

MICHAEL R. INGGS

PRESENT ADDRESS

Department of Electrical Engineering
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PERMANENT ADDRESS

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ACADEMIC APPOINTMENTS

Head Advanced Computer Engineering Laboratory, 2008-Present
Centre for High Performance Computing,
South Africa.

Start new laboratory to investigate and develop the hardware and software of next generation of high performance computer. My personal interest is the application of this technology to EM Sensors in the form of real time signal and image processing, as well as back end tasks such as target tracking.

Consultant Karoo Array Telescope Project, 2006-2007
Pinelands Office
South Africa.

Assist in setting up the System Engineering effort for the Karoo Array Telescope project, as well as managing the development of the RF front end of the experimental demonstrator phase of the project.

Professor Department of Electrical Engineering 2002 – Present
University of Cape Town
Rondebosch
South Africa

Ad hominem promotion to full professor of Electrical Engineering.

Visiting Professor Liverpool Hope University 2007 – Present
Hope Park, Liverpool
UK

Deanery of Business and Computer Science assisting with the setting up a research programme into compilers for reconfigurable computers.

Visiting Professor Department of Electronic and Electrical Engineering 2003
University College London
Bloomsbury
London, UK

Collaboration with the Radar Research groups, leading to projects that are still ongoing.

Assoc. Professor Department of Electrical Engineering 1988 – 2001
University of Cape Town
Rondebosch, South Africa

Established myself in teaching and set up the Radar Remote Sensing Group, with a strong focus on radar, radar signal processing and the applications of radar in the field of remote sensing.

Research Officer Imperial College London
Dept. Electrical Engineering
London SW7

1975 – 1978

Appointed to carry out contract research related to subsurface propagation, as well as millimetre wave propagation in the clear air. Supervised by Mr. Harold Page, Prof. John Brown and Dr. Richard Clarke. Registered for a part time PhD during this period, under the supervision of Dr. Richard Clarke. Supported a number of postgraduate and undergraduate projects in the laboratory.

RESEARCH FUNDING

Funding for academic radar research in South Africa was small and difficult to obtain in the early 1990s. Individual students were able to obtain bursaries from the National Research Foundation. Small amounts of consulting were available. Total annual funding was probably of the order of R100 000 per annum.

In the late 1990s, interest in SAR work, including multicomputer technology saw a steady rise in research income. Research income almost doubled from about 1997, when the DTI/NRF Tertiary Human Resources for Industry Programme (THRIP) came on line. Essentially, for multi-company funded research, this allowed R1:R1 contributions from Industry to be matched by the DTI. THRIP doubled the research budget, and resulted in research income of between R1 million and R2 million over the period 1997 to 2003. Specific research in the areas of SAR, high performance computing for signal processing, and subsurface radar dominated.

After 2004, the economic situation in South Africa changed, and funding for radar work came virtually to a standstill. Fortunately, in the background, the SANDF Project Ledger brought in bursary funding for South African students. The research group has been able to attract a fairly constant level of about R250 000 per annum since 2003. This has been addition to the THRIP funding, and this funding kept a level of postgraduate radar research running, much of it at Master's level.

In 2004, the South African Government decided to bid for the Square Kilometre Array, a large, international, radio telescope project. A large project team was set up, and virtually the entire senior radar group at UCT moved to this project. The overlap between radar and radio astronomy is very large. After assisting on the SKA project, I moved to the Centre for High Performance Computing to set up a well funded laboratory to investigate reconfigurable and multicore computing, these technologies having an enormous overlap with radar and radio astronomy. The Advanced Computer Engineering Laboratory (ACELab) funding, together with the SANDF postgraduate funding has enabled the radar group at UCT to continue with its work in PCL and Networked radar, in collaboration with UCL.

In 2009 we completed a R300 000 project with an American Geophysics company to develop a navigation radar package for the oil drilling industry. The project was put on hold after the first phase, due to rapidly changing priorities in the coal and gas industry.

The group was successful in 2009 in obtaining R90 000 URC funding for a concept study for a passive radar system for aircraft detection.

INDUSTRIAL APPOINTMENTS

Director OpenFuel (Pty) Ltd 2000 – 2004
Cape Town
South Africa

Established with Dr. Alan Langman. The prime objective of the company was to exploit Free and Open Source software and carry the concept to the hardware domain. A number of products were released, and a major project to develop a subsurface obstacle avoidance radar and signal processing framework was completed.

