

Society of Oxford University Engineers

Welcome to the first edition of SOUE News

In this issue, we have articles describing the two afternoon lectures given by members of the department at the recent AGM event, together with the Head of Department's Report presented at the AGM. We also have an article describing the project work that was on show at the Open Day, and obituaries of three former Oxford engineers who died this year.

We welcome contributions for future issues. Please send articles for publication to SOUE at the address on the back page or via e-mail to souenews@soue.org.uk.

Head of Department's Report to SOUE 1 October 2000–30 September 2001

Rodney Eatock Taylor

Staff movements

- Professor John O'Connor (St. Peter's) retires on 30 September after 37 years on the academic staff in the Department.
- Professor Richard Darton (who was seconded to the Department in 1991 by Shell as a senior research fellow to help establish Chemical Engineering) joined the permanent staff with a Fellowship at Keble (vice Cui).
- Dr Richard Field joined as University Lecturer in Chemical Engineering (vice Whalley) and as a Fellow of Balliol.
- Professor David Clarke has been awarded the equivalent of a five year senior research fellowship by Invensys plc, to enable him to work full time on his research in the Department. His teaching duties will be taken on by Dr Mark Cannon, currently a Departmental Lecturer. Dr Cannon has accordingly been appointed to a five year University

Lecturership with a Fellowship at St. Peter's

- Dr Byron Byrne, previously an 1851 Research Fellow, was appointed to a Departmental Lecturership as from 1st October 2001.

Significant Awards

- Dr Steve Elston was awarded a Philip Leverhulme Prize "to acknowledge world-class achievement by an outstanding young scholar in engineering". The prize is £50,000 to be spent on the advancement of his research on liquid crystal technology.
- Dr Emmanuil Kriezis was awarded a Royal Society Research Fellowship starting 1 October.
- Professor Richard Darton has received an Engineering Foresight Award from the Royal Academy of Engineers.

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Head of Department's Report cont.

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- Kevin Lorrimer, a graduate student and former undergraduate in the Department, has been awarded a Royal Commission Industrial Fellowship for three years, to work on biosensors.
- National prizes won by our students include
 - Jon MacCormick: BCS award for his doctoral thesis
 - Marius Linguraru (DPhil student in Medical Vision Laboratory): runner-up in Younger Engineers House of Commons Poster Competition
 - Guy Blackburn: (4th Year) Salter's Graduate Prize for Chemical Engineering

Research

Our bid for £9.7m from the University's (£42.9m) share of the Government's Science Research Infrastructure Fund was successful. This provides 75% (the maximum permissible share) of our planned 3220m² Information Engineering Building. We are fund-raising for the rest. The aims of the project are:

- to bring together the teams comprising the Robotics and Image Analysis group into a single contiguous space.
- to create substantial new interactions between the four Information Engineering groups by providing shared space for research.

The new building will be located between the E & T and Jenkin buildings, extending on to the site of the existing houses 44-46 Banbury Road. It will be closely linked with its neighbours, and the links between the Holder and E & T buildings will at the same time be improved. Completion is anticipated in early 2004.

The Department can share pride in the recent nomination of Oxford as the UK's most innovative university, in the "LaunchIT" competition. Competing universities were judged on the number and value of university spin-out companies and the strength of the university's links with companies around the world and the local and regional businesses community. Oxford University has spun out 35 companies, of which nine originated from work in this Department. The most recent, Novarc, is based on work by Steve Duncan in this Department and Dr Patrick Grant in Materials, in collaboration with the Ford Motor Company. Its business concerns an innovative spray-forming technology for prototype and production tooling in a wide range of manufacturing processes.

Oxford has been awarded a Faraday Partnership to develop technologies to clean up polluted land and water. Funded by the DTI and EPSRC, it involves a collaboration with five other universities, industry, the Environment Agency, NERC etc. It will be directed by Professor Chris Knowles, Director of the Oxford Centre for Environmental Biotechnology in this Department.

The Department is also involved in the recently announced Faraday Partnership on Radio Frequency Engineering, through Dr Paul Smith. Other partners include Cambridge, Lancaster and Strathclyde Universities, CLRC (Central Laboratory of the Research Councils), the Welding Institute and Caperhurst.tech Ltd.

