
Department of Computer Science
University of Cape Town



Annual Review 2003

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Table of Contents

CONTEXT	1
MISSION	1
VISION	1
ROLE	1
HIGHLIGHTS	2
STAFFING.....	2
INTERNATIONAL CONFERENCES	2
INNOVATION FUND	2
ICTI	2
AIM LABORATORY.....	2
STAFF AND THEIR ACTIVITIES.....	3
STAFF OF THE DEPARTMENT.....	3
HOSTED VISITORS	3
COLLABORATION AND DISSEMINATION	4
<i>Local Conferences.....</i>	<i>4</i>
<i>International Conferences.....</i>	<i>4</i>
<i>Other Visits Abroad</i>	<i>4</i>
PROFESSIONAL ACTIVITIES.....	5
UCT AND DEPARTMENTAL ACTIVITIES	6
RESEARCH.....	8
DEPARTMENTAL LABORATORIES AND PROJECTS	8
<i>Data Network Architectures Laboratory.....</i>	<i>8</i>
<i>Advanced Information Management Laboratory.....</i>	<i>8</i>
<i>Collaborative Visual Computing Laboratory.....</i>	<i>8</i>
<i>Centre of Excellence</i>	<i>9</i>
PHD, MSc AND MPhil GRADUATES	9
<i>PhD graduates</i>	<i>9</i>
<i>MSc graduates.....</i>	<i>9</i>
<i>MPhil graduates.....</i>	<i>9</i>
PHD AND MSc STUDENTS	9
<i>PhD students</i>	<i>9</i>
<i>MSc students</i>	<i>10</i>
HONOURS PROJECTS	11
PUBLICATIONS.....	12
<i>Journals.....</i>	<i>12</i>
<i>Conference Proceedings</i>	<i>12</i>
<i>Technical Reports and Other Publications</i>	<i>14</i>
<i>Invited Colloquia.....</i>	<i>14</i>
DEPARTMENTAL EQUIPMENT AND FACILITIES	15
EXISTING EQUIPMENT	15
PROGRAMS	15
FREE AND OPEN SOURCE SOFTWARE.....	15
INDUSTRY INVOLVEMENT AND DEPARTMENT PROFILE	16
ADVISORY BOARD.....	16
INDUSTRIAL PROJECTS AND COLLABORATION.....	16
MARKETING AND ADVERTISING	16
STUDENTS AND TEACHING.....	17
BCS APPLICATION.....	17
STUDENT ENROLLMENT AND RESULTS.....	17

ACADEMIC DEVELOPMENT.....	17
IT PROGRAMME QUALITY ASSURANCE REVIEW	19

CONTEXT

Mission

As its primary mission, the Department of Computer Science endeavours to develop and impart knowledge and skills in the field of computer science.

Vision

The Department of Computer Science strives to be a department of the first rank in both an international and an African context, sustaining

- ❖ high respect for its research and post-graduate education;
- ❖ excellence in teaching in order to produce graduates who possess the skills that are needed wherever decision making or creative thinking takes place; and
- ❖ an influential role in industry and the Information Technology community.

Role

The Department of Computer Science has a multi-faceted role with responsibility to

- ❖ produce graduates with knowledge and skills relevant to both the International and the South African Information Technology community;
- ❖ carry out innovative research which adds to basic understanding;
- ❖ produce service courses and provide research assistance in the fields of science and engineering;
- ❖ provide services to Industry through technology transfer and applied research;
- ❖ take an active part in the academic and governance affairs of the University;
- ❖ provide opportunities and support for students from disadvantaged backgrounds to realise their potential; and
- ❖ promote, support and advise schools in the teaching of Computer Science Technology.

HIGHLIGHTS

Staffing

Four new staff members joined the department during the course of 2003, substantially expanding research capabilities and further normalising the teaching loads.

Mr J. Kelleher brought with him a wealth of experience from the telecommunications industry and contributes to software engineering research.

Dr M. Kuttel, with a background in computational chemistry, joined the department to focus on research in scientific and parallel/cluster computing.

Mr G. Stewart, an alumnus of the department, came with many years of experience from industry to head the Academic Development Programme in the department.

Dr H. Suleman was appointed as a senior lecturer, strengthening research thrusts related to digital libraries and information retrieval/management in the department.

International Conferences

Staff from the Department were instrumental in organising the Afrigraph conference, held in Cape Town. This was the second in an ongoing series of international conferences on Virtual Reality, Computer Graphics and Visualisation.

Innovation Fund

The Department is involved in two prestigious Innovation Fund research projects. The Innovation Fund was established by the Department of Arts, Culture, Science and Technology to provide significant funding for applied research. The two projects are LODOX, which is developing a low-dosage x-ray system, and CAVES, which aims to develop authoring tools for Virtual Reality Systems.

ICTI

ICT Innovations was launched as a professional software development company, affiliated with, and led by, the department in order to provide students with practical experience and bridge the gap between academia and industry.

AIM Laboratory

With the expansion of staff and research coverage of the department, it was felt that a new laboratory was needed to support new and existing research activities. After much discussion, the Advanced Information Management laboratory was formed to address these needs, spanning the overlapping research areas of 6 staff members.

