

SOCIETY FOR FREE RADICAL
RESEARCH
(Australasia)



NEWSLETTER September, 2002

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The Executive would like to thank all those who have contributed to this issue of the Newsletter. Special mention should be made to the efforts of Roger Truscott and the Organising committee for the forthcoming **SFRR(A) Meeting**: details are enclosed in this Newsletter. As always, the Executive will continue to keep members informed of recent and up-coming events in Australasia and elsewhere around the globe via the current 2002 "Diary". Please feel free to submit relevant articles to the Secretary if you wish the information to be made available to the members of SFRR(A). A membership form for 2002-2003 is attached to the back of this Newsletter. Membership fees were due by July 31, 2002 !

From the President.....

The last few months since the last newsletter have been extremely busy both scientifically and in terms of administration. The executive have progressed a number of matters which impinge on the way the Society is run and these changes will hopefully bear fruit in terms of a more efficient and stable future.

As outlined in the last newsletter we have been working through all the regulatory hoops arising out of the merger with the Sydney Free Radical Group. On the 15th May we finally achieved legality as an Incorporated organization, so we are now officially the “Society for Free Radical Research (Australasia) Inc.” This has a number of benefits particularly in terms of public liability and also financially. The new organization now has its own tax file number and Australian Business Number and we are currently in the process of applying for the status of “Income Tax exempt organization”. Lots of form filling, but hopefully worthwhile in the long run.

The merger with the Sydney Free Radical Group, together with the excess funds from the last two meetings in Wellington and Sydney, have had a very positive effect on the Societies finances, as you will see from the financial statement later in this newsletter. A considerable proportion of the Societies assets have been placed in two term deposits with the Commonwealth Bank to earn interest for the organization. We are now in a better financial situation than ever before and this should bode well for the future. However, we cannot afford to be complacent and (as always) I would ask all of you to check on your membership status. If you're uncertain you can easily check by e-mailing our Treasurer who keeps up-to-date membership records – see the front page for contact details and renew this if you are not up to date (**a membership form is attached as the last page of this Newsletter**).

We are also in the process of renewing and up-grading our website. The current site, based at the University of Sydney, will shortly cease to exist, and a new version will appear at www.sfrra.org.au. Hopefully this new domain name will be easy to remember and we hope you will all visit and contribute to the site once it is up and running in a few weeks time. If there is anyone out there who is particularly interested and skilled in website design and maintenance, who would like to volunteer to manage the site and keep it up-to-date, please let one of the Executive know (see front page for contact details). It would not be an onerous job, but would be extremely valuable to the Society.

At the recent SFRR International meeting in Paris, there was a significant representation from our society – our region contributed 6 major talks, numerous posters, and 22 delegates, which is very impressive given the distance involved and the size of our current membership (though the location may also have had something to do with this !). This degree of representation is a very positive affirmation of the high standing in which

the science being carried out by members of the Society is held at the international level. At this meeting elections were held for the Officers of the International Society and the following people were elected to serve for two-year (President and President-Elect) or four-year terms starting from 1st January 2003:

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| President: | Kelvin Davies (currently President-Elect) |
| President-Elect: | Catherine Rice-Evans (President from 1 st January 2005) |
| Secretary-General: | Angelo Azzi |
| Treasurer: | Henry Forman |

With regard to our own meetings, the next Annual meeting of the Society will be held at the **University of Wollongong, Wollongong, from the 14th-16th December this year**, with Roger Truscott in overall charge of proceedings. Planning is well advanced for this meeting (see enclosed details and forms) and I would urge you all to mark these dates down in your diaries, to submit lots of abstracts for oral and poster presentations, and come along to what should be a great meeting.

Looking further ahead, as outlined in the last Newsletter, we are planning (subject to the approval of the membership at the meeting in Wollongong) to have a return joint meeting with the Japanese branch of the Society in Kyoto, Japan, between the 4th-7th December 2003. It's a great place to have a meeting, as it's a fantastic city to visit, so start saving your dollars!

