A combination which, needless to say, had even the most serious connoisseur detecting elements of guava and damp autumn leaves in their blend, despite raised eyebrows from the charming wine mistress.

The Tuesday morning set off without a hiccup and the moment came that I myself had to present. I heard my mouth make the right sounds, but in reality, sheer terror had me retreating safely in to happy place, only to emerge again when I heard myself say "thank you". I was in complete screensaver mode, and had you been close enough, you would not have been surprised to see a clownfish or manta ray swim across my eyes.

Regardless, after presenting, I was free to enjoy the rest of the conference and I was duly impressed with the very high standard of all the presentations.

Dusk saw the delegates return to the venue dressed to the night as we gathered for the traditional banquet. Warm candle light created a cozy atmosphere as sepia toned past presidents looked down on us from slideshows, reminding us of our 40 year heritage. Awards were received, special mentions were made, milestones were celebrated and I even achieved a lifetime goal of hugging a very esteemed, newly appointed Fellow. Having been identified as one of three key nodes keeping the ORSSA network together, I was rather excited to be seated at professor Jan van Vuuren's table, but taking my history into consideration, I was petrified of projecting some beetroot ball onto his clothing or spilling a glass of wine on him. Pride, however, negated caution as many students rushed to his side to congratulate him.

And so, Wednesday dawned and the conference drew to a close. All that remains is to pack what I have learnt from this conference into my treasure chest and to cherish each lesson. I have learnt that organizing a conference is no small task and excellence is a virtue to be greatly esteemed. I have learnt that when it comes to work, it is better to pull than to push, that opening a bottle of bubbly with a prop sword is apparently quite easy and that there wasn't actually any pawpaw in the desert wine. I have learnt how to sneak undetected glances at a certain Greek delegate, that caviar doesn't really taste like anything, that it is possible to become a Fellow despite having a contagious and frequent giggle, and that you can go from Springbok Pub to delivering a prizewinning presentation in four hours.

But most importantly, I've learnt the value of family. I've seen old boys greet each other like brothers and I've felt the open arms of the Society welcoming its youngsters. I've experienced the corporate search for answers to our existential questions and have found even the unsurities binding us closer together. I am truly excited about the amazing future that awaits the Society and I am grateful for a real family to come home to. Happy 40th, ORSSA!

Dave Evans, Stephan Visagie, John Bartholdi III and Sarma Yadavalli at the 40th Anniversary Celebration

Jan van Vuuren, Danie Lötter, Marthi Harmse and Vusumuzi Hlophe during the 40th Anniversary Celebration Banquet of ORSSA.

The 40th Anniversary Celebration Banquet on September 22nd, 2009, during the 38th annual ORSSA conference in Stellnbosch.

# Tom Rozwadowski Award: 2008

*by Dave Evans (DaveE@dbsa.org)*

The Tom Rozwadowski medal is the Society's premier scholary award, presented for the best published contribution to Operations Research made by a member of the Society during the previous year. Tom Rozwadowski was a founding member of the Society. He emigrated to the United States, and he and his family died tragically soon afterwards, in a carbon monoxide poisoning accident. The Society awards the medal in his memory; it was first presented in 1971.

Seven papers published in 2008 were considered. The initial screening was done by a nomination committee consisting of the vice-president and chapter chairpersons. A short list was presented to the selection committee, consisting of the president, the immediate past-president and two members of the executive committee.

The criteria used as a basis for making the award include originality, the quality of any theory developed, interaction between theory & practice, new areas of application, new opportunities created for operations research, and clarity of exposition.

Several excellent papers were received. The winning paper was "The identification of possible future provincial boundaries for South Africa based on an intramax analysis of journey-to-work data", by JH Nel, SC Krygsman and T de Jong, which appeared in Volume 24(2) of ORiON. As JH (Hannelie) Nel is the only author who is a member of ORSSA, she is the recipient of the 2008 Tom Rozwadowski medal.