Other News

After a long illness, Dr Peter Whalley, Reader in Engineering Science and fellow of Balliol, died on 10 October 2000 aged 55. An obituary appears on page 6.

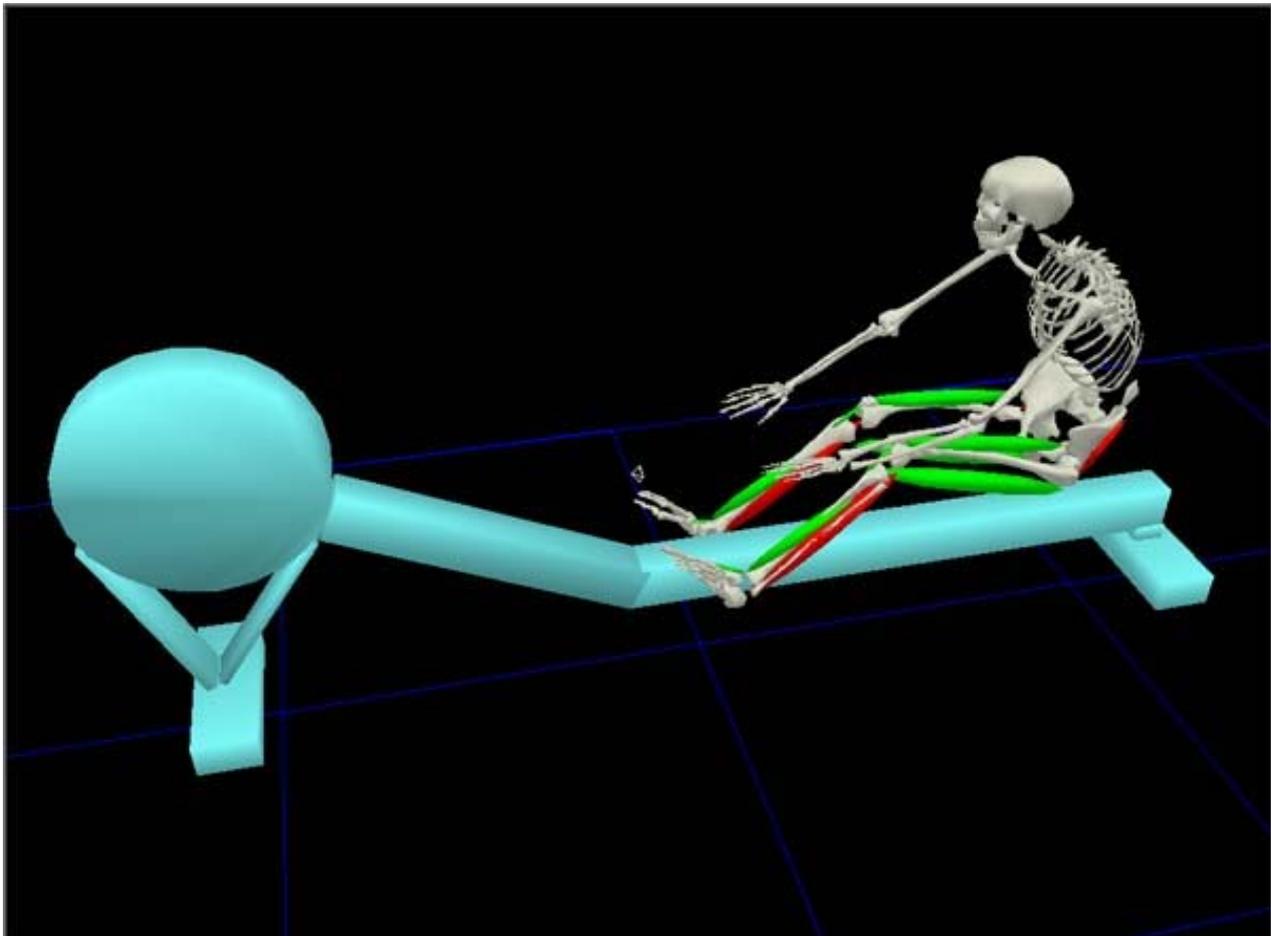
Biomechanics of the Musculoskeletal System

Dr Amy Zavatsky – report by David Witt

Amy Zavatsky talked about two aspects of biomechanical research in which she has been involved. The first involved replacement knee joints, and how well they mimicked the natural version kinematically, especially in respect of how the knee-cap moved when the joint was flexed. (The knee-cap in question is the patient's original one, not part of the prosthesis.) She described the test methods, and the experimental results with two different prosthetic knee-joints, both in wide clinical use. One of these prosthetic joints generated a knee-cap movement which closely resembled that of the natural joint which it replaced, while the other produced a totally different motion. One might suppose therefore that the latter prosthesis would perform poorly, generating discomfort or worse for the user, but Amy revealed that, in extended clinical use so far,

both did very well! The human frame, it seems, can be very adaptable.