Manager South African Naval Dockyard 1985 – 1987
Electronics Simon's Town
South Africa

Responsible for the depot level support of all weapon systems deployed in the South African Navy, including electrical installations, communications and industrial electronics on board ships. Staff of about 400.

Manager ESD (Pty) Ltd 1983 – 1984
Radar and EW Halfway House
South Africa

Responsible for research and development of a large number of radar and electronic warfare system, delivered to the SA Defence Force, as well as Dept. Civil Aviation.

Consulting Raytheon Data Systems 1981 – 1983
Scientist Norwood
Mass. USA

Consulting engineer working with staff developing high capacity digital microwave equipments utilising 8 phase and 16QAM technology, novel for its time.

Consultant RF Technology Centre 1978 – 1981
ERA
Leatherhead, UK

Contract research projects, mostly in the area of millimetre wave dielectric waveguide technology and subsystems, mostly for the MoD.

Development Decca Radar Research Labs 1974
Engineer Hersham
United Kingdom

System responsibilities for a radar electronic support measures receiver suite, including the development of a sector gate allowing for the analysis of radar signals in a narrow range of bearing angles.

CITIZENSHIP AND FAMILY

I was born on the 22nd December, 1951, in Uitenhage, Republic of South Africa. I am married to Patricia Jane (nee Michell) and we are both South African citizens. We have two daughters, Kirsten Joan, born 81/07/08 and Stella Eva, born 89/09/21, and a two sons, Jonathan Charles, born 83/4/18 and Gordon Eric, born 87/05/25.

EDUCATIONAL QUALIFICATIONS

Pr Eng (RSA) , 1985.

PhD (Electrical Engineering), London University, United Kingdom. (Imperial College). 1979. Supervisor was Dr. R.H. Clarke.

Diploma of the Imperial College. Diploma obtained by submission of thesis, 1979

Rhodes University, Grahamstown, South Africa, BSc. (Hons) in Physics, 1973
Awarded Arthur Trevor Williams bursary.

BSc. (Physics) Rhodes University, Grahamstown, South Africa, 1972

- Physics I, II, III (Major)
- Mathematics I, II
- Applied Mathematics I, II, III
- Computer Science I (2nd Year Subject in addition to degree requirements)
- Geology I

St. Andrews College, Grahamstown, Matriculation, First Class JMB pass, 1969.

RESEARCH INTERESTS

My research interests lie in the area of Systems Engineering applied to EM Sensors (Radar, Radio Astronomy), and also in the high speed computing that supports these sensors.

More specific topics of interest are:

- Remote Sensing using Electromagnetic Sensors
- Radar Signal and Image Processing
- High Performance Computing, clusters and novel architectures
- Signal processing hardware, embedded systems
- Ground penetrating radar
- Microwave and millimetric components
- Electronics and software applied to life critical applications.

Other areas which are not directly related to the above, but which are of interest, include:

- Communications and Telemetry systems
- Systems Engineering, especially Logistic Support Analysis,
- Software Design and Testing.

Details of projects and students under my supervision are given at the end of this document.

PRODUCT DEVELOPMENT

In this section, some of the projects with which I was strongly involved that matured to production are mentioned. In radar, it is common for "production" to be one system. For security and commercial reasons, it is not possible to be completely explicit.

1974 Electronic Support Measures Receiver I was involved in the development of a complex Decca Radar system that entered service with a number of Navies around the world. My specific contribution was a bearing gate which allowed signals from a certain bearing to be analysed.

1976 NetKit I developed the software for a serial interface for the Commodore PET computer. This was sold in large quantities in the UK and USA.

1980 RDS 6400 I was project engineer for the new 16QAM digital radio family produced by Raytheon Data Systems. This product never reached significant production due to the sale of this company.

1982 Naval ESM System I was responsible for the final integration, rework and commissioning of 5 ESM receivers for the SA Navy.

1984 S Band ATC Radar I was involved in the production, under licence, of 13 S Band Air Traffic Control radars for the Department of Civil Aviation and the SAAF.

1985 Doppler Radar I was system engineer for the design, construction, integration and test of 4 doppler radar systems for use on the Overberg Test Range.

1996 - 2008 Obstacle Avoidance Radar I was involved in the design, integration and test of a succession of prototype obstacle avoidance radars for directional drilling. This hardware is now entering a preproduction phase in the USA.

2007 Radio Telescope Receiver I was responsible for the system design and project management in industry of the multichannel RF Front end of the experimental model (XDM) of the Karoo Array Telescope. Versions of this system will enter serial production in 2009, leading to 80 systems by 2012.