Best wishes to all, and I hope to see you all in sunny Wollongong.

Michael Davies

President SFRR(A)

Final word on SFFR(A+J) 2001

As chairman of the Organizing Committee, it is a pleasure to recall some of the more memorable moments of our last annual scientific meeting, SFRR(A+J) 2001. Four things come to my mind. First, and foremost, I was extremely impressed with the quality of both the scientific presentations and the discussions following. I believe it compares well with that of meetings of the International Society or of its branches. Clearly, our branch can make up in quality what we lack in quantity of members!

Second, I very much enjoyed the social program with the many highlights. Many of us already knew about the superb singing of Toshikazu Yoshikawa, the extroverted mannerism of our Tony, and the secret life of Nick Hunt as an entertainer. However, who did know how tough it is to be a member of Toshi's lab

when performance on the stage counts, and who will ever forget the resonating 'House of the Rising Sun' with which Nick surprised even his oldest friends?

Third, heading the Organizing Committee was easy because of the hard work of Mike Davies, Paul Witting, Nick Hunt and Kaylene Thomas (locally) and Toshikazu Yoshikawa, Yorihiro Yamamoto, Yuji Naito and Toshihiko Ozawa (SFRR Japan), and the extent of financial support from our sponsors, particularly Chugai Pharmaceuticals and Unilever. As a result of our conference more than \$12,000 and almost \$5000 could be 'returned' to SFRR(A) and SFRR(Japan), respectively. As pointed out elsewhere in this Newsletter, our Society is now in a healthy financial situation. I encourage the present Executive Committee to consider investing some of this money for educational initiatives, such as an Education Program aimed at supporting young scientists interested in working in the area of free radicals in chemistry, biology and medicine.

Fourth, our society has come of age, and I am proud we initiated a process of formal recognition of outstanding contributions to our Society. Jan Gebicki has done so much for SFRR(A) and he is a well-deserved inaugural winner of the award! As scientists we learn, and have to be critical. However, this should not be mixed up with an overemphasis of the Australian tall poppy syndrome. It is important to occasionally reflect and appropriately recognize the contribution local scientists have made to our field.

On a sadder note, SFRR(A+J) 2001 was the last meeting that Nick Hunt, former president and a long-standing and close personal friend and colleague of mine, attended as a member of SFRR(A). The reasons for this are complex, though I personally regret to have lost from our Society such a valuable asset. I very much look forward to the second joint meeting of SFRR(A+J) in Kyoto in 2003.

Roland Stocker

Conference Details

Research Activities of Michael Berridge

Cancer Cell and Molecular Biology Research Programme

***Malaghan Institute of Medical Research,
PO Box 7060, Wellington South, New Zealand***

Group Leader: Mike Berridge

Personnel: An Tan, Debbie Scarlett, Maya Kansara, Patries Herst (PhD student)

The Malaghan Institute has existed as a Charitable Trust since 1979 to support basic research into the nature, cause and treatment of human disease. The cancer cell and molecular biology programme was one of the two foun

research projects that established the Institute, originally the Wellington Cancer and Medical Research Institute and its founding bodies, the Wellington Division of the Cancer Society of NZ and the Wellington Medical Research Foundation. In addition to the projects outlined here, the Malaghan Institute has strengths in immunology, haematology and supports basic research programmes in cancer immunotherapy, vaccine development against asthma, tuberculosis and influenza, parasite immunology, molecular mechanisms of multiple sclerosis, autoimmune disease and the immunology of bone marrow transplantation.

Cell surface respiration by mammalian cells

Mammalian cell respiration occurs primarily in mitochondria, which are thought to be the only cell organelles that consume oxygen for the purpose of ATP production. A small amount of ATP is also produced during glycolysis; this is thought to be supported anaerobically by lactate production. Using mitochondrial gene knockout (ρ^0) lines, we have obtained evidence for non-mitochondrial respiration in mammalian cells in which electron transport across the plasma membrane, from cytosolic NADH to molecular oxygen supports glycolytic ATP production. In this process, oxygen is consumed at the cell surface and NADH, produced during glycolysis and during the T cycle, is oxidised to NAD^+ to facilitate continued glycolytic energy production.