STAFF AND THEIR ACTIVITIES

Staff of the Department

The staff complement in 2003 was as follows:

Professor and Head of Department:

K. J. MacGregor, BSc Strathclyde MSc Glasgow

Professors:

E. H. Blake, BSc (Hons) Wits PhD London

P. S. Kritzinger, MSc (Eng) Wits PhD Waterloo

Associate Professors:

S. Berman, BSc Rhodes, MSc PhD Cape Town

G. Marsden, BSc(Hons) PhD Stirling

Senior Lecturers:

J. Gain, MSc Rhodes PhD Cantab

M. Linck, MSc PhD Cape Town

P. Marais, MSc Cape Town DPhil Oxon

H. Suleman, MSc UDW PhD VPI&SU

Lecturers:

D. Cook, BSc (Hons) Cape Town

M. Kuttel, PhD Cape Town

A. Potgieter, MSc Pretoria

Part-Time Lecturers:

A. Hutchison, MSc HDE Cape Town PhD Zurich

Industry Advisor:

T. Papenfus, BSc (Eng) Wits

Computer Systems Managers:

S. Chetty, MCP

M. West

Administrative Assistant:

M. L. Wood

Senior Secretary:

S. Solomons

Laboratory Assistant:

B. Sam

Part-time Research Assistant:

E. Gill

Hosted Visitors

The department was pleased to host the following visitors during the course of the year:

- Professor Stan Budkowski, Director of Research, Institut National des Télécommunication, Evry, France spent time with the students in the DNA Group discussing their projects and future collaboration with the University of Cape Town in general.
- Gary Olson, the Fitts Professor of Human-Computer Interaction at University of Michigan.
- Professor Markus Siegle of the University of the Federal Armed Forces, Munich, Department of Computer Science and University Erlangen-Nuernberg, Germany, who gave a short course on Stochastic Modelling to Honours and post-graduate students.

Collaboration and Dissemination

Local Conferences

- Prof. Berman presented a paper at the WWW 2003 conference held at the University of Durban-Westville.
- Dr Gain attended the Afrigraph 2003 conference held in Cape Town.
- Dr Marais attended the Afrigraph 2003 conference held in Cape Town.
- Prof. Marsden:
 - Presented a paper at the SAICSIT 2003 conference in Johannesburg.
 - Attended the SA Midwife Conference 2003 and facilitated a workshop on Internet searching.
- Dr Suleman attended the ETD Africa workshop held in Johannesburg and made presentations on various topics.

International Conferences

- Prof. Marsden attended the Microsoft Professional Developers Conference in Los Angeles.
- Dr Suleman presented a paper and poster at the 7th European Conference on Digital Libraries in Trondheim, Norway.

Other Visits Abroad

- Mr Kelleher attended an International Week at the Institut National des Télécommunication, Evry, France. He delivered a number of technical seminars to their Business Management and Engineering Schools and represented UCT, Computer Science, and the DNA research group at an academic road show.
- Prof. Kritzinger spent several weeks in Europe where he:
 - Attended the Formal Methods for Software Architecture Summer School in Bertinoro, Italy.
 - Attended the Formal Techniques for Networked and Distributed Systems – FORTE 2003 – in Berlin, Germany as a Member of the Technical Programming Committee. He attended two meetings of the IFIP WG7.4 of which he is a member.

- Was invited to the Retirement Seminar of Professor Heinz Beilner, University of Dortmund, Germany.
- Gave a Seminar on the UTRA Modelling project in the DNA Group and was a member of the jury of PhD examination committee of Justin Templemore-Findlayson at the Institut National des Télécommunications, Evry, France, with hosts Professors Stan Budkowski and Jean-Luc Raffy.
- Gave a seminar on the UTRA Modelling project in the DNA Group at the Eidgenossische Technische Hochschule, Zurich, where his hosts were Professors Jurg Gutknecht and Thomas Gross.
- Visited the IBM Zurich Research Laboratory with host Dr Liba Svobodova for various discussions. One outcome of this visit is that an MSc Student in the DNA group, Oksana Rydina, has been invited to apply for a pre-doctoral position at the Laboratory in the group doing research on the use of UML in Business Process Modelling.
- Prof. Marsden was on sabbatical for the first half of 2003, during which time he visited the following institutions:
 - University College London, London, where he spent 10 days at the UCL Interaction Centre. UCLIC is now run by Harold Thimbleby as a joint venture between the Psychology and Computing Science departments at UCL and is responsible for teaching an MSc in Interaction Design. Whilst there, he looked at the problems of specifying user interfaces using finite state machines and dealing with the associated combinatorial explosions.
 - University of Ulster at Jordanstown, Northern Ireland, where he gave a seminar and initiated discussions with Terry Anderson, who is working on visualisation of query results.
 - University of Waikato, New Zealand (4 months), where the aim of his sabbatical was to continue the work started on accessing digital library content on small screen devices. While text documents were adequately handled in the past, image browsing on small screen devices, a more complex problem, was tackled. This application is all the more relevant given the prevalence of camera cellphones. Some research on the interface to Greenstone was conducted in collaboration with Ian Witten and work on image browsers with Steve Jones, Matt Jones and Dynal Patel. This work has resulted in three conference papers and a journal paper. It is also serving as the backbone of Patel's PhD. Besides the research, he also taught a half course in database programming and another in HCI, and gave numerous seminars, including a workshop at Media Lab South Pacific based in Wellington. He also had the opportunities to work with Scott Jenson (of Apple computer and Symbian), as well as Ben Shneiderman and Jenny Preece (possibly the two top researchers in HCI).