PATENTS

Dielectric image waveguide antenna array Document Type and Number: United States Patent 4507664

Link to this page: <http://www.freepatentsonline.com/4507664.html>

Abstract An antenna array comprises a dielectric image waveguide (3) acting as a feeder, which may be of the insular or inverted-strip type, in contact with a dielectric sheet (1). On the sheet (1) is located a plurality of strips (4) of metallizing extending outwards from the feeder-guide (3). The inner ends of the strips are located to couple with the feeder-guide and their outer ends act to radiate or receive most of the power. Preferably the mode propagated in the feeder-guide is an E.sub.mn.sup.y mode higher than the fundamental, suitably the E.sub.21.sup.y mode.

Ground penetrating radar Document Type and Number: United States Patent 6664914

Link to this page: <http://www.freepatentsonline.com/6664914.html>

Abstract A ground penetrating radar includes a signal generator, a return signal processor, a gate and an antenna. The signal generator is a dual frequency synthesizer that generates a stepped frequency master signal and a tracking signal offset by an intermediate frequency. The return signal processor is a dual channel quadrature receiver that mixes down a return signal and a sample of the master signal to intermediate frequency using the tracking signal. The signal generator is pulsed by the gate and the return signal is gated at the same frequency. Hollow pyramidal antennas are also described that have an ultrawide band bowtie structure with antenna electronics located within one antenna element. A method of operating the radar is also described.

Obstacle avoidance system for underground drilling operations Document Type and Number: United States Patent 7013991

Link to this page <http://www.wikipatents.com/7013991.html>

Inventor(s) Wilson-Langman; Alan (Milnerton, ZA); Inggs; Michael R. (Simons Town, ZA); du Toit; Leendert Johannes (Somerset-West, ZA); Kothari; Kirankumar M. (Hoffman Estates, IL); Hanson; David R. (Pella, IA)

Abstract An obstacle avoidance system for obstacle detection in an opaque material. The system includes at least one electromagnetic signal source adapted to produce an electromagnetic source signal suitable for transmission through the opaque material, at least one electromagnetic signal detector adapted to receive reflected electromagnetic energy signals from discontinuities in the opaque material encountered by the electromagnetic source signal, and a reflected electromagnetic energy signal processor suitable for determining a presence of obstructions and/or strata variations within the opaque material. The system is preferably integral with a head element suitable for traversing the opaque material, for example a subterranean drill bit.

PROFESSIONAL ACTIVITIES

- Member of Institute of Electrical and Electronic Engineers, USA.
- Founder Chairman local AESS Chapter
- Member of the following special interest Societies within the IEEE:
 - Antennas and Propagation
 - Computers
 - Aerospace Electronics Systems Society
 - Geoscience and Remote Sensing Society

- Engineering Council of South Africa (Registered)

COURSES LECTURED

- EEE2007 Introduction to Electronics (one year only)
- EEE3023 Electronics
- EEE3050 Digital Electronics and Microprocessors
- EEE3058 Communications Engineering
- EEE3017 Digital Electronics
- EEE3064 Digital Electronics and Microprocessors
- EEE3048 Communication Electronics
- EEE4054 Optoelectronics (one year only)
- EEE4086 RF and Microwave Systems
- EEE4082 Telecommunications
- EEE5084 Radar Systems
- EEE5080 Radar Systems Project
- EEE5096 Radar Signal Processing
- EEE50024 Space Technology I
- EEE4058 Fourth Year Thesis (coordinator)
- EEE4084 Digital Systems
- Various radar courses for industry, local, India (IIT Bombay), Saudi Arabia (ISPRS)

ADMINISTRATIVE DUTIES

- Assistant Dean Postgraduate (1989 – 1998)
- Core Committee of Assessors, Faculty of Engineering and the Built Environment (PhD thesis examination adjudication)
- Doctoral Degrees Board
- Faculty Research Committee (1989 - 2006)
- Member of Faculty ITEC (1993-05)
- University ICT Committee (to end 2006)
- Programme Convenor Electrical and Computer Engineering (ECE) (1995–2006)

Programme Management at UCT has taken on a very important role in the last 10 years, since the convenors are responsible for collating the documentation of the five-yearly accreditation of degree programmes by the Engineering Council of South Africa, as part of the Washington Accord. The ECE programme attracts a very high level of student, with most graduating with Honours or First Class Honours. The students do a large part of the Computer Science degree at UCT, as well as hardware oriented topics in the Electrical Engineering Department. I set up the courses in the EE department that support this degree i.e. Embedded Systems and Reconfigurable Logic.

