Editorial

This first issue of Volume 21 of ORiON contains six papers that vary considerably in nature, ranging from topics in stochastic & deterministic optimisation, and vehicle routing & network theory to topics in discrete event simulation and very practical issues surrounding the teaching of Operations Research at undergraduate level.

In the first paper of this volume, titled *A fixed recourse integer programming approach towards a scheduling problem with random data: A case study*, Johan Joubert and David Conradie challenge the assumed reality of deterministic linear programming and integer linear programming models with respect to applications in engineering, business and economics. Instead of these traditional modelling approaches, the authors resort, by way of demonstration, to a two–stage, fixed recourse program in order to introduce random variables with a uniform distribution, rather than merely using expected values of the problem variables in a deterministic approach. They apply their stochastic approach to a workforce sizing and scheduling case study concerning outsourcing of garden services at the campuses of the University of Pretoria (where unpredictable weather patterns introduce a major stochastic flavour to the problem). In this case study the authors conclude that, although a significantly larger fulltime staff complement results with the stochastic approach, it is possible to avoid the costly expense of casual workers typically incurred in a deterministic approach when unexpected values of largely unpredictable problem variables realise in practice. The authors argue convincingly that similar approaches may also be desirable in many other applications.

Kobus Wolvaardt en Geertien Venter stel in die tweede artikel, met die titel *'n Algoritme vir die minimum van die konkawe knapsakprobleem*, 'n nuwe algoritme bekend waarmee hulpbrontoedelingsprobleme met lineêre beperkings opgelos kan word, indien die doelfunksie 'n skeibare som van konkawe funksies is. Die konvekse weergawe van hierdie klas probleme is lank gelede (voor 1980 reeds) opgelos, en in hulle huidige fokus op die konkawe probleemweergawe gebruik die outeurs die Kuhn–Tucker nodige voorwaardes vir 'n globale minimum as uitgangspunt om 'n algoritme te ontwikkel (wat hulle die *grootste–verskil algoritme* (GVA) doop) om 'n gulsig verkrygde beginoplossing iteratief mee te verbeter. Hulle toon aan dat die algoritme binne 'n eindige aantal stappe konvergeer, en pas dan die algoritme op 'n groot aantal toetsprobleme toe om die doeltreffendheid daarvan (sowel as die kwaliteit van oplossings daarmee verkry) met dié van ander bekende algoritmes, soos die CKP (akroniem vir *concave knapsack problem*) algoritme van Moré en Vavasis (1991) en dinamiese programmering te vergelyk. Hulle bevinding is dat die GVA algoritme beduidend meer dikwels na optimale oplossings konvergeer as die CKP algoritme, en dat die doeltreffendheid van die GVA algoritme ook baie goed met dié van ander metodes vergelyk.

In the third paper, titled *Efficient heuristics for the Rural Postman Problem*, George Groves and Jan van Vuuren present a local search framework for the (undirected) Rural Postman Problem (RPP), which allows local search approaches that are typically associated with and have been applied successfully to the well–known *Travelling Salesman Problem* also to be applied to the RPP. New heuristics for this well–known routing problem that are based on this framework are introduced and the authors demonstrate that

these heuristics are capable of solving significantly larger instances of the RPP than have hitherto been reported in the literature. They also show that the quality of solutions uncovered by these heuristics compare very favourably to that of known methods.

The fourth paper by Oloff de Wet titled *The rectilinear Steiner ratio* gives a new and considerably more compact proof than was previously available for a well–known theorem in network theory. The theorem in question states that the rectilinear Steiner ratio (the maximum ratio of the length of a minimum spanning tree to the length of a Steiner minimal tree) of a set of points in $\mathbb{R}^2$ is 3/2, and was first proved in a rather complicated fashion by Hwang (1976). A number of simpler proofs of this theorem have since appeared in the literature, but the novelty of this beautiful, self–contained, new proof hinges on the introduction of restricted point sets and the subsequent use of continuity arguments.

The fifth paper of this issue, titled *Simulation of fruit pallet movement in the port of Durban: A case study*, contains a description of one micro component of a larger project coordinated by the CSIR, in which the aim was to promote effective logistics operations amongst the role–players in the South African fresh fruit supply chain, and to make recommendations for the utilisation of, and investment in, logistics infrastructure in order to enhance the competitiveness of the South African fruit export industry. A first paper [3] has already appeared, in which the aims, scope and deliverables of this larger project was described in detail. In this second paper (in a series of three) James Bekker, Marize Mostert and Esbeth van Dyk focus on one of the micro–scale discrete event simulation models that were designed as part of a series of infrastructure capacity models for the project. Fruit pallet movement at Fresh Produce Terminals in the port of Durban is simulated in this model, which is used to evaluate the adequacy of the storage capacity of the cold store facility at the port. Numerous specifics pertaining to input data analysis are provided and the paper closes with a discussion on model validation and output data analysis. The main conclusion is that the current and immediate future cold store capacities at the port of Durban are adequate, but that a quite substantial sub–optimal efficiency is currently achieved as a result of vessel and other delays.

The final paper of this issue, titled *Operations Research: An indispensable toolkit for the logistician*, contains a very useful documentation by Wessel Pienaar of the recent process of undergraduate curriculum design in Operations Research at the Department of Logistics of the University of Stellenbosch. The author discusses the background that led to the introduction of Logistics Management and Operations Research as undergraduate fields of study at Stellenbosch and goes on to describe the role and necessity of Operations Research in logistics decision making. This background is then used as the context in which the recent process of evaluation and updating of the Operations Research curriculum at the Stellenbosch Department of Logistics is described in some detail. This paper will certainly be of very practical value to anyone seeking to initiate Logistics and/or Operations Research as formal disciplines of study at a tertiary institution.

The diversity and quality of the six papers contained in this issue of ORiON again bear witness to the excellent operational research activity currently in South Africa on topics spanning a very broad spectrum! I am confident that readers of ORiON will find something interesting in this issue, suiting their tastes no matter in what particular area of Operations Research they practice.

A few thanks are due. I would firstly like to thank the eleven authors who have contributed their interesting work to Volume 21(1) of ORiON — your support of ORiON is truly invaluable — you are encouraged to continue utilising ORiON as publication vehicle for your research. Secondly, my thanks go to the twelve anonymous referees who have generously given of their time to evaluate the papers in this issue timeously and in a very professional manner; they have made valuable suggestions, which have in most instances led to a substantial improvement in the quality of papers. Thirdly, my sincere thanks go to associate editors Paul Fatti and John Hearne for their management of the refereeing process of two of the papers in this issue on my behalf. Finally, I would like to thank the business manager, Stephan Visagie, for his pains to oversee the typesetting of the manuscripts in LaTeX and the certainly non–trivial publication process of this issue.

Jan van Vuuren
June 2005

References

[1] Hwang FK, 1976, *On Steiner minimal trees with rectilinear distance*, SIAM Journal on Applied Mathematics, **30**, pp. 104–114.

[2] Moré JJ & Vavasis SS, 1991, *On the solution of concave knapsack problems*, Mathematical Programming, **49**, pp. 397–411.

[3] Van Dyk FE & Maspero E, 2004, *An analysis of the South African fruit logistics infrastructure*, ORiON, **20(1)**, pp. 55–72.