This controversial finding challenges the simplistic textbook view that mitochondria are the sole organelles involved in mammalian aerobic respiration. Two unexpected findings led us to hypothesise cell surface respiration in mammalian cells. The first was the realization that a new sulfonated tetrazolium salt, WST-1, which was claimed to be reduced to its soluble formazan by a mitochondrial enzyme, was actually reduced extracellularly as demonstrated by almost complete inhibition of reduction by superoxide dismutase (SOD), a protein that cannot get into the cell. The second key observation was that mitochondrial gene knockout (ρ^0) cells that are incapable of mitochondrial electron transport and mitochondrial oxygen consumption, not only showed enhanced reduction of the tetrazolium dye, but also grew in an oxygen-dependent manner.

The most obvious approach to addressing the question of whether ρ^0 cells “breathed” oxygen was to measure oxygen consumption. Because no oxygen electrode was available to us in Wellington at the time, I spent a year collaborating with Mike Murphy in Dunedin whose intimate knowledge of the temperamental behaviour of Clark-type oxygen electrodes allowed me to collect enough data to support the model: ρ^0 cells do indeed consume significant amounts of oxygen, a process that is insensitive to mitochondrial electron transport inhibitors and uncouplers of oxidative phosphorylation.

Subsequent work by An Tan, Debbie Scarlett and Patricia Herst, a PhD student, has now provided substantial evidence to support the view that oxygen consumption in ρ^0 cells occurs at the cell surface. Again, an unexpected result provided key information about involvement of the plasma membrane in oxygen consumption. Thus, an experiment designed to investigate a possible role for a cell surface NADH oxidase in oxygen consumption by ρ^0 cells was predicted to show increased oxygen consumption in the presence of NADH. Instead, NADH extensively inhibited oxygen consumption at micromolar concentrations. Because extracellular NADH does not cross the plasma membrane, oxygen consumption at the cell surface is implicated.

Electron transport across the plasma membrane

In other studies we have looked at the effect of oxygen on electron transport across the plasma membrane measured by the cell-impermeable tetrazolium dye, WST-1. With both wild type and ρ^0 cells, WST-1 reduction was increased under anoxic conditions and attenuated under supraoxygenic (40-80% O_2) conditions. These results suggest that WST-1, or its intermediate electron acceptor partner, are in competition with oxygen for low potential electrons transported across the plasma membrane from cytosolic NADH. SOD sensitivity of WST-1 reduction, but not oxygen consumption, indicates that superoxide is a mechanistic player in extracellular WST-1 reduction while

inverse relationship between WST-1 reduction and oxygen concentration suggests an indirect role for superoxide reduction.

Initial studies suggested glycolytically produced NADH as the most likely electron donor for trans-plasma membrane electron transport (tPMET), but subsequent experiments have shown a major role for NADH produced in mitochondria via the TCA cycle in that inhibitors of the malate-aspartate shuttle extensively inhibit WST-1 reduction in both normal cells, and ρ^0 cells that have a functional TCA cycle but are deficient in electron transport complexes I, III and IV, and ATP synthase (complex V).

Effects of oxidative stress on tPMET

Contrary to predictions that oxidative stress would increase tPMET because increased surface NADH-oxidase activity had been observed, cell irradiation or treatment with hypericin or menadione all reduced WST-1 reduction in both wild type and ρ^0 cells suggesting a shift in intracellular redox status of cells towards an oxidized environment, e.g. reduced intracellular NADH.