AWARDS

- 1990 Mellon Foundation Travel Grant
- 2006 THRIP award for High Technology Innovation

TECHNICAL SERVICE

1. Technical Committee and session chair, 1998, 2000, 2002, 2005, 2007, 2009 European SAR Conference
2. Technical Committee and session chair of 1998, 2000 IEE conference on the Detection of Abandoned Landmines
3. Speaker at the Seminar on recent advances on Differential Interferometric SAR, Indian Institute of Technology, Mumbai, January, 1999.
4. Reviewer, IEEE Trans. Antennas and Propagation.
5. Reviewer, IET Proceedings on Radar, Sonar and Navigation.
6. Reviewer, IEEE Trans. Geoscience and Remote Sensing
7. Reviewer, IET Electronics Letters.
8. Reviewer, IET Microwaves, Antennas and Propagation
9. Reviewer, AJEEE, Australian Journal of Electrical & Electronics Engineering
10. Technical Committee, International Remote Sensing Society 2000 Conference, South Africa.
11. Technical Committee, South African Conference on Communications and Signal Processing.
12. Chair, South Africa Chapter of the IEEE AES Society.
13. Technical Committee, URSI Commission F, Garmisch, February 2002.
14. Technical Chair and member of organising committee for IEEE Geoscience and Remote Sensing Symposium 2009.
15. Editorial Panel IET Radar Sonar and Navigation (2008 –)
16. Member of the review panel for the CSIR parliamentary grant review process (2005–).
17. Member of the IT Panel for reviewing DTI THRIP grant applications (2004–).
18. Member of the Technical Advisory Panel for the National Centre for high Performance Computing (2007–2008)
19. Member of Technical Committee EuRad 2008, 2009.
20. Member of the Technical Committee Radar 2008, 2009, France
21. Member of the National Committee for EOS Data Standards.
22. Technical Co-chair, IEEE International Geoscience and Remote Sensing Symposium, 13-17 July, 2009.
23. Invited co-editor, Special Edition Transactions IEEE Geoscience and Remote Sensing, December 2010.

COMMUNITY SERVICE

- Chairman, Simon's Town School Governing Body (1985-2000). Assisted with setting up the first school offering maritime training as a school leaving qualification.
- Member of SANDF Reserve Forces (Cape Town Highlanders)
- Unity Medal awarded 1996
- Medalje vir Troue Diens awarded 2009

SUPERVISED POSTGRADUATES

PhD supervised to completion

1. "Range Doppler Synthetic Aperture Processing at VHF Frequencies, J.M. Horrell, 1999.
2. "Aspects of Low Frequency SAR Processing", R.T. Lord, 2000.
3. "The Design of Signal Processing and Hardware for a Stepped Frequency Ground Penetrating Radar", A. Langman, 2002
4. "Three-dimensional Borehole Radar Imaging", KP Mukhopahdyay, 2005
5. "The Design and Implementation of a Simulator for Multistatic Radar Systems", M. Brooker, 2008

Ph.D. Thesis Co-Supervised to Completion

1. 'Long-range imaging radar for autonomous navigation', G. Brooker, 2005, Sydney University, Australia.

MSc Projects Completed

I was the academic supervisor of all of these projects, some of which had had co-supervisors in industry and at UCT.

1. 'TMS320 C 25 Signal Processor Design for a Monopulse Radar' C.P. van der Linden, 1991.
2. 'Test System for Shipboard Antennas' K.P. van der Riet, 1991.
3. 'Simulation of Angle Accuracy in Pulsed Surveillance Radars' JJ Bras, 1991.
4. 'A Spaceborne SAR Processor Design' P.J. Kritzing, 1991.
5. 'Implementation of a Spaceborne SAR Processor Software', S. Welsh, 1991.
6. 'A Study of Bistatic Radar and the Development of an Independent Bistatic Radar Receiver' M. del Mistro, 1992
7. 'Application of Cepstrum Techniques to in-situ Sound Absorption Measurements', 1993, A. Jongens
8. 'South African Synthetic Aperture Radar Campaign Design', L. Alexander, 1993.
9. 'A Spatially Variable Fertilizer Applicator System', R. Eatock, 1994.
10. 'Standardising Modules for Tactical Command and Control Man-Machine Interfaces', C. Alston, 1994
11. 'Failsafe Display System', R. Fullalove, 1994.
12. 'Speckle Reduction in SAR Imagery', M. Gebhardt, 1995
13. 'Electrode Length Measurement in Electric Arc Furnaces', N. Ballard, 1995
14. 'On the Waveform Fidelity of Broadband Digital Storage Architectures', T. Kusel, 1995
15. 'Ground Penetrating Radar Equipment Design' M. Kabutz, 1995.
16. 'Ship Target Recognition' A. Robinson, 1996
17. 'Literature Review of Interferometric SAR' I.G. Hassenpflug, 1996.
18. 'Radar Simulator', P. Golda, 1997
19. 'Real Time SAR Processor', P. Archer, 1997
20. 'Radar Processing using PVM', S. Wuyts, 1997
21. 'Ship target recognition', H. Serretta, 1998