One of the logical bases for defining 'regional' boundaries (e.g. provinces) is that people should live and work in the same 'region.' This paper describes a way of progressively grouping small areas where this applies, to create progressively larger regions. Starting from *N* areas, if the process is iterated *N*-1 times, one ends up with the whole country as one region. Obviously the iterations may be stopped at any point before that, to provide 9, 8, 7, etc., provinces, as required.

The paper describes the process very clearly, and gives an example of how it can be used for South Africa. It has been sufficiently highly thought of that is has been forwarded to the South African President's Office. Clearly, political requirements may be added to any of the solutions from the model, to provide a more practical, implementable, provincial model.

The Society congratulates Hannelie Nel on the award of the Tom Rozwadowski medal, which was made by the President, at the gala 40th Anniversary Dinner, at the National Conference at Stellenbosch University on Tuesday 22nd September, 2009.

Hannelie Nel being congratulated by Sarma Yadavalli on winning the Tom Rozwadowski medal.

*Recognition Award by the Operations Research Society of South Africa (ORSSA)*

**Category III:** To a non-member of ORSSA for outstanding contributions over a long period of time

# *Gideon de Wet*

***Citation.*** By Jan van Vuuren, on behalf of the Executive Committee of ORSSA.

Gideon de Wet was born in Karasburg, Namibia on the 10th of April 1936. After simultaneously completing a bachelor of science degree (majoring in mathematics, applied mathematics and physics) and a bachelors degree in electronic engineering in 1959 at Stellenbosch University, Gideon went on to obtain a PhD in Electronic Engineering at Stellenbosch University in 1970. He also holds a postgraduate diploma in Digital Electronics from the Philips International Institute for Technological Studies in Eindhoven, the Netherlands (obtained in 1963), a postgraduate diploma in Control Engineering from the University of Cambridge in the United Kingdom (obtained in 1970), an Advanced Executive Programme diploma from the University of South Africa (obtained in 1978) as well as a diploma in Technology Management from the Massachusetts Institute of Technology in the United States of America (obtained in 1989).

Gideon has had a long and illustrious career in various capacities and in many institutions across South Africa – too many to mention here. Suffice it to say that his career comprised roughly five distinct periods: the period 1962-1970 when he was a lecturer in the Department of Electrical and Electronic Engineering at Stellenbosch University, an industry period during the 1970s during which he was an operations research engineer at SASOL and later headed the Institute for Maritime Technology (IMT) in Simon's Town, the period 1981-1988 during which he was affiliated with the Arms Corporation of South Africa (ARMSCOR), the period 1988-1992 when he was professor of Engineering Management at the University of Pretoria, a period during the 1990s during which he headed the Policy Studies Unit at the CSIR and a period that he has devoted to consulting and part time graduate supervision, and during which he has held directorships at various companies.

Gideon has been fortunate enough to be a pioneer on many occasions. For example, he was the founding manager of IMT in Simon's Town in 1976, an institution which has perhaps hosted one of the largest and most influential operations research groups within the South African military domain over many years, still excelling in this capacity today. In 1981 he was whisked away from Simon's Town to Pretoria to start the secret Space Programme of the South African Government in the capacity of Chief Systems Engineer, although his official cover position at ARMSCOR at that time bore the slightly more mundane title of General Manager: Research. He was also the first incumbent of the Chair for Engineering Management at the University of Pretoria, where he taught management of technology and entrepreneurship at postgraduate level, a position he held fulltime from 1988 to 1992 and part time during the period 1993-2001. He was the first Director: Intellectual Capital of the successful company DataFusion (Pty) Ltd from 1990 to 2003. He was also director of LGI and Technotron (Pty) Ltd during the period 1989-1993, during which time he participated in the establishment of a number of very significant technology-driven ventures. In 1991 he started the Policy Studies Unit at the CSIR, thereby enabling him to participate in and indeed initiate technology cooperation ventures with countries such as Chile, Mauritius and New Zealand. In the process he was also engaged as consultant for the United Nations' Economic Commission for Africa.

Although Gideon is now officially retired, he still undertakes consulting work. He also still supervises PhD students at the Nelson Mandela Metropolitan University, and in 2006 he was invited to teach as Visiting Erskine Fellow at the University of Canterbury in Christchurch, New Zealand. In 2008 he received the Portland International Conference on Management, Engineering and Technology award for leadership in Technology Management.