ROS production by ρ^0 cells

Other investigations have identified intracellular sites of superoxide and ROS production in normal and ρ^0 cells using flow cytometry using the fluorescent dyes dihydroethidine and fluorescein diacetate. When considered alongside information about mitochondrial membrane potential which can be either elevated, attenuated or unchanged in different ρ^0 cell types, the results indicate that ρ^0 cells produce low levels of non-mitochondrial ROS that is evident in wild type cells, but only about 10% of the mitochondrial ROS of wild type cells.

Cell surface NADH-oxidase

Potential involvement of a cell surface NADH-oxidase described by the Morre laboratory (Purdue University) in tPMET involving WST-1 reduction, in oxygen consumption and in cell surface enzyme activity is a central focus of our current research. Reconciling conflicting results from four different assay systems has been a non-trivial exercise that has led Debbie Scarlett to propose a reverse electron flow model that explains most of the results. In addition we are using blue native gel electrophoresis and proteomics approaches to identify the plasma membrane complexes involved and to characterise, at the molecular level, individual components of the complex.

Non-steroidal anti-inflammatory drugs from New Zealand biota

A joint biodiscovery research programme with the National Institute of Water and Atmospheric Research (NIWA) and Crop & Food Ltd, aims to identify and characterise a number of novel anti-inflammatory compounds from collections of marine organisms and from terrestrial biota. The programme is dependent on screening assays that use WST-1, which is reduced to a soluble formazan by the respiratory burst of activated human neutrophils, when used in conjunction with the intermediate electron acceptor, 1-methoxy phenazine methosulfate (PMS), which is reduced by actively metabolising cells. Thus, WST-1 can be used not only to detect high potential electrons from superoxide but also low potential electrons at the cell surface that appear to be a function of normal metabolic activity. Rapidly dividing cells generate a similar tPMET flux to PMA-activated neutrophils but these electrons are insufficiently energised to reduce WST-1 in the absence of PMS.

Treasurer's Report for the SFRR (Australasia) Summary of Accounts 23rd August, 2002

Opening Balance: (from last Treasurer's report 8th Jan, 2002) = \$17,637 AUS

Income:

6/3/02: \$2,610 Transfer from T. Kettle - Proceeds from SFRR(A) Wellington meeting
 26/6/02: \$12,468 final payments from Organizing Comm. SFRR(A+J) 2001
 26/6/02: \$31,842.09 from Sydney Free Radical Group Inc. Merger
 Subscriptions from 9/1/02-23/8/02: \$838.171

Interest:

7/3/02: Term Deposit of \$10,000– returned \$ 84.48 as interest on 7/8/02. Reinvested \$ 10,084 at 3.2% for 5 months (matures 7/1/2003)
 23/8/05 Term Deposit of \$30,000 at 4.7% p.a. to mature 23/4/2003 (approx. interest return = \$940).

Expenditure:

10/1/02: \$1,026.10 for SFRR International dues
 27/2/02: \$372.37 for Affiliate Membership of ASMR 2000-2002
 20/3/02: \$929.50 for C.R. Warne Trophies (for SFRR(A) "Distinguished Service" trophies)
 30/4/02: \$33.00 for name merge of SFRG Inc. and SFRR(A)
 15/5/02: \$42.00 for Dept. Fair Trading for name change
 27/5/02: \$2,000 SFRR(A) Travel Award to Miss Sharon Ricardo
 4/6/02: \$2,000 SFRR(A) Travel Award to Mr Lincoln Morton
 15/8/02: \$10 Cheque dishonour fee (from a subscription)
 8/2/-23/8:\$17.60 Account Fees and Taxes

Current Balance of all accounts (Including Term Deposits) as of 23/8/02: \$58,981.42

Comments:

1. Bank fees of \$7 AUS were again charged for each subscription that was in New Zealand dollars (not shown in expenditure above). As per 8th of January 2002 Report from the Treasurer it was requested that in 2002, all NZ members must send their membership fees of NZ \$35 (full member) or NZ \$17 (student member) to Dr. Tony Kettle who would gather the subscriptions into one collective transfer to SFRR(A) to prevent multiple charges. This needs to be emphasized again.
2. Some members are still paying dues in cash. Memberships **must** be paid by cheque or money order.
3. Note that a total of \$40,000 is in Term Deposit Accounts. This is to take advantage of the far greater interest offered. The money can be withdrawn at any time for a small fee if an emergency arises. Sufficient funds remain in the cheque account to cover all financial obligations.