22. 'System level simulation of Digital Design: a case Study', G. Carter, 1998
23. 'The Design and imlementation of a Radar Simulator', R. Lengenfelder, 1998
24. 'Top-Down Design of DSP Systems: a case study', Y. Tremeac, 1999
25. 'Design and implementation of a 200 to 1600 MHz, stepped frequency, ground penetrating radar transceiver.', G. Farquharson, 1999
26. 'The Design and Implementation of a Distributed Data Capture and Processing Framework for Ground Penetrating Radar', A. Wallis, 2001.
27. 'Three Applications of Satellite Borne Repeat Pass SAR Interferometry in Southern Africa', G. Doyle, 2001.
28. 'Design and Implementation of a Parallel Registration Algorithm for SAR Images', O.O. Fadiran, 2001
29. 'The Development of a Node for a Hardware Reconfigurable Parallel Processor', C. van Schaik, 2002
30. 'The Design and Implementation of a Wideband Digital Radio Receiver', C. van Dyk, 2002
31. 'A 500kHz to 5 MHz Stepped Frequency Borehole Tomographic Imaging System', A. Isaacson, 2002
32. 'Simulation of a Slope Stability Radar for Opencast Mining' , DJ Tanser, 2003
33. 'Development of a Cable Odometer with a Network Interface', TN Nyareli, 2003
34. 'Design, Simulation and Implementation of a Digital Quadrature Demodulator for a Stepped Frequency Radar', M.K. Cope, 2003
35. 'Development of a Real Time Radar Acquisition System', SK Modise, 2003
36. 'Gollach - Configuration of a Cluster Based Linux Virtual Server', T. Gwena, 2003
37. 'Development of a Parallel SAR Processor on a Beowulf Cluster', T.H. Bennett, 2003
38. 'Theory, Design and Implementation of an IF Cancellation Module for use in a Stepped Frequency Continuous Wave Ground Penetrating Radar', CF Zietsman, 2004
39. 'The Development of a Radar Digital Unit for the SASAR II Project', Justin M. Webster, 2004
40. 'Calibration System for the Tracking Accuracy Measurement System (TAMS) using differential GPS (dGPS) ', Alan N. Mountain, 2004
41. 'An Airborne X-band Synthetic Aperture Radar Receiver Design and Implementation', Ajmal I. Mohungoo, 2004
42. 'Design and Implementation of a X-band Transmitter and Frequency Distribution Unit for a Synthetic Aperture Radar', Darren G. Coetzer, 2004
43. 'A High Speed Data Acquisition System', Andrew Martens, 2005
44. 'Design and Implementation of the Pillbox Antenna for SASAR II', Sifiso B. Gambahaya, 2005
45. 'Systems Level Investigation of Television Based Bistatic Radar', Ching-Wei Wesley Chang, 2005
46. 'Implementing a Ground Penetrating Radar User Interface in System-On-Chip Technology', Etienne F. Bauermeister , 2005.
47. 'GPR Propagation Simulation and Fat Dipole Antenna Design', Tai-Lin Greg Chen, 2006
48. 'Design of a Hardware Platform for Narrow-band Software Defined Radio applications', Kalen Watermeyer, 2007
49. 'Using GPS bistatic signal for ocean and land remote sensing in South Africa', Shikoane Given Phaladi, 2007
50. 'L-band RFI Measurement System Simulation and Investigation', Andile Mngadi, 2007