Professional Activities

The Department's staff have the following affiliations and professional associations:

- Prof. Berman served as external examiner to the University of the Western Cape (in software engineering and databases) and to UNISA (in software engineering).

- Mr Cook was Chair of the South African Computer Olympiad and Coach of the South African Olympiad team.
- Dr. Gain was a member of the ACM and ACM SIGGRAPH. He was co-chair of Afrigraph 2003, the 2nd international conference on Virtual Reality, Computer Graphics, Visualization and Interaction in Africa – he was also elected president of Afrigraph. He served as the assistant coach for the ACM Inter-collegiate programming competition.
- Dr Hutchison was on the Program Committee of the 3rd annual Information Security South Africa Conference in 2003. He acted as an Evaluator for the Council of Physical Sciences of the Netherlands Organization for Scientific Research (NWO) Computer Science grant selection advisory panel as an expert on the subject of dynamic logic in security. Also, he acted as an external MSc examiner for the Computer Science department of the University of the Witwatersrand.
- Prof. Kritzinger was elected as Programming Committee member for Formal Techniques for Networked and Distributed Systems Conference, FORTE 2003, Berlin, that was held in Berlin in October 2003 and the workshop on the Verification and Validation of Enterprise Software Systems to be held in Oporto, Portugal, in April 2004. He continued during 2002/3 as Specialist Editor for Computer and Software Engineering of the Proceedings of the South African IEEE as well as evaluator of researchers submitted for evaluation to the NRF. Prof. Kritzinger was re-evaluated by the NRF as a researcher during 2003 and retained his category C classification.
- Dr Kuttel was appointed treasurer for the World Association of Theoretically Oriented Chemists (WATOC) conference to be held at the Cape Town International Convention Centre on January 16-20, 2005.
- Dr Marais was treasurer of the Afrigraph organisation, a capacity in which he played an active role in ongoing organising of the conference series.
- Prof. Marsden undertook a review of Interactions publications for the last 5 years as part of an ACM internal review.
- Dr Suleman was on the organising committee of the ETD Africa workshop held at the University of Witwatersrand. He was nominated to the program committee of the 5th International ETD Symposium, to be held in Lexington, Kentucky in early 2004.

UCT and Departmental Activities

- Prof. Berman was the convenor of the IT Programme, chair of the IT Programme Committee and chair of the IT Programme Self-Review Team for the IT Programme Quality Assurance Audit. Additionally, she served as a member of UCT's Quality Assurance Working Group; the Science Faculty's Programme Committee for Mathematical, Physical and Statistical Sciences; the Science Faculty's Programme Management Forum; selection committees for posts in Information Systems and Mathematics and Applied Mathematics; and the Science Faculty's Skills Development Steering Committee, which she chaired.
- Dr Gain served on the IT Programme Committee as well as CUES (Committee for Undergraduate Education in Science). At a departmental level, he coordinated the colloquium series and the MSc and PhD programmes.

- Dr Kuttel was the departmental class representative liaison officer and was further responsible for the ongoing evaluation and quality control of teaching.
- Dr Linck was an IT Programme Student Advisor in the Science Faculty and served on the Engineering Undergraduate Committee and the Science Faculty Timetable Committee.
- Dr Marais was on the IT Programme Committee and CUES (Committee for Undergraduate Education in Science).
- Prof. Marsden served on the university ICT Users Group (ICTUG) and the faculty IT committee. He was further responsible for marketing of the Department and mediating with textbook publishers through the faculty.
- Dr Suleman served on the university ICT Users Group (ICTUG).

RESEARCH

Departmental Laboratories and Projects

Data Network Architectures Laboratory

The DNA Group consists of Professor Pieter Kritzinger, Neco Ventura in Electrical Engineering at UCT and Dr Andrew Hutchison, a previous graduate of the group and now working for industry, as team members. The DNA Laboratory specialises in the security, correctness analysis, performance analysis, design, specification and modelling of stochastic concurrent communicating systems (SCCS) in general, and telecommunication systems in particular.

During 2003 the DNA Group received R206000 and R218000 in funding from Industry and THRIP through the Telkom Centre of Excellence and R103000 from the NRF.

Advanced Information Management Laboratory

The AIM Laboratory was a newly established group of researchers, loosely formed around the ideas of creating and managing information. The AIM group consists of Prof. Berman, Dr Kuttel, Prof. MacGregor, Prof. Marsden, Ms Potgieter and Dr Suleman.

The research areas covered include databases, conceptual modelling, persistent programming languages, object-oriented databases, scientific computing, parallel and distributed computing, client/server computing, object technology, digital libraries, complex adaptive systems, distributed artificial intelligence, component-based software engineering and information retrieval.