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Conference Report: *IMPRESSIONS OF THE XIth Biennial SFRR(I)*

The Society for Free Radical Research held its XIth biennial conference in Paris from July 16 to July 20. It was well attended with several hundred registrants including a strong Australian/New Zealand presence. I presented a poster on 17th July, which was the first full day of the conference. The work was well received as it provides *in vivo* evidence that nitration of γ -tocopherol could be associated with CHD. It also suggests that 5-nitro- γ -tocopherol could be a sensitive marker of reactive nitrogen species *in vivo*. International exposure is an essential ingredient in the training of researchers and this experience has been of great value to me.

Two plenary lectures were presented by SFRR(A) members. Mike Davies presented data regarding the search for an *in vivo* marker of singlet oxygen damage to proteins. He presented a thorough discussion of his subject matter which may have been (in my experience) too chemically oriented for some but necessary given the topic. Roland Stocker became one of the many victims of computer malfunction and battled against the odds to present some recent data concerning probucol, its metabolites and their effects. His data revealed some information regarding structural features related to bioactivity of these compounds.

Several presentations addressed aspects of atherosclerosis which were new to me. One concept presented by Dr Fulvio Ursini was that absorption of oxidised fatty acids can induce abnormal folding of Apo B100 with subsequent alteration in the overall 3-dimensional structure which renders the LDL particle atherogenic through a mechanism which was not entirely clear. The presenter suggested, therefore, that atherosclerosis can be viewed as a protein folding disorder in the same way as other diseases such as Alzheimer's Disease.

An earlier presentation by Dr Alex Sevanian described a sub-group of LDL referred to as LDL⁻ which was thought to be produced by the interaction of reactive aldehyde groups with the nitrogen containing amino acid side chains on the surface of the LDL particle. This chemical reaction prevents protonation of the lone pair of electrons on the nitrogen and therefore the LDL particle develops relatively less positive surface charge compared to native LDL i.e. a more negative charge.

Dr Harry Ischiropolis presented micrographs showing that nitration of fibrinogen induces morphological changes in the structure of clots compared to normal clotting. However, he also pointed out that it is difficult to achieve nitration in the absence of oxidation. Also, Dr Frank Kelly presented data from the VIP Study in which women at risk of pre-eclampsia were identified early in pregnancy and treated with a combination of vitamins C and E. The treatment appeared to yield a significant improvement both in terms of the number and the severity of pre-eclampsia cases and was associated with reduced F₂-isoprostanes.

Work related to my own interests was presented by Dr Azzi who discussed tocopherols as cell signalling molecules rather than simple antioxidants. It is critical to understand tocopherols in this way because atherosclerosis is such a complex disease that many mechanisms are likely to be operating concurrently to produce the disease state. Along a similar vein was the presentation of Dr Jeremy Spencer who has demonstrated that various flavonoid antioxidants are quite toxic to neuronal cells possibly through an oxidant generation pathway. Methylation abolishes the toxicity of these compounds. Since methylation and other common modifications of phenolic structures *in vivo* interrupt antioxidant structures, modulation of gene expression by metabolised phenolic compounds, rather than pure antioxidantation is a real possibility, which has not been widely considered.

Overall, although there appeared to be only a few abstracts selected for oral presentation, several interesting themes were communicated throughout this conference. Personally, I benefited greatly from the interaction with researchers from all over the globe and was pleased to receive positive feedback from those who came to visit my poster.

I would like to thank the Society for Free Radical Research (Australasia) for this valuable opportunity.