51. 'Study of the Protocol used for the Measurement of Radio Frequency Interference at Candidate SKA Sites', Sydney B. Dunn, 2008
52. 'A High-Speed Testing Platform Using a 10Ge Switch for Radio Astronomy', David George, 2008
53. 'The Characterisation of a Double-Conversion Superheterodyne Receiver', Monica Wai-Man Wu, 2008
54. 'Integration, Implementation and Testing of the X-Band SASAR II System', Georgie George, 2009
55. 'Commissioning a 400 Hz Rotary Inverter', Wayne Anthony Smith, 2009
56. 'Adventures in Radio Astronomy Instrumentation and Signal Processing', Peter McMahon, 2008
57. 'Design of a Low-Cost High Speed Data Capture Card for the Hubble Sphere Hydrogen Survey', Jason Salkinder, 2008
58. 'Suitability of a Commercial Software Defined Radio System for Passive Coherent Location', Aadil Volkwin, 2008
59. 'Low Cost Radar and Sonar using Open Source Hardware and Software', Lance Patrick Williams, 2008
60. 'Development of an FPGA based Carrier Card for KAT', Michael Aitken, 2008

MSc Thesis Co-Supervised to Completion

1. 'Simulation of radar interferograms', L. Wray, 2000

PhD Projects in progress

1. Yunus Abdul Gaffar (part-time) 'Classification of Sea Vessels in a Persistent Surveillance Radar System using ISAR Imagery' (under examination)
2. Albert D. Gazendam (part-time) 'On the Performance Benchmarking of Storage Subsystems in High Performance Computing Environments'
3. J. Stephan Sandenbergh 'A Low-Cost Time Synchronization Method for a Netted Radar System using Multi-channel Common View GPS Time Transfer'
4. Simon L. Winberg 'Evolving a Knowledge Management System for Development Methods with Application to Embedded Software' (under correction)
5. Jason Manley, 'Automated Design of Radio Astronomical Signal Processing Hardware'
6. Jeanine Engelbrecht, 'Applications of Differential Interferometric SAR for Terrain Stability Monitoring'.

MSc Projects in Progress

1. Roufurd Julie 'Fibre Optic Calibrator for Karoo Array Telescope'
2. Gunther E. Lange 'Investigation into Passive Radar Target Tracking Techniques' (Under examination)
3. Joseph Milburn 'Parallel Processing applied to Multiple Target Tracking'
4. Jonathan M. Ward 'Design and Implementation of a Non-Contact Level Measurement Instrument' (under examination)

5. Andrew Woods 'A Radio Astronomy Correlator Implementation using High Performance Reconfigurable Computing'
6. Hendrik Jan de Wind, 'Tracking of Small Boats with a Scanning Radar in High Sea States'
7. Anria Cilliers, 'Automated Helicopter Target Recognition using Radar' (under examination)
8. Sebastiaan Heunis, 'PCL Signal Processing on the USRP'
9. George Nyaori, 'Coal Seam Radar Propagation Studies'
10. Sharef Neemat, 'Secondary Radar Signal Processing'
11. Richard Focke, 'Next Generation Radar Signal Processor: Dynamic Control of the Waveform Generation Function'
12. Saleh Alsaif 'Secondary Radar Simulator'
13. Benson Chan 'Passive Radar Propagation Optimisation'
14. Jean-Paul Costa Da Conceicao 'FPGA based Tracking Filter'
15. Brandon Kyle Hamilton 'Operating System for FPGA based computer'
16. Jingxu Han 'Performance Evaluation of MIMO Radar Systems'
17. Janet Ruth Hewitson 'Development of Algorithms for the Implimentation of Scaling Floating - Point Numbers on FPGA'
18. Tsung-Jui Ray Hsieh 'Scaled Fraction Arithmetic on FPGA'
19. Roaldje Nadjiasngar 'Polynomial Tracking Filters'
20. Arjun Radhakrishnan 'Graphics Card Based Signal Processing For The Karoo Array Telescope'
21. Shanly Rajan 'Automated Gateway Discovery Using Open Firmware'
22. Makhamisa Senekane 'Design of Manuel VME Bus Exerciser'
23. Nicholas James Thorne 'FPGA Co-processor Development For The Virtex 5'
24. Pei-Hung Tsai 'Digital Beamforming'
25. Andrew Van Der Byl 'Development of parallel processing elements for reconfigurable computing'

DETAILS OF RESEARCH AND PROFESSIONAL EXPERIENCE

These paragraphs provide some more detail concerning the material given in point form above.

1988 to present In 1988 I was appointed Associate Professor in the Department of Electrical and Electronic Engineering, University of Cape Town (instigated name change to Electrical Engineering in 1990). In 2002 I was given *ad hominem* promotion to Professor, without application. Undergraduate teaching has been in the Communications, Electronics and RF direction at all levels except first year. In 1989 I introduced MSc. courses in Radar Systems and Radar Signal Processing, and more recently, Space Technology.