The second half of her talk described work done in Canada on a way of exercising the muscles of paralysed patients (paraplegics), to stop them wasting away from disuse. Muscles can be made to contract by applying electrical stimuli to them, and will then do work if the motion is opposed by something capable of absorbing this work. By using a rowing machine (ergometer) for this, all four limbs can be exercised simultaneously. The Oxford group has recently been investigating the biomechanics of this situation, by modelling the musculo-skeletal system and how it interacts with the ergometer, and enquiring whether improvements can be made, for example by applying feedback of the forces or motions produced to the control of the muscle stimuli.



Kinematic output for one subject rowing on an ergometer. Motion data captured using a Vicon Motion Analysis System (Oxford Metrics, UK).

Recent Developments in Impact Engineering

Dr Nick Petrinic – report by Fionn Dunne

Dr Petrinic's lecture started with an overview of some of the applications of his research work in the general area of impact engineering. In particular, the effects of foreign object damage (FOD) on aircraft engine components were discussed. FOD can comprise of soft objects such as, for example, an unfortunate Canada goose flying into the fan blades of an aero-engine, and hard objects such as pieces of metal that have been left on runways that can sometimes be thrown up and into the engines. Dr Petrinic works closely with aero-engine manufacturers and develops computational methods for analysing the effects of FOD. A range of techniques is now available including finite element and discrete modelling methods, which Dr Petrinic outlined. Another application of the work included the complete simulation of a vehicle and passenger in a crash, in order to assess the vehicle's crash-worthiness. This work enables car manufacturers to simulate how well, or otherwise, their designs for side impact panels minimise damage to passengers and vehicles.

Dr Petrinic went on to describe some of the experimental equipment that is needed to support the development of his computational methods. This includes very high strain rate Hopkinson bar tests, and various 'guns' that are used to fire projectiles under carefully instrumented and controlled conditions to investigate impact deformation, damage, and dynamic fracture in engineering components. He expressed gratitude to Professor Ruiz and Dr Harding who had both spent many years in building up the impact laboratories and research at Oxford.

Dr Petrinic concluded his lecture by describing a further application of his work in medical engineering. Here, he described the development of discrete models which he is using to simulate human skin and the delivery of medical drug particles. The research is in collaboration with an Oxford spin-out company, Powderject. It is hoped that the models developed will enable the effectiveness of Powderject drug delivery to be investigated and then improved, and that new drug delivery methods can be developed.



*Left: Carlos Ruiz, who gave the 14th Jenkin Lecture. (The text of his lecture *The Engineering Don* will be available separately.)*

Exhibition of Project Work

David Witt

For the Trinity Term SOUE Open Day, on the occasion of the Lubbock Lecture, we held an exhibition of 4th-year project work. Since the Open Day was later than usual, on Friday of 6th week, and uncomfortably close to the start of Part 2 exams, we got only eight exhibits, but they nevertheless made a good display. The exhibition was in Lecture Room 3, a new one opening off the 1st-floor foyer, and attracted lots of visitors, including present undergraduates.

Prizes were awarded (and paid for out of SOUE funds). First prize in the “exhibited hardware” section went to Iain Crouch (Univ) for his automatic gear-changing bicycle. The electronic system not only sensed how fast the rider was pedalling, and changed gear appropriately, but also adjusted the speeds at which changes occurred, on the basis of how hard the rider was working. The optimum speeds are different if you are in a hurry, since to put in more power you should push the pedals not only harder, but faster too.



This exhibit, by Kate Halliwell (St. Hilda's), is a model of a 17th-century proposal by John Wallis for a roof for the Sheldonian Theatre in Oxford. It solves the problem of spanning a large space with timbers that are much shorter than the width between the walls. Each beam rests on others at the ends, and itself supports others. It sounds like pulling oneself up by the boot-laces, but it works!