Prof. Berman was principal grant-holder for an NRF project entitled "Databases and distributed systems", funded to the level of R88000 in 2003.

Collaborative Visual Computing Laboratory

The Collaborative Visual Computing (CVC) laboratory consists of four full time academic staff members (Prof. E. H. Blake, A/Prof. G. Marsden, Dr J. Gain and Dr P. Marais) and twenty three research students. The group forms an integral part of the Telkom and Siemens Centre of Excellence in ATM and Broadband Networks and their Applications, a joint undertaking by the University of Cape Town, the University of the Western Cape and the University of Stellenbosch.

The CVC lab brings together expertise in graphics, interface design and psychology. Typical areas of research include: virtual modelling, visualisation, mobile computer interfaces, scene rendering and collaboration in virtual environments.

The lab is involved in work funded by a number of South African agencies, including the NRF, THRIP and the Innovation Fund (initiated by DACST). Industry sponsors of our research include Telkom, Siemens and Microsoft. In 2003 the following funded projects were initiated or continued in the lab:

- Cheap and Practical Graphics Solutions (NRF): R100000
- Interfacing Virtual Environments (NRF): R345000
- CoE in ATM & Broadband Networks: R236000

- Asynchronous Interaction (Microsoft): R196257

The CVC group is also a key consortium member in the CAVES (Innovation Fund) project. Total funding for all consortium members amounted to R3.3 million in 2003. Additional funding for individual staff members was obtained from the UCT University Research Committee (URC).

Centre of Excellence

The Centre of Excellence (CoE) in Asynchronous Transfer Mode & Broadband Networks and their Applications was established in 1997. It is supported by Telkom, Siemens and the Department of Trade and Industry (through the THRIP programme). The objective of the CoE is to promote research and development in broadband technologies and their applications; to train postgraduate students and professionals in the expertise required in this field of telecommunications; and to promote the empowerment of previously disadvantaged communities, striving to increase the numbers of South African black and female students.

The CoE makes a significant contribution to our ability to build up infrastructure for teaching postgraduates and for research. In this it fills a gap other funding bodies and UCT cannot address due to lack of funds.

PhD, MSc and MPhil Graduates

The following is a list of graduates and their thesis topics (the supervisor's name is given in parentheses).

PhD graduates

1. Nirenstein, S. *Fast and Accurate Visibility Preprocessing* (Edwin Blake)
2. Welz, M. *Modulating Application Behaviour for Closely Coupled Intrusion Detection* (Andrew Hutchison)

MSc graduates

1. Appenzeller, J. (Diplom, Informatik, EPFL) *Realtime System Development with UML: A Case Study* (Pieter Kritzingner)

MPhil graduates

1. Nunez, D. *A connectionist explanation of presence in virtual environments* (Edwin Blake)

PhD and MSc Students

A list of the remaining post-graduate students, with their thesis topics and supervisors, follows.

PhD students

1. Nunez, D. *A capacity limited, constructionist cognitive theory of virtual presence* (Edwin Blake)
2. Semwayo, D. *A Conceptual Model for Environmental Data Integration* (Sonia Berman)
3. Tucker, W. *Social Amelioration of Bridged Communication Delay* (Edwin Blake)

4. Vermeulen, H. *Collaborative Authoring of Virtual Environments* (Gary Marsden)
5. Walton, M. *Designing Collaborative Virtual Environments* (Gary Marsden)
6. Winnemoeller, H. *Visual Shortcuts: Exploiting Visual Perceptual Phenomena to Improve Rendering Quality and Performance* (Edwin Blake)

MSc students

1. Angel, I. *Investigating interfaces for virtual sculpting* (James Gain and Patrick Marais)
2. Beirowski, C. *The Use of Visual Formalisms in Specifying Interaction in Virtual Environments* (Gary Marsden)
3. Brown, S. *Informational Support in a Virtual Environment: Using Nutrition Information to Improve Quality of Life for HIV+ Individuals* (Edwin Blake)
4. Burford, D. *Real-Time Facial Animation for Avatars in Collaborative Virtual Environments* (Edwin Blake)
5. Chetty, M. *topic to be advised* (Edwin Blake)
6. Chibesakunda, M. *A Methodology for Analyzing Power Consumption in Wireless Communication Systems* (Pieter Kritzinger)
7. De Wet, N. (Pieter Kritzinger) is developing a tool for the performance analysis of interactive software systems based on UML version 2.0.
8. Eyambe, L. *Visual Component Composition for Digital Libraries* (Hussein Suleman)
9. Gelderbloem, A. *Knowledge Discovery from Heterogeneous Sources* (Sonia Berman)
10. George, B. *Secure Wireless Communication* (Ken MacGregor)
11. Hamza, S. *Virtual Stories of AIDS: The Use of Narrative in Virtual Reality as an Intervention in a Virtual AIDS Support Group* (Edwin Blake)
12. Hanslo, W. *topic to be advised* (Ken MacGregor)
13. Hendricks, Z. *Authoring Tool Generation for Collaborative Virtual Environments* (Edwin Blake and Gary Marsden)
14. Ladeira, I. *Comprehension and Interest in a Virtual San Storytelling Environment: A Cultural Heritage Application for Children* (Edwin Blake)
15. Landman, J. (Pieter Kritzinger) is doing a theoretical study of the Shared Physical Channel of the WCDMA link in UMTS.
16. Lesoana, M. *Interactive Storytelling* (Edwin Blake)
17. Lewis, J. *Multimodal Media Bridging using Instant Messaging* (Edwin Blake)
18. Li, C. Y. *topic to be advised* (Anet Potgieter)
19. Lifson, F. (Pieter Kritzinger) investigates the theory and application of Markov Reward Models.
20. Lukell, S. (Andrew Hutchison) is doing research on Attack Construction Analysis of Cryptographic Protocols within a Multidimensional Security Protocol Engineering Framework.