I have coordinated a number of years of THRIP funding (Dept. of Trade and Industry (DTI), administered by the National Research Foundation (NRF)), and this culminated in 2006 in winning an award for the most innovative high technology programme. Annual income from this source was well in excess of R1 million. The research work sponsored by industry during this period has been related to radar systems, subsurface radar and high performance computing.

I have carried out many committee duties, which have been detailed in the sections above. I have been deputy head of department for some 6 years, and programme convenor for the Electrical and

Computer Engineering Programme. As part of this, I set up and initially taught specialist courses in embedded systems and reconfigurable logic.

I set up the Radar Remote Sensing Group in 1988, which has carried out a high level of research in EM Sensor technology for more than 20 years (<http://www.rmsg.uct.ac.za>). This has included work with

- NASA JPL
- DLR Institute for High Frequency and Radar
- ESA
- Water Research Commission, South Africa
- Ball Aerospace
- University College, London
- Liverpool Hope University
- Berkeley CASPER Group
- NCSA (University of Illinois)

During 2004 to 2007, I assisted with setting up the engineering processes to enable the Department of Science and Technology and NRF to develop the Karoo Array Telescope Project. During 2007 I moved from a 50 percent to 80 percent involvement in this project. From late 2007, I moved to a joint appointment between UCT and the Centre for High Performance Computing, managed by the Meraka Institute and UCT. This is to set up the Advanced Computer Engineering Laboratory. This laboratory tackles technology highly suited to mainstream computational science, as well as support for EM Sensor signal and image processing.

1985 to 1987 Appointed as first Manager Electronics in the Naval Dockyard, Simon's Town as Deputy Chief Engineer. I was responsible for directing the depot maintenance of all electronic equipment for Naval Western Command. This includes:

- Weapon electronics (Radar, Sonar, EW),
- Communications (Radio, DF and Comint),
- Automatic Test Equipment,
- Industrial Electronics (Navigation, Power Control and Equipment Monitoring),
- Electrical installations and repairs.

I was also responsible for the development of test facilities. This has included the testing of a microwave anechoic chamber and the design of antenna pattern plotting equipment. Projects also carried out related to the development of automatic radio test facilities and calibration system for RF signal generators and communications receivers.

During 1986 I attended a postgraduate course in Systems Engineering.

I was Project Engineer for a large time, attendance and job clocking system for 4000 people. This has involved all facets of project and system design, including the difficult process of software system specification. The final system comprised 3 minicomputers, cross-coupled for response time and fail-safe operation, and, a network of 120 terminals.

I was also responsible for the financial performance of the Electronics Division (110 persons (growing to 400), 90 of whom are technical). This implies coordination of budgets for all operational costs

(wages, equipment, etc) and then monitoring performance against budget. I was also responsible for taking corrective action to ensure compliance to the total budget. Since the SAN Dockyard is the first SADF Unit to become self accounting, this involved considerable education of middle management in my department.

I directed a small group of Naval and National Service Engineers (6) involved in various projects related to Logistics design, equipment evaluation and test facilities development.

The Dockyard trains some 20 Electronics apprentices and I was required to monitor course content to ensure it is applicable to the rapid changes in technology. I also had a full time training officer who carried out adult enhancement training of my staff, again to keep up with the rapid changes in technology.

1982 Joined ESD (Pty) Ltd., as a Senior Consultant.

Responsibilities included the design, development and testing of Radar and EW systems and components such as antennas and other microwave devices. Numerous technical reports were produced but, unfortunately, security considerations preclude a detailed discussion of projects and technical achievements.

In August, 1983, I became head of Radar and Electronic Warfare Department. The Department is responsible for the development and supply of Radar and EW equipment to local and overseas customers.

The technical workforce of the division was about 35, 30 of whom were Engineers. The majority of staff had postgraduate degrees in Engineering or Computer science.

1981 Joined Raytheon Data Systems Telecom Division as Senior Engineer. Initially I was technical liaison for a multi-disciplinary project to develop and industrialise a new high capacity digital microwave radio using Quadrature Amplitude Modulation (QAM). This work involved the design of high quality microwave, IF and digital circuitry. The latter required ECL, Advanced Schottky Logic and other techniques to handle data rates up to 140 Mb/s. The radio also incorporated advanced digital signal processing and dynamic equalization techniques. Due to market uncertainties, this project was placed on hold very close to the production of advanced engineering models. Prototype performance was very promising. After that I was involved in the development of microwave low noise amplifiers and high speed fibre optic communications systems. I was promoted to Senior Consulting Scientist for the Engineering Department at the beginning of 1982.