Gideon has never been a member of ORSSA. Yet, in his work he often employed and promoted techniques that originated within the realm of operations research, particularly at SASOL, IMT and ARMSCOR. However, it has been his role as top-down facilitator of operational research work and groupings in industry that has been most beneficial to the local profession of operations research. During a closed ballot on the 5$^{th}$ of August 2009, the Executive Committee of ORSSA decided to recognize the significant contributions by Gideon de Wet in his capacity of facilitator, promoter and protector of the profession of operations research at various national institutions by presenting him with a Recognition Award (Category III: To a non-member of ORSSA for outstanding contributions over a long period of time).

*Fellow of the Operations Research Society of South Africa (ORSSA)*

# *Jan Harm van Vuuren*

***Citation.*** By Hans Ittmann, on behalf of the Executive Committee of ORSSA.

Jan H van Vuuren was born on 2 February 1969 in Durban, South Africa. After completing his secondary school training in 1986, he enrolled for a Bachelor of Science degree at Stellenbosch University with Mathematics and Applied Mathematics as majors. He obtained this degree with distinction in 1989, followed by an Honour's degree in Applied Mathematics from the same university in 1990, also with distinction. Thereafter he enrolled for an MSc at Stellenbosch, on the modelling of two-dimensional shapes of and tension forces in elastic, torsion-free cables with bending stiffness. He obtained this degree with distinction in 1992 and then enrolled for a DPhil in Mathematics at the University of Oxford in the UK. His doctoral studies involved the analytic determination of simple criteria by which non-mathematicians would be able to verify the permanence (or otherwise) of solutions to existing models of biological competition of a number of cohabiting species in a given geographical region. Upon completion of his D Phil. studies in 1995, he was appointed as temporary lecturer in the Department of Applied Mathematics at Stellenbosch University. In 1997 he became senior lecturer and in 2003 associate professor of Applied Mathematics. He was promoted in 2007 to full professor and head of Operations Research within the Department of Logistics at Stellenbosch University.

Jan's research interests and expertise are diverse and include operations research, discrete mathematics, differential equations and cryptography, although graph theory, he confesses, is his true passion! He is a National Research Foundation (NRF) rated researcher and has received various research grants from the NRF as well as from ARMSCOR and Stellenbosch University. He has won the Tom Rozwadowski medal of ORSSA three times, while he has also been runner-up on three occasions, namely in 1999, 2002 and 2008, for the IFORS Development prize. Jan has acted as advisor over the period 1999 to 2007 to student teams that participated annually in the international "Mathematical Contest in Modelling" event.

Jan has made substantial contributions to ORSSA and to the development of OR in South Africa. He has been a very active member of ORSSA in various capacities. His most significant contribution has been in taking the journal *ORiON* to a whole new level. He took over as editor-in-chief in 2004 and almost immediately introduced a total re-launch of the journal, giving it a highly professional look and ensuring a solid stream of top quality papers. Today *ORiON* is on an equal footing with any international OR journal.

He has also made significant contributions to education in OR in South Africa. While it is difficult to make comparisons, he has probably contributed to the supervision of more MSc and PhD students in OR and related areas than anyone else in the country. Furthermore, he has put enormous personal effort into getting these students to ORSSA conferences on a regular basis, thus drawing them into ORSSA. A number of his former students are now playing leading roles in OR and ORSSA.

Jan is a prolific author and co-author of scientific papers and has published 44 papers with more in the pipeline: a truly prodigious output. In addition he has presented numerous papers at national and international conferences. In the background and, in his typical unassuming manner, Jan has contributed significantly to the OR society by being the driving force in introducing many new initiatives into ORSSA - the ORSSA fellowships being one. He has organised a number of ORSSA conferences and taken the responsibility for ensuring that the ORSSA newsletter has an editor through a succession of his students taking on this responsibility.