First prize in the “posters only” section went to Graham Hawkes (St. Catz) for an exhibit about the development of a combustion chamber for a small gas turbine. There were two exhibits on internal-combustion engines, one on model helicopter control, one on the welding of polythene, an automatic goalkeeper for table football, and the one illustrated below.

The judges, four former undergraduates from the 80's and 90's, now engineers in industry, seemed impressed with the exhibits, and faced with only eight of them, felt able to award prizes, of various sizes, to all of them.

We plan to run a similar exhibition next year, and we hope for more exhibits if the date reverts to 5th week. When Lecture Room 3 is full, we can overflow into the foyer!

Related National Prizes

Two of the exhibitors were awarded national prizes for their work:

- Marko Bacic was awarded the BTextact Technologies Award for the Best Electrical Engineering Student, based on his project "Helicopter Instrumentation and Control";
- Kate Halliwell was awarded the Institution of Structural Engineers Model Analysis Award 2001, for her project "Wren's roof of the Sheldonian — a structural optimisation problem"; see the model of Wallis' proposal for this roof (left), the making and analysis of which was part of this project.

Obituaries

Peter Whalley

From an address by Alastair Howatson

Peter Whalley first came into contact with the Department of Engineering Science in the 70s when he took up his first job, at Harwell. The group he joined had formal links with the Department, and it was not long before he was being asked to give occasional tutorials. He must have liked what he saw of us, for in 1980 he was a candidate for the University Lecturership left vacant by John Bridgewater's departure. As a member of the then appointing committee, I remember reading his CV. It was quite an easy read, really; apart from a list of publications it was all 'A' and '1'. He was duly appointed.

Peter was a Lancashire man, born there in 1945, and many years in Cambridge and Oxford did not entirely remove traces of that county's rich accents. He went to Bacup and Rawtenstall Grammar School, in the Pennine foothills. Having distinguished himself there he proceeded to Cambridge in 1964, to read Natural Sciences at Trinity. With a first in Part I and a Senior Scholarship, he went on to Chemical Engineering, took his double first and stayed on as a Research Scholar to work with J.F. Davidson. He was always rather proud of the fact that this record enabled him to live in Trinity as a student for seven successive years.

He completed his PhD — in good time, of course — in 1971. He and Marion, whom he had met at Cambridge (where she was at Girton), were married there that year and promptly moved to Harwell. There he carried out research on fluid flow and heat transfer, involving him in wide contacts with universities, other national laboratories, and industrial companies. By 1978 he was a Principal Scientific Officer. Then came the Oxford appointment that was to form a large part of his life; he joined us at the beginning of 1981.

It rapidly became clear that we had acquired an excellent colleague. Peter was a highly successful teacher, both as lecturer and as

tutor, an active researcher, and a willing administrator. To all these facets of the academic life he brought boundless energy and the kind of efficiency on which I for one quickly grew to depend. So too did many others. In 1988-91 he was a highly effective Chairman of the Sub-faculty of Engineering Science. At the same time he served as Estates Bursar at Balliol with conspicuous success, the kind of double act which is rare and probably getting rarer. He seemed to thrive on it, and showed every sign of enjoying himself. All that time his research continued in the area of heat transfer and he published two editions of his first book. As if that were not enough, in 1994 he agreed to be recycled as Estates Bursar for another two years. In what might be called the dormant interval he had taken a term's leave during which he wrote and submitted to the Press another book. When I once said to him that I didn't know how he could do such a demanding job, he replied that it was quite easy when one had good advice. It was the kind of genuine modesty that was typical of him.

He played an important role in University affairs, in particular in the setting up of Chemical Engineering as a major subject in the Department, a development which had for long been desired but which previously had proved elusive. His own contacts and expertise enabled him, together with Professor Brady, then Head of Department, to obtain the necessary industrial support in the early 90s. He began a second stint on the Physical Sciences Faculty Board in 1995, and had become Chairman in 1998, just before his powers began visibly to fail. He was not one to yearn for promotion for its own sake, but he was glad to be made a Reader in 1997. It was a remarkable record, and seems the more so if we reflect that the illness that took his life must have been growing on him for longer than we could ever have suspected.