As consultant to the engineering department I assisted numerous junior engineers. I also assisted the Sales and Projects sections to design many Digital and Analogue Radio routes. In particular I assisted in all aspects of propagation: multipath effects, space and frequency diversity advantages and rainfall attenuation.

I was also involved in the conceptual design of a millimetre wave, high capacity local distribution system for urban applications. This was to work in conjunction with the company's fibre optic product line.

1978 Joined IITRI (U.S.A.) as a consultant based at the RF Technology Centre, Leatherhead, U.K. This group was hosted under the auspices of the Electrical Research Association, which it joined when it became ERA Technology. My work at the Centre concentrated on the development

of dielectric waveguide technology, with emphasis on integrated circuits. Most of the work I was involved in was for the UK MOD. I was project leader of a multidisciplinary team developing a novel thick film technique for depositing the dielectric waveguide patterns required to form an integrated circuit.

I also developed a microprocessor driven remote transmitter for use on an antenna range during this period. The transmitter could be programmed to produce frequencies between 2 and 18 GHz and could deliver any polarization required for antenna testing.

During this period, Dr. G. Klintworth and I formed K&I (Pty) Ltd. We developed a low cost RS232C interface for the Commodore range of personal computers. This interface, known as the NETKIT, was marketed by Kingston Computers (U.K.) and Omicron Corporation (USA). The product was upgraded to NETKIT II. I was responsible for writing an extension to the BASIC interpreter resident in the microcomputer that allows the user to communicate with other machines via the RS232C interface, exchanging data and programs.

My other work during this period was mainly in the millimetre wave field, including reflector antenna design. I also led a team investigating the feasibility of the mass production of millimetre wave array antennas. The project concentrated on manufacturing problems. We investigated approaches such as metallic waveguide, dielectric waveguide, vacuum brazing and chemical milling.

During this period I generally worked in a small group of peers and was responsible for my own theoretical and practical work. I left the company to broaden my experience and return more towards the communications and propagation fields.

1975 Joined the Department of Electrical Engineering, Imperial College, London, as a Research Officer, conducting a Millimetric Radio Wave propagation experiment funded by the UK Science Research Council. I set up a 12 km link at 38 GHz, together with a comprehensive data recording system for monitoring the signal characteristics and attendant weather conditions. The receiver was configured as a variable baseline interferometer, allowing atmospherically induced phase scintillations to be monitored. I developed a computer based simulation of the propagation experiment that used the angular plane wave spectrum approach to propagation. Excellent agreement between the simulation and the real data resulted.

Due to the scarcity of millimetre wave components at the time, I also developed a number of Gunn diode oscillators operating at 38 GHz. Some promising performance was obtained using these as self oscillating mixers.

I supervised a number of undergraduate projects relating to reflector antennas, microcomputer software, automatic remote data recording systems. I also assisted with both post and undergraduate practical laboratory work.

During my employment in the Department I was registered as an external student and attended most of the postgraduate courses offered by the Electromagnetics and Communications sections. These were mainly aimed at the MSc students.

1974 Joined Decca Radar Research Labs, Walton on Thames, United Kingdom as a Development Engineer. My work was mainly in the development of panoramic receivers in the 1 to 18 GHz range, for use in EW applications. Involved in the calculation of probability of intercept for various types of EW receivers.

1973 Completed postgraduate BSc. (Hons) degree at Rhodes University, taking topics in Physics and Applied Mathematics. Vacation work was taken up by the construction of a time reference system for a 22 GHz radio telescope.

1972 Completed BSc. degree (3 years) at Rhodes University, majoring in Physics and Applied Mathematics.

Vacation employment included the construction of a 145 MHz Radio Interferometer, Systems analysis and programming for a large Chemical Manufacturer, and, work study for a tyre manufacturer.

1969 Matriculated from St. Andrew's College, Grahamstown, Republic of South Africa, with a first class pass. Subjects included Physics, Chemistry, Mathematics, Additional Mathematics, English, Afrikaans and Latin.

PUBLICATIONS

Books

'The Propagation of Millimetre Waves through the Clear Atmosphere' PhD Thesis, Imperial College, University of London. 1979.

Peer Reviewed Articles

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International and National Conference Publications

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