For his numerous contributions to the profession of OR in general and more specifically to ORSSA, for his invaluable contribution as editor of *ORiON* over the past six years, Prof Jan van Vuuren was duly elected *Fellow of the Operations Research Society of South Africa* during a closed electronic ballot of the Executive Committee on the 5th of August 2009.

*Fellow of the Operations Research Society of South Africa (ORSSA)*

# *Martha Fredricka Petronella Harmse*

***Citation.*** By Jan van Vuuren, on behalf of the Executive Committee of ORSSA.

Martha Fredricka Petronella Harmse, known to us as Marthi, was born in Bloemfontein on the 25th of September 1965. After completing a bachelor of science degree (majoring in mathematics, applied mathematics and computer science) at Stellenbosch University in 1986, she enrolled for an honours degree in operational analysis at the same university, obtaining this degree in 1987. She followed this up with a masters degree in computer science, also from Stellenbosch University, early in 1990, after which she became a mathematics teacher in Vanderbijlpark during the remainder of the academic year 1990. In 1991 she took up a lecturing position in the Department of Computer Systems at the Vaal Triangle Technikon in Vanderbijlpark, where she stayed for two years before accompanying her husband on a development programme in Houston, Texas during the period 1992-1993.

Upon her return to South Africa in 1994, she again took up a position at the Vaal Triangle Technikon, but this time as lecturer in the Department of Information Technology, a position she held for six years. Then, in 1999, she became head of the Department of Curriculum Development within the Vaal Triangle Technikon, her main responsibility being to facilitate the implementation of the institution's outcome-based education programme – she held this position until 2001. During this time in Vanderbijlpark she also became a part-time student again, studying philosophy up to third year level for non-degree purposes at the University of South Africa during the period 1995-1997, and obtaining distinctions for all her courses. In 2000 she obtained a second masters degree *cum laude*, this time in operations research from the then University of Potchefstoom for Christian Higher Education

In 2002 Marthi joined the Modelling Development and Application Services team within the larger Operations Profitability group at SASOL Technology, which focuses on decision support for the whole of SASOL on an *ad hoc* basis, building models in support of operational, tactical and strategic decisions within the company. At SASOL Marthi has been involved in a broad variety of projects, employing modelling techniques such as mixed integer programming, nonlinear programming, discrete event simulation and metaheuristics, often assuming leadership positions in these projects. In 2008 she moved to the Human Resources department within SASOL in the capacity of values-driven leadership navigator, where her current responsibilities include the management of organizational culture. Four of the largest SASOL projects under Marthi's leadership included developing and implementing an advanced planning and scheduling model for the various business units in SASOL Polymers, designing a model suite aimed at optimizing the coal value chain from SASOL Mining to SASOL Synfuels, building a decision support system enabling SASOL to implement the recent labour hire legislation requirements and restrictions, and designing and implementing a continuous, dynamic simulation model for human capital management at SASOL.

Marthi has had a longstanding connection with ORSSA, serving the Society passionately and tirelessly in various capacities. Apart from being a regular presenter of papers at national conferences, Marthi has twice organized national conferences for ORSSA. She served as Chapter Chair of the Vaal Triangle Chapter of ORSSA during the period 2001-2005, as President of the Society during the period 2006-2007 and she now serves as Treasurer. She was also a key figure in terms of securing various sponsorships in the run-up to ORSSA's successful hosting of the triennial conference of the International Federation of Operations Research Societies in Sandton last year.

For her numerous contributions to the profession of Operations Research in general, and her services over many years to ORSSA in particular, Marthi Harmse was duly elected *Fellow of the Operations Research Society of South Africa* during a closed electronic ballot of the Executive Committee on the 5th of August 2009.