21. Lyness, C. *Perceptual Depth Cues, in Support of Limited Angle CT Data Diagnosis* (Edwin Blake and Patrick Marais)
22. Maclay, D. *An Optic Flow Approach to Painterly Rendering of Dynamic Environments* (Edwin Blake)
23. Marte, O. *Model-based Segmentation and the Detection of Bone Fractures* (Patrick Marais)
24. Mason-Jones, N. *topic to be advised* (James Gain)
25. Neeser, R. *The Use of Spatial Deformation for Correcting Taphonomic Distortions in Fossilized Hominid Crania* (James Gain)
26. Patel, D. *topic to be advised* (Gary Marsden)
27. Perkins, S. *Shape Reconstruction from X-ray Data* (Patrick Marais)
28. Ryndina, K. (Pieter Kritzing) is developing improved techniques for Requirements Specification based upon USE Cases.
29. Schroder, R. *topic to be advised* (Gary Marsden)
30. Steyn, B. *Topology Alteration Of Meshes Using Directly Manipulated Free-Form Deformations* (James Gain)
31. Tangkuampien, J. *Intuitive User Interfaces for Non-professional Virtual Environment Authors* (Gary Marsden and Edwin Blake)
32. Tobler, B. *Bridging the Gap between Security Protocol Specification and Implementation* (Andrew Hutchison)
33. Walters, L. *Traffic Modeling for Mobile Communication Networks* (Pieter Kritzing)
34. Winterbottom, C. *topic to be advised* (Edwin Blake)
35. Wong, B. *Using Access Information in the Dynamic Visualisation of Websites* (Gary Marsden)

Honours Projects

As usual, the Honours projects produced some excellent work. The following projects were tackled:

1. Genetic Selection of Parametric Scenes (Bruce Merry, Gianni Giachetta, Bruce Thwaites)
2. HIV/AIDS Quality of Life: Education and Awareness (Amber Kisch, Warren Prior, Eric Savage)
3. Large Scale Structure of the Universe (Sameshan Perumal, Carl Hultquist)
4. Course Management Web Tool (Tracy Baving, Trevor Green)
5. Dynamic Online Communities (Aleksandar Manojlovic , Ryan Slade)
6. Peer Group Document and Citation Management (Senate Mafike, Siyabonga Mhlongo, Phathutshedzo Tshivhengwa)
7. Low-cost Distributed Virtual Reality (Kevin Feng, Peter Fang, Karen Wai)
8. A web tool for geographic Information Systems (Nuraan Kariem, Salie Hendricks)

9. Soapifying the Open Archives (Sergio Congia, Michael Gaylord, Bhavik Merchant)
10. Magma - Commercial Applications Project (Chad Botha, Anton de Kock)
11. Using Windows Embedded at UCT (Alapan Arnab, Jealous Jason Dembaremba)
12. Scalable Model Viewing (Rory Marcussen, Nic Appleby, James McMillan)
13. BLOX: A visual environment for digital libraries (David Moore, Stephen Emslie)
14. Intelligent Knowledge System (IKS) (Henry Brown, Colin Rouse, Phumelelakahle Kunene)
15. Secure M-Commerce (Duncan Truter, Francois Kritzinger)
16. Real-time Hand motion capture (Daniel Gerson, Ryan Cannell)
17. UTRA Channel Simulator (Collette Consani, Heidi Proske)

Publications

Journals

1. Lukell, S. and Hutchison, A. C. M. (2003). "Attack Analysis of Cryptographic Protocols Using Strand Spaces", *South African Computer Journal*, Vol. 31.
2. Marsden, G. (2003). "Using HCI to leverage communication technology", *Interactions*, Vol. 10, No. 2, ACM press, pp. 48-55.
3. Saul, E. and Hutchison, A. C. M. (2003). "Enhanced Security Protocol Engineering Through a Unified Multidimensional Framework", *IEEE Journal on Selected Areas of Communications (J-SAC)*, Vol. 21, No. 1, pp. 62 – 76.
4. Southern, R. and Gain, J. (2003). "Creation and Control of Real-time Continuous Level of Detail on Programmable Graphics Hardware", *Computer Graphics Forum*, Vol. 22, No. 1, March 2003, pp. 35-48.
5. Suleman, H. and Fox, E. A. (2003). "Leveraging OAI Harvesting to Build a Union Catalog", *Library Hi-Tech*, Vol. 21, No. 2, pp. 219-227, edited by Timothy W. Cole, Emerald Publishing.
6. Suleman, H., Fox, E. A., Kelapure, R., Krowne, A. and Luo, M. (2003). "Building Digital Libraries from Simple Building Blocks", *Online Information Review*, Vol. 27, No. 5, pp. 301-310, Emerald Publishing.