Peter was, I suppose, what we tend to describe as a private person. But he was famously plain-spoken: on any issue of academic or

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Obituaries cont.

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professional life, one knew exactly where he stood. His stock-in-trade did not include charm or diplomacy; in fact he was the least smarmy person I have known. He was capable of ruffling feathers, and quite often did so. As an Estates Bursar he brought in economies which caused some of his colleagues to mutter darkly. That, on the other hand, would be too mild a description for the reaction of the Junior Common Room when he let them know, in unequivocal terms, what he planned to do about charges. Nor did the University at large escape his attention; on occasion, brisk letters would be fired off, pointing out something to be done or even suggesting that someone had done those things which they ought not to have done. In his professional work he was much in demand as a referee and reviewer, since he was perspicacious and never minced words: of one book he predicted that it would be liked by librarians since it would certainly remain on the shelves.

Given all that, one might think that here was an ascetic, a curmudgeon even. It was by no means so. He had a lively sense of humour and was perfectly sociable, always enjoying impromptu conversation although he had little time for small talk. Although he could grumble (indeed one of my pleasures was to hear him grumbling) he was quick to admire virtue in others. He also passed a test by which not many of us would want to be judged: without exception, everyone who worked closely with him, in any capacity and at whatever level, liked him and held him in the highest regard; that included his students, with whom he was always sympathetic. He was a staunch churchman; that aside, his chief extramural interest was his family. Even at the height of term he would often bicycle off home at a relatively early hour after the day's work: before six, I think. (On the other hand, he was at his desk each morning before most of us had got round to breakfast.)

Peter formally retired at the end of Hilary term 2000, by which time he was in hospital. In the

terrible affliction that inexorably took his abilities and finally his life, he remained stoical and uncomplaining to the end. He died on 10 October 2000, not long after his 55th birthday.

Obituaries appeared in national newspapers in 2001 of three former Oxford engineers who died in their mid to late eighties.

Anne Burns (nee Pellew) was Gilchrist Scholar at St. Hugh's, 1935-1939, and got a 1st in 1939. **Ian Toler** was at Christ Church, 1930-1934. **Chris Thorneycroft** came up to BNC in 1934 and left after 2 years to fight in the Spanish Civil War.

[The original paper version of this issue contained the full obituaries of Anne Burns and Ian Toler, reproduced with permission from The Times; permission was not granted for web or downloadable publication, so this PDF version of the newsletter contains summaries, with a little additional material.]

Anne Burns

Anne Burns, née Pellew (1915-2001) was a scholar at St. Hugh's, 1935-39. After taking a First in Engineering Science, she went to work at the Royal Aircraft Establishment at Farnborough, and made her career mainly in air accident investigation, e.g. of the Comet airliner in the 1950s, caused by metal fatigue; and also on the effect of air turbulence on several well-known aircraft. She took up gliding as a recreation in 1954, and after setting many national and international records for distance, height and speed, became British national glider champion in 1966.

Obituary in the Times, 30 January 2001.

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Obituaries cont.

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Major Ian Toler

Ian Toler (1912-2001) was at Christ Church from 1930 to 1934, and learnt to fly with the University Air Squadron. He then worked with a steel company for a few years, but spent World War II in the Army, where he too was a glider pilot, but in this case piloting the troop-carrying gliders which were used to land forces behind enemy lines, e.g. at D-Day and Arnhem. He was awarded the Distinguished Flying Cross for gallantry and leadership at Arnhem. He also led his squadron at the successful Rhine crossing in March 1945, where a very large glider-borne force was used.

Obituary in the Times, 6 September 2001.

Chris Thorneycroft

Chris Thorneycroft (1915-2001) came up to Brasenose in 1934, but left before finishing his course, to fight with the International Brigade in the Spanish Civil War. He came from a strong engineering family background (Thorneycroft firms built naval destroyers on the Thames and lorries at Basingstoke), and he found that his skills in this area were of great help to the Republican forces. They were of course eventually defeated, and on return Thorneycroft worked with Napiers on aero-engine development from 1938-47, and on internal combustion engine research later. In retirement he helped with the rehabilitation of young offenders.

Obituary in the Guardian, 1 October 2001.

SOUÉ News

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