*Fellow of the Operations Research Society of South Africa (ORSSA)*

# *Theodoulos Stylianides*

***Citation.*** By Jan van Vuuren, on behalf of the Executive Committee of ORSSA.

Theodoulos Stylianides, known to us as Theo, was born on the 29th of March 1950. After completing a bachelor of science degree (majoring in physics and applied mathematics) at the University of the Witwatersrand in 1973, and an honours degree in applied mathematics at the same university in 1974, Theo joined the Fuel Research Institute of South Africa in the capacity of research officer, a position he held until 1978. Thereafter he joined PLAN Associates, where he remained until 1995, first as production manager, then as associate and finally as partner. Here he applied operational research and statistical techniques to problem solving in urban and regional planning over a wide range of projects including transportation studies, various retail location problems, air pollution reduction and demographic projections for the Koeberg nuclear power station. During this period Theo also became a student again, obtaining a second honours degree in 1980, this time in operations research from the University of South Africa (UNISA), as well as a masters degree *cum laude* in 1982, also in operations research from UNISA. He was also awarded a diploma in business management from Damelin Management School in 1988.

In 1995 Theo joined the CSIR Logistics and Quantitative Methods group where he was responsible for project management and technical leadership over a broad spectrum of fascinating projects, including the development of a vehicle scheduling algorithm for South African Breweries, the development of a model for clinker capacity expansion at Blue Circle Cement, the development of depot location models for Omnia Fertilizers, the development of a crime analysis decision support system for the South African Police Service, the development of transmission load forecasting models for Eskom, the development of an electricity consumption forecasting model for BHP Billiton, and the development of a container growth forecasting model for Kagiso Urban Development. In 2008 he was promoted to competence area manager of the Logistics and Quantitative Methods group at the CSIR, heading a team of 30 researchers and supporting staff responsible for advanced modelling and supply chain related research as well as statistical modelling.

Theo has won many awards, including a certificate of merit awarded by the CSIR's crime prevention initiative for his work on the geographical mapping of crime data for the South African Police Service, and three icomtek excellence awards, one for best team performance in 1998, one for business excellence in 2000 and one for best achiever in 2004. In 1998, he was also awarded the prestigious Tom Rozwadowski medal by ORSSA for a paper titled *A model of clinker capacity*, published in the European Journal of Operational Research, and in 2008 he won the CSIR Built Environment's Management Excellence Award.

Theo speaks four languages (French, Greek, Afrikaans and English) and holds membership of various professional and learned societies, including associate membership of the South African Institute of Management, full membership of the Institute of Operations Research and the Management Sciences (the American operations research society, known as INFORMS), and of course, until today, regular membership of ORSSA. He is also a professional natural scientist, registered with the South African Council for Natural Scientists, and considered an expert in crime analysis, energy modelling, capacity expansion modelling, project management, urban and regional planning, logistics modelling and business management.

Theo has had a longstanding connection with ORSSA, where he has been a regular presenter of papers at national conferences. He served as treasurer of ORSSA during the period 2002-2003. During this time he

devoted considerable time and effort towards updating and improving the Society's member database. He was also a key figure in preparations in the run-up to ORSSA's successful hosting of the triennial conference of the International Federation of Operations Research Societies in Sandton last year.

For his numerous contributions to the profession of Operations Research in general, and his services over many years to ORSSA in particular, Theo Stylianides was duly elected *Fellow of the Operations Research Society of South Africa* during a closed electronic ballot of the Executive Committee on the 5th of August 2009.

# SAS Student Competition: The University of Stellenbosch Walks Away with the Glory.

*by Margarete Bester (mbester@oprecon.com)*

This year we were fortunate enough to receive 3 Masters and 4 Honours project entries of students that completed their projects in 2008.

The objectives of the competition are:

- to propagate the use of Operations Research (OR)
- to encourage the inclusion of project work in courses within the field of OR
- to bring the Operations Research Society of South Africa (ORSSA) to the attention of students and staff at universities and technikons.

SAS sponsors this competition annually with a R5000 prize for the best Masters and R4000 for the best honours project.

Zane Simpson walked away with the prize for the best Honours project, for his project titled: '*A Continuum of Combinatorial Optimization Problems Involving the Partitioning of Items into Clusters*'. His study leaders were Prof Jan van Vuuren and Prof Stephan Visagie from the University of Stellenbosch.

The winner of the Masters award was Darian Raad for his project titled: '*Multi-objective optimization of water distribution systems design using metaheuristics*.' His study leader was Prof Jan van Vuuren.