Conference Proceedings

1. Chetty, M., Tucker, W. and Blake, E. (2003). "Using Voice over IP to Bridge the Digital Divide - A Critical Action Research Approach", in *Proceedings Southern African Telecommunication Networks and Applications Conference*, George, South Africa.
2. Hanslo, W. and MacGregor, K. (2003). "Using XML Messaging for Wireless Middleware Communication", in *Proceedings South African Telecommunication Networks and Applications Conference*, George, South Africa.
3. Hendricks, Z., Marsden, G. and Blake, E. (2003). "A Meta-Authoring Tool for Specifying Interactions in Virtual Reality Environments", *Proceedings of Afrigraph 2003*, ACM press, pp. 171-180.

4. Jones, M. and Marsden, G. (2003). "Using a Mobile Device to Vary the Pace of Search", in *Proceedings of Mobile HCI 2003*, Lecture Notes in Computer Science 2795/2003, Springer-Verlag, pp. 390-394.
5. Kritzinger, P. S., Chetty, M., Landman, J., Marconi, M. and Ryndina, O. (2003). "ChattaBox: A Case Study in Using UML and SDL for Engineering Concurrent Communicating Software Systems", in *Proceedings Southern African Telecommunications Networks and Applications Conference*, George, South Africa.
6. Lewis, J., Tucker, W. and Blake, E. (2003). "SoftBridge: A Multimodal Instant Messaging Bridging System", in *Proceedings SATNAC 2003*, George, South Africa.
7. Lifson, F. (2003). "Verification of Service Level Agreements with Markov Reward Models", in *Proceedings Southern African Telecommunications Networks and Applications Conference*, George, South Africa.
8. Lukell, S. and Hutchison, A. C. M. (2003). "Attack Analysis of Cryptographic Protocols Using Strand Spaces", in *Proceedings of the 3rd Annual Information Security South Africa Conference*, Johannesburg, South Africa, pp. 141-154.
9. Lukell, S. and Hutchison, A. C. M. (2003). "Automated Attack Analysis and Code Generation in a Multi-Dimensional Security Protocol Engineering Framework", in *Proceedings Southern African Telecommunications Networks and Applications Conference*, George, South Africa, pp. 265-270.
10. Marsden, G. and Cairns, D. E. (2003). "Improving the Usability of the Hierarchical File System", *Proceedings of SAICSIT 2003*, ACM Press, pp 122-129.
11. Sharpe, A., Hampton, M., Nirenstein, S., Gain, J. and Blake, E. (2003). "Accelerating Ray Shooting through Aggressive 5D Visibility Pre-processing", *AFRIGRAPH 2003: Proceedings of the 2nd International Conference on Computer Graphics, Virtual Reality, Visualisation and Interaction in Africa*, Cape Town, South Africa, 3-5 February 2003, ACM Press, pp. 95-100.
12. Steyn, B. and Gain, J. (2003) "Topology Alteration for Virtual Sculpting using Spatial Deformation", *AFRIGRAPH 2003: Proceedings of the 2nd International Conference on Computer Graphics, Virtual Reality, Visualisation and Interaction in Africa*, Cape Town, South Africa, 3-5 February 2003, ACM Press, pp. 63-68.
13. Suleman, H. (2003) "Metadata Editing by Schema", in *Proceedings of the 7th European Conference on Research and Advanced Technology for Digital Libraries (ECDL2003)*, Trondheim, Norway, 17-21 August 2003.
14. Suleman, H., Madalli, D. P. and Fox, E. A. (2003) "Design and Implementation of Networked Digital Libraries: Best Practices", in *DRTC Workshop on Digital Libraries: Theory and Practice*, March 2003, Documentation Research and Training Centre, Indian Statistical Institute, Bangalore, India. pp. 79-87.
15. Tobler, B. and Hutchison, A. C. M. (2003). "Generation, Analysis and Verification of Cryptographic Protocol Implementations", in *Proceedings of the 3rd Annual Information Security South Africa Conference*, Johannesburg, South Africa, pp. 297-306.
16. Walters, L. O. and Kritzinger, P. S. (2003). „A Web Browsing Traffic Model for Simulation: Measurement and Analysis”, in *Proceedings Southern African Telecommunications Networks and Applications Conference*, George, South Africa.

17. Welz, M. and Hutchison, A. C. M. (2003). "Encoding and Isolating Computer Security Concerns", in *Proceedings of the 3rd Annual Information Security South Africa Conference*, Johannesburg, South Africa.