Lincoln Morton

SFRR Conference Travel Grants

- Travel Grants will be provided on a competitive basis to the value of AU\$3000 for attendance at international meetings to be held in 2003. Deadline for submission is December 15, 2002 and applicants will be contacted subsequent to Committee selection.
- All financial members of SFRR (A) (≤ 35 years of age) are eligible to apply and we welcome applications from Australia and New Zealand. A committee will review all applications, with these being judged on merit relative to opportunity. The decision of the committee will be final and no correspondence will be entered into with any individual applicant. The winner(s) will be notified in person, and transfer of the Travel Award is dependent on proof of acceptance for the abstract submitted.
- To apply submit a copy of the abstract for the conference, a full Curriculum Vitae including a complete list of publications, and two reprints to: Dr Paul K. Witting, Secretary, Society For Free Radical Research (Australasia) Inc., Centre for Thrombosis and Vascular Research, School of Medical Sciences, University of New South Wales, NSW 2052, AUSTRALIA.

For Your Diary - 2002 -

- *September 8-11.* Second International Conference on Metal Toxicity and Carcinogenicity. National Institute for Occupational Health and Safety and Health, Morgantown, USA. Contact. Kianglin Shi, PhD, Tel. 1-304-285-6158, Fax. 1-304-285-5938, E-mail. Xshi@cdc.gov
- *September 25th- 28th.* INTERNATIONAL CONFERENCE - ANTIOXIDANTS: BENEFITS and RISKS CHURCHILL COLLEGE, CAMBRIDGE, UK. International Conference organised by EUROFEDA, a Concerted Action that comprises part of a portfolio of projects supported by the European Commission within the Fifth Framework Programme's 'Quality of Life and Living Resources' Key Action, 'Diet, Health and Nutrition' sub-programme. Questions related to the conference and informal enquires may be e-mailed to Dr Sian Astley (EUROFEDA Coordinator) and sent to + 44 (0) 1603255167. Electronic abstracts (as an email or a Microsoft Word attachment) can be sent to sian.astley@bbsrc.ac.uk
- *October 1-3.* 28th Annual Scientific Meeting of the Australian Atherosclerosis Society. Millenium Hotel, Sydney, Australia. Contacts: Meetings first Ph: +61-3-9739-7697, Fax:+61-3-9739-7076, E-mail: aas@meetingsfirst.com.au.
- *October 2-4.* SECOND SYMPOSIUM Antioxidants In Nutrition And Therapy: Mechanisms In Physiology-Pathology-Pharmacology Sanur, Bali, Indonesia. Steering Committee Helmut Sies, Lester Packer, Maria Livrea, Barry Halliwell, H-J, Fedi Freisleben, Organizing Committee: Wahyuning Ramelan Fransiska Zakaria Fadilah Supari Widjaja Lukito Septelia Inawati Ermita I. Ilya Abraham Simatupang, Erni Purwaningsih Rahmawati Ridwan. Contact Online: www.sffrindo, e-mail septelia@commerce.net.id
- *November 20-24.* 9th Annual Meeting of the Oxygen Society. Marriott Rivercentre, San Antonio, TX,

USA. Contact. The Oxygen Society at info@oxygensociety.org or Tel. 1-925-472-5904.

- *Nov. 22-24.* THE THIRD CONFERENCE OF THE INTERNATIONAL COENZYME Q10 ASSOCIATION. London, United Kingdom. Organizers: Gian Paolo Littarru; Anthony Schapira, information obtained at the following web-site: <http://www.wcsi.unian.it/coenzymeQ/index.html>
- *December 4-6.* FOURTH ANNUAL MEPSA CONFERENCE, Location: Corus Hotel, Hobart, Tasmania. Contact: Conference Secretariat Greg Woods Senior Lecturer, Discipline of Pathology, University of Tasmania, GPO Box 252-29, Hobart Tasmania 7001 Australia. ph +61-3-6226 4832, fax +61-3-6226 4833, email: G.M.Woods@utas.edu.au.
- **December 14-16. 11th Annual meeting of SFRR(A). University of Wollongong, Wollongong. For further details see article elsewhere in this newsletter.**