Congratulations to the University of Stellenbosch for walking away with both the Honours and Masters awards. We would also like to make use of the opportunity to thank SAS for their support throughout the years.

Dariaan Raad being congratulated by Sarma Yadavalli.

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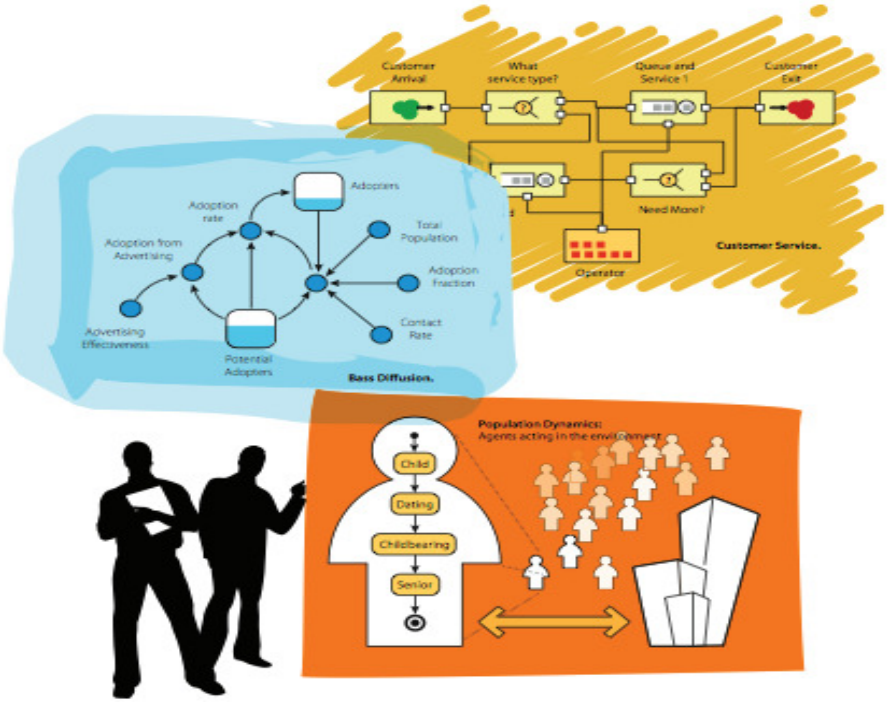


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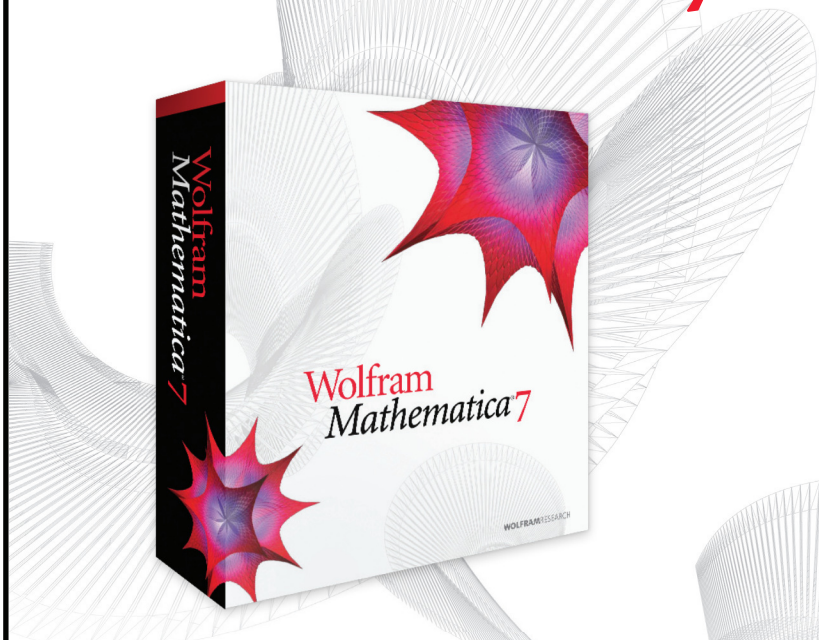


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