Technical Reports and Other Publications

1. Chibesakunda, M. K. and Kritzinger, P.S. (2003). *A Methodology for Analyzing Power Consumption in Wireless Communication Systems*, Technical Report CS03-28-00.
2. George, B. and MacGregor, K. J. (2003). *Secure Wireless Networks*. Technical Report CS03-05-00.
3. Lewis, J., Tucker, W. and Blake, E. (2003). *A Multimodal Instant Messaging System using XML-Based Protocols*. Technical Report CS03-08-00.
4. Maclay, D. and Blake, E. (2003). *The Use of Optic Flow in the Painterly Rendering of Animated Models*. Technical Report CS03-07-00.
5. Marsden, G. (2003) Public broadcast on HCI, New Zealand National Radio.
6. Neeser, R., Gain, J. and Ackermann, R. (2003). *The Use of Free-Form Deformation for Correcting the Taphonomic Distortions of Fossilized Hominid Crania*. Technical Report CS03-06-00.
7. Suleman, H., Eyambe, L., Luo, M. and Fox, E. A. (2003). "New Directions in Digital Library Componentisation", poster at the *7th European Conference on Research and Advanced Technology for Digital Libraries (ECDL2003)*, Trondheim, Norway, 17-21 August 2003.
8. Winnemöller, H. (2003). *Testing Effects of Color Constancy for Images displayed on CRT Devices*. Technical Report CS03-03-00.

Additionally, each honours project published its major findings as a technical report, with titles corresponding to those listed earlier.

Invited Colloquia

Several colloquia were held during the year. These were attended by staff and senior students from several departments at UCT, as well as interested people from the computer industry.

- 24 July : Vision-Realistic Rendering
(Brian Barksy, Computer Science Division and School of Optometry, University of California, Berkeley)
- 7 August : From the Sublime to the Ridiculous - Information visualisation on the large and small screen
(Gary Marsden, Computer Science Department, University of Cape Town)
- 9 October : GRID Aspirations: Who, why, where and how?
(Mark Horner, Physics Department, University of Cape Town)
- 13 October : Team Assembly for Virtual Corporations
(Sallie Henry, Computer Science Department, Virginia Tech)
- 11 December : A multi-agent infrastructure for the Internet
(Deshendran Moodley, Computer Science Department, University of Natal)

DEPARTMENTAL EQUIPMENT AND FACILITIES

Existing Equipment

The Department maintains a network of UNIX and Windows based systems which are available for use by senior and graduate students. First year computing facilities are provided by the Science Faculty. The value of the current senior/graduate equipment base exceeds R2M. The available equipment includes:

Servers

17 Machines running a variety of operating systems (FreeBSD, OpenBSD, WindowsNT, Windows2000, Windows2003) that provide Web, email, domain, file, print, research and other services to the department as a whole.

Workstations

200 Workstations comprising of Unix and Windows operating systems, including Network Computers with simultaneous Unix and Windows operating systems on the desktop, notebook computers and high-end Intel XEON and AMD based systems.

Printers/Scanners/cameras/projectors

6 network laser printers, 2 high-resolution scanners and a range of digital cameras.

Science First Year Laboratory

The Department is the major user of 150 Windows PCs in this laboratory.

The current undergraduate student-to-machine ratio is about 4.5:1, which needs to be improved.

Programs

The Department of Computer Science is a paid-up subscriber to the Microsoft Developer Network Academic Alliance program. The program allows the department and registered Computer Science students easy access to software from Microsoft.

Free and Open Source Software

The Department makes extensive use of open source software, which is available at no cost, primarily under the GPL and BSD licenses. The software is provided by the FreeBSD Project, the OpenBSD Project and a multitude of private individuals and other vendors. The types of software employed range from operating systems, to network infrastructure services, to word processing and typesetting suites.

INDUSTRY INVOLVEMENT AND DEPARTMENT PROFILE

Advisory Board

Tom Papenfus continued in his role as the Department's industrial advisor during 2003.

Industrial Projects and Collaboration

Prof. Marsden collaborated with the following companies:

- EMSS software - Stellenbosch
- Qeo cellular telephones - Cape Town
- AVG - Cape Town

The DNA Group continued their excellent relationship with Telelogic in Sweden who donated their UML and SDL Tau Generation 2 toolset to the department for academic use.

In addition, Justin Kelleher completed an assignment for BATSA (British American Tobacco) working as a Software Futures (SF) consultant. This short deployment gained the DNA group access to the SF Best Practices team in the following ways:

- Jo Appenzeller presented the Rose RT model to the SF team and prospective customers.
- Oksana Ryndina received an industrial use case model for use in her research.
- Justin Kelleher received the Rational Tool Suite from SF and presented his research concepts for verification to their Best Practices team.

Prof. Berman collaborated with the following external entities:

- Cape Metropolitan Council – for an Honours project by Nuraan Kariem and Mogamat Hendricks
- De Beers (Debswana) – for an Honours project by Colin Rouse, Henry Brown and Phumelelakahle Kunene

Marketing and Advertising

The Department is pro-active in attracting students to join the IT Programme at UCT. To improve its profile and exposure to outside organisations and prospective students, the Department:

- was actively involved in the University Open Day, where its exhibit in 2003 drew a large number of prospective students; and the Schools Open Day where prospective students spent time in the computing labs and were given a series of talks on the Department and the IT Programme.
- maintains a Web presence which offers a window onto the activities of the staff and students. For many local/international students and companies, this is the first contact they have with the Department. This website was substantially redesigned in 2003.
- worked with Microsoft to host their SA Academic conference at UCT.

STUDENTS AND TEACHING

BCS Application

During 2003 the Computer Science Department commenced the application procedure with the British Computer Society (BCS) for accreditation of its BSc (Hons) degree in Computer Science. A preliminary application was sent to the BCS early in 2003. It was successful and a BCS visit was scheduled for the last quarter of the year. This visit was postponed by the BCS because of issues, unresolved at the time, that the BCS had with various Engineering Councils in the UK. A BCS assessor is scheduled to visit the Department in May 2004. Professor Macgregor and Dr Linck have been handling this application.

Student Enrollment and Results

Student enrolment in the department was in line with figures for the previous year, with a marked increase in postgraduate students. In addition to the Masters programmes in Computer Science (500/1/2), an increasing interest was shown in the Masters in Information Technology programme (503/4), a conversion degree for students with undergraduate degrees in other fields. Full details are listed in Table 1.

During the course of the year, Computer Science re-evaluated its curriculum (especially in the third year and Honours courses) to ensure it was appropriately in line with both the 2002 ACM/IEEE curriculum guidelines and the requirement of the BCS.

Results for all undergraduate courses were similar to those obtained in previous years, and are listed in Table 2. A total of 105 students passed the third year major course in Computer Science, while 40 students graduated with Honours in Computer Science. 2 Computer Science PhD students graduated in 2003 while 2 students obtained their Masters degrees.

Academic Development

The Department continues to run an Academic Development Programme (ADP/GEPS), designed to assist talented, but under-prepared, historically-disadvantaged students who do not meet the standard admissions criteria of the University.

The students on the AD programme enrol for a four-year BSc, which includes 2 years of ADP courses, followed by the regular CS2 and CS3 courses.

In general, statistics show that 20-30% of students admitted to the AD programme finally pass CS3. Given the disadvantage, on entry to UCT, of ADP students, we view this as a high rate of success.

Table 1. Final Registration Figures for 2003, 2002, 2001 and 2000

<i>Course</i>	<i>Enrollment in 2003</i>	<i>Enrollment in 2002</i>	<i>Enrollment in 2001</i>	<i>Enrollment in 2000</i>
115F	327	329	290	169
116S	235	227	210	162
110H	107	112	161	167
111H	85	63	83	38
117F	100	-	-	-
201F	209	178	203	147
202S	199	154	185	135
302F	112	102	112	73
303S	114	108	110	64
304S	42	22	35	24
UGRAD TOTAL	1530	1295	1389	1196
400/3W	42	37	20	19
500/1/2W	39	27	28	26
503/4W	31	13	4	-
600W	8	6	6	4
GRAD TOTAL	120	70	54	49
TOTAL	1650	1365	1443	1115

Table 2. 2003 Student Pass Rates (2002 and 2001 pass rates are indicated in brackets)

Course	Wrote	Passed	Percentage Passed
115F	303	266	88% (87 %, 77%)
116S	211	175	83% (93 %, 78%)
110H	79	60	76% (81 %, 65%)
111H	82	69	84% (82 %, 68%)
117F	94	74	79% (93 %, 75%)
201F	197	146	74% (97 %, 83%)
202S	190	126	66% (91 %, 90%)
302F	114	99	87% (98 %, 95%)
303S	113	105	93% (100 %, 99%)
304S	42	35	83% (86 %, 94%)
400/3W	42	40	95% (100 %, 100%)

IT Programme Quality Assurance Review

In 2003 the Information Technology Programme became the first programme to be reviewed by UCT's new quality assurance system. A group of staff involved in the core courses, along with Faculty representatives, such as the Deputy Dean and University staff from the Planning Department and Centre for Higher Education, produced a Self-Review Portfolio for the BSc (IT) degree. This portfolio described and critically scrutinised the teaching, assessment and management processes in the programme, and included cohort data showing our intake and throughput statistics. The programme was then reviewed by a panel of four - an industry representative, a Computer Science professor from another university, and two UCT academics.

During their visit, the panel examined the portfolio and examples of student work, interviewed staff and students, inspected laboratory facilities and relevant websites, etc. This very thorough audit resulted in a report by the Review Panel to the Dean and Deputy Vice-Chancellor, which concluded that the programme was of a good quality and its quality management systems were sound. They particularly praised the breadth of the curriculum, the research-led teaching and the success of the Academic Development Programme. At the same time, they emphasised that "the computing laboratories are seriously under-resourced. Possible means for obtaining funding, namely the nomination of IT as a UCT Strategic Thrust, do not appear to have resulted in any additional resources. It is not clear what it means to be a Strategic Thrust at UCT. There seems to be a mismatch between the notion of Strategic Thrust and its importance to UCT in terms of resource allocation to those thrusts." Unfortunately there is no indication that UCT will address such problems. While issues raised by the Review Panel were discussed with the Dean who then formally responded to the University Executive regarding the Panel's report, it appears that there are no resources to finance remedial action.

The Quality Assurance Review involved a great deal of work, but was highly beneficial in that we gained some valuable insight regarding the competencies of our intake and the problems our students face, and a number of new mechanisms for better management of the programme have now been instituted.