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- *April 2-5.* 37th Annual Scientific Meeting of the European Society of Clinical Investigation Verona, Italy. For further information please contact: Cogest M. & C. Giovanni Ricevuti, MD, Vicolo San Silvestro 6 Dept. of Internal Medicine and Therapeutics I-37122 Verona University of Pavia – IRCCS Policlinico, san Matteo Italy P.le Golgi 2, I-27100 Pavia – Italy. Phone +39 045 597940 phone +39 0382 502499 / +39 0382 526944, fax +39 045 597265, fax +39 0382 526950, e-mail cogest@tin.it, e-mail g.ricevuti@smatteo.pv.it or at www.genomica.net/ESCI/ESCI.htm, <http://labtime.unipv.it/>, <http://www.aacc.org/ja/intmeet.stm> or Homepage: www.esci.eu.com.
- *June 26-29.* Summer meeting of the Society for Free Radical Reserach- Europe. Free radicals and Oxidative Stress: Chemistry, Biochemistry and Pathophysiological Implications. Local organiser: Dimitrios Galaris (dgalaris@cc.uoi.gr), info: www.uoi.gr/conf_sem/sfrr
- *July 2-4.* Biochemical Society Meeting. University of Essex, United Kingdom Free Radicals: Enzymes, Signalling and Disease (3 day symposium) Organizers: Chris Cooper (Essex, UK), Mike Wilson (Essex, UK), Victor Darley-Usmar (Birmingham, USA). Superoxide: Production and Destruction (2 day sympsium) Organizers: Martin Brand (Cambridge, UK), Tony Moore (Sussex, UK), John Moody (Plymouth, UK). Relevant e-mail addresses: Biochemical Society: meetings@biochemistry.org, Local organizer (Prof. Chris Cooper): ccooper@essex.ac.uk More details can be found on the Biochemical Society's meetings web page: <http://www.biochemistry.org/meetings/>. The Essex meeting itself is at the following web-site: <http://www.biochemistry.org/meetings/programme.cfm?meetno=679>.

- *November 20-24.* 10th Annual Meeting of The Oxygen Society. Sheraton Seattle Hotel & Towers, Seattle, Washington USA. Abstract submission period: May 1 - September 3, 2003 Registration on-line at www.oxygensociety.org. For more information, visit www.oxygensociety.org or contact The Oxygen Society via email at info@oxygensociety.org or (925) 472-5904.
 - **December 4-7. Proposed 2nd joint meeting of SFRR (Australasia) and SFRR(Japan), Kyoto, Japan.**
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Society for Free Radical Research (Australasia)
2002 MEMBERSHIP APPLICATION/RENEWAL FORM: (Due date 31 July 2002)

Title: _____ **Name:** _____

Address: _____

Phone: _____ **Fax:** _____

e-mail: _____

Research Interests:

Annual Fees:

Full Membership Aus\$30 / NZ\$35 Student Membership Aus\$15 / NZ\$17

Please tick the appropriate box above and send a cheque payable to "Society for Free Radical Research (Australasia)" in Australian dollars to the address below.

All NZ members should send their membership fees of NZ \$35 (full member) or NZ \$17 (student member) to Dr. Tony Kettle (Christchurch School of Medicine, PO Box 4343, Christchurch, New Zealand) who will arrange a collective transfer to SFRR(A) to prevent multiple currency-changing charges.

Dr Des Richardson, Treasurer, SFRR (Australasia)
Children's Cancer Institute Australia
PO Box 81, High St, Randwick, Sydney
NSW 2031
Australia

Signature: _____ **Date:** _____

(Student membership only - ask your supervisor to complete the declaration below)

I confirm that the above applicant is at present a student under my supervision.

Name:

Signature:

Institution:

Date:

