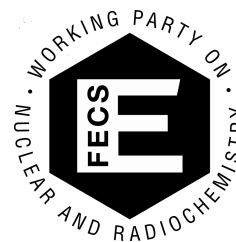


**Secretariat:** Radiochemical Methods Group  
Analytical Division  
The Royal Society of Chemistry  
Burlington House  
Piccadilly  
London W1V 0BN  
United Kingdom.



# RADIOCHEMISTRY IN EUROPE NEWSLETTER

Issue 24 – February 2003

## EDITORIAL COMMENT

Welcome to the twenty-fourth Newsletter for Radiochemists in Europe now under the sponsorship of the Federation of European Chemical Societies (FECS).

This newsletter is now firmly established on web page (<http://www.rsc.org/pdf/andiv/europenews.pdf>). The newsletter is also available through the website of The WP on Nuclear and Radiochemistry of FECS, namely <http://www.chemsoc.org/networks/enc/fecs/fecsradioc-hemistry.htm>. This website has other useful connections to "Future Events" called nuclear and radiochemical activities in Europe, and the Homepage of the Radiochemical Methods Group of RSC. If any other group would like their website to be linked, please send me the details.

There are two changes to the list of Liaison Persons at this time. The International Union of Radioecologists have nominated Dr. George Hunter to liaise with the newsletter. Prof. Rolf Michel has taken over as the representative for Germany. He was recently appointed as the chairman of Nuclear Chemistry Division in the German Chemical Society for the period January 1, 2003 till December 31, 2006.

The FECS WP on Nuclear and Radiochemistry, which is discussing training needs in Europe, has maintained contact with other groups who have lodged Expressions of Interest within the FP6 programme of the European Commission. Whilst none cover the exact area of interest of the WP attempts will be made to share any data collected via the various surveys and to seek financial support from the European Commission. See later article.

Articles, reports on meetings, laboratory profiles, courses, positions vacant, redundant equipment and any other item you feel may be of interest to other radiochemists are still required. Also the early announcement of dates for meetings and conferences is important to avoid the possibility of organising two at the same time on similar topics within Europe.

Providing that information is available I intend to compile this newsletter 4 times per year in March, June, October and December/January. Please send information in good time for inclusion that is by the end of the month prior to publication. **Editor: Dr. Tony Ware (e-mail: [tonyware@compuserve.com](mailto:tonyware@compuserve.com))**

----- x -----

## •EUROPEAN RADIOCHEMISTS ASSOCIATION.

### Aims and Objectives

The objective of the association is to extend and improve communications between radiochemists in Europe through a newsletter. This will be achieved through aims, which include

1. Establishing a liaison person within each country (or group).
2. Exchanging with each of the other liaison persons details of the activities of their own group during the current and subsequent years,
3. Setting up a diary of relevant International Events to avoid duplication of dates and hence improve attendance
4. Exchanging details of specialist equipment, facilities and methodology.

**•FEDERATION OF EUROPEAN CHEMICAL SOCIETIES  
EUROPEAN COMMISSION'S 6<sup>th</sup> FRAMEWORK PROGRAMME FOR RESEARCH**

As indicated in the last newsletter the FECS WP on Nuclear and Radiochemistry registered an Expression of Interest entitled "Network for Training of Nuclear and Radiochemistry in Europe" with the European Commission. Dr Jan John from the Czech Republic attended Launch of the FP6 in Brussels from 11<sup>th</sup> to 13<sup>th</sup> November 2002. As a result of his contact with Dr. Frans Moons he attended the Mid-term assessment and second progress meeting of the European Nuclear Engineering Network (ENEN); a network set up under an EU contract last year. At the meeting he presented the proposals of the WP and discussed the possibility of collaboration. The ENEN aim to establish a Masters in nuclear energy and the proposed syllabus includes sections on radiation measurement and radiochemistry but no request has arisen for our help or support at this time.

Information from the European Commission has indicated that the FP6 Budget has a specific item for Euratom Priorities and that nuclear and radiochemistry is regarded as part of this budget. As such our proposals must fulfil the call for projects in the Euratom Research and Training Programme on Nuclear Energy (2002-2006). The first call is for "Education and training in nuclear engineering and safety" with the aim to achieve the sustainable integration of education and training in nuclear engineering and safety in Europe. It is likely that the ENEN will put forward proposals in this area. The second is "Education and training needs for radiation protection and radioactive waste management" with the objective to determine the needs for co-ordinated education and training activities on a European scale and how these could be met. Again an existing project and network is considering this call. A meeting on Education and training in radioactive waste management is to be held in London on 4<sup>th</sup> March that Dr. Tony Ware will attend on behalf of the WP. Other research networks and integrated projects also have sections on education and training. Nowhere in the call for proposals is there a requirement for the wider education and training of radiochemists, which the WP envisaged in its proposal.

Any project within FP6 need a co-ordinator and at least three partners who are legal entities. At this stage I do not believe that FECS is a legal entity in FP6 terms and certainly not the WP. The legal entities are being sought. This should not be too difficult if the WP proposals are merged with other proposals. It could prove difficult if the WP had to make an individual proposal, as a full Cost Model would have to be developed by May 6<sup>th</sup>.

The WP is still interested in establishing a network or at least a database of universities and laboratories that offer training packages in nuclear and radiochemistry. It is possible for the WP and individuals to seek funds from the Framework Programme 6 (FP6) through its Human Resources and Mobility Programme. E.g. In the section of this newsletter on "News from the Internet" 4 Marie Curie Fellowships are advertised.

The WP has not had an opportunity to meet to discuss progress so the views expressed above are not formally endorsed. Having reread the following section from FP6 I would hope that there are still opportunities to obtain funds for education and training in radiochemistry.

"Marie Curie Conference and Training Courses will allow less experienced researchers to benefit from learning from and networking with experienced researchers. Summer schools, training events, laboratory courses covering one or several specific themes over a period of years will be supported. A series of events spanning 4-5 years and organised through professional agencies would appear to be especially favoured. Participants will be funded to attend if they are within 4-10 years of the date when they obtained their first degree."

(e-mail:[tonyware@compuserve.com](mailto:tonyware@compuserve.com))

----- x -----

**· LABORATORY PROFILE**

**Centre for Radiochemistry Research (CRR), University of Manchester**

Introduction

The Centre for Radiochemistry Research (CRR) at the University of Manchester was the first of British Nuclear Fuels' (BNFL) University Research Alliances, and was established in April 1999 as a partnership between BNFL and the University of Manchester.

In the 1970s, many universities taught topics related to the nuclear fuel cycle, but over the last 25 years much of this activity has declined as staff retire and facilities are decommissioned. As a result, there is now relatively little specialist nuclear-related material in most undergraduate Chemistry courses and the UK skill base has been in decline for a considerable time. The CRR aims to address this by creating a small group of high quality academic staff, fully involved in research and teaching, and a vibrant group of research students and postdoctoral researchers, working in modern facilities.

In 1998/99 the section consisted of 1 academic staff, 3 postdoctorates and 3 PhD D students. This has grown steadily and in 2003/2004 this is now 4 academic staff, 5 support staff, 8 postdoctorates and 25 PhD students. The original facilities in Manchester were built in 1964, and were completely inadequate for the CRR. The laboratories have now been completely refurbished and re-equipped, at a cost of £ 2.5 M. The new facilities were opened in July 2001 by Lord Sainsbury, Minister for Science, and were fully operational by January 2002. The laboratories give us the ability to work with elements which are important in the nuclear energy sector, including technetium, neptunium and plutonium. One particular difficulty in work of this type is access to modern equipment, so the CRR laboratories are fully equipped with a wide range of analytical and spectroscopic instruments.

### Luminescence Spectrometry

A wide range of projects at the Manchester Centre for Radiochemistry Research are using luminescence spectroscopy to provide information about electronic structure and solution state dynamics for a range of transition metals in the d and f-blocks.

The use of light, or more specifically photons, in spectroscopic techniques is nothing new, but the vast variety of applications for spectroscopic techniques is becoming increasingly more diverse. In traditional absorption spectroscopy, a photon of light is used to excite a molecule from its ground state to an excited state, provided that it has energy approximating the energy gap between two energy levels. The spectrum obtained from a UV-Vis spectrometer is essentially a probe of transitions from the ground state to energy levels in excited states. Luminescence spectroscopy is a similar technique, but with the difference that upon excitation, a molecule will reach an excited state by absorption of a photon, and upon relaxation back to the lower lying state, will emit a second photon. This process can give more detailed information about the electronic structure of a molecule and can give both the excited state and the ground state energy levels. The advantages of luminescence spectroscopy over absorption spectroscopy are numerous. In particular, absorption spectroscopy relies on attenuation of the incident light by the sample, as the name implies. Luminescence relies on detection of a signal against zero baseline, and is much more sensitive. The technique is extremely sensitive and can detect down parts per trillion levels. While d-block transition metal luminescence is dominated by MLCT states, lanthanide ions have partly filled f orbitals that only weakly interact with their environment, and have low extinction coefficients. This often means that they require to be bound to a sensitising molecule in order for them to be effectively used as luminescent probes.

The Centre uses a Perkin Elmer LS-55 luminescence spectrometer, which can measure  $\lambda_{ex}$  from ~220nm up to 700nm,  $\lambda_{em}$  from 240nm up to 800nm and fluorescence, phosphorescence ( $\tau > 40\mu s$ ) and total emission. Near-IR fluorescence spectroscopy is similar to spectroscopy in the visible region, but no commercial equipment is available to measure the emission. The equipment at CRR uses laser excitation to stimulate the sample, while the emission is detected using a germanium diode and can measure  $\lambda_{ex}$  from ~220nm up to 700nm,  $\lambda_{em}$  from 240nm up to 800nm and fluorescence, phosphorescence ( $\tau > 20\mu s$ ) and total emission

### Laser Luminescence Microscopy

Microscopy adds spatial resolution to the power of more conventional luminescence techniques. For instance, laser excitation can be used to look at the luminescence of complexes adsorbed on silica particles and other solid supports. All the luminescence microscopy work has been conducted at the Lasers for Science facility at Rutherford Appleton Laboratory in Didcot. The luminescence images are captured using a CCD coupled to a time-gated intensifier. Once the luminescence images have been collected an accurate lifetime map can be drawn, distinguishing between particles based on their luminescence lifetime; this is done by working out the luminescence lifetime of each pixel in the image.

### Networking and Collaborative Research Programmes (by Iain May)

The Centre for Radiochemistry Research (CRR) is strongly linked to BNFL through a wide range of research projects and is thus heavily reliant on BNFL for both financial support and technology driven research. This has already led to all four academics (Nick Bryan, Steve Faulkner, Francis Livens and myself) being involved in a series of projects directly related to nuclear fuel processing and nuclear waste management. However, irrespective of how well established these links become, and how well networked we are into the company, it would be a great mistake to look continually to one organisation for support and collaborative research. With this in mind all four academics have been actively forging new research links with other scientists in both academic and other industrial research organisations. We now have a network of contacts that spans across most of the scientific research community within the University of Manchester, as well as many additional research links in the UK, Europe, US and Australasia.

Networking and developing research links is a major part of all our jobs. In the past few weeks representatives of our group have attended an EC 5<sup>th</sup> Framework progress meeting in Paris (Bryan), visited GOGEMA at Cap Le Hague in France as a guest of Prof. Jacques Foes of CNAM (Livens and May), attended an international research conference in

Heidelberg, Germany as an invited speaker (Faulkner) and been a guest of Dr. Shen Dai at the Oak Ridge National Laboratory, Tennessee (Vladimir Volkovich). It is also worthwhile noting that we have two international research scientists, Dr. Niga Ertok from Turkey and Emmanuelle Chardon, from the University of Montpellier, France) currently working in our research laboratories. Our research links take many forms and it is worthwhile spelling out these benefits with some other examples of current collaborative programmes.

PhD student training can often be significantly enhanced by spending time in other research facilities; learning new skills, using facilities not available at the CRR and (perhaps most importantly) experiencing different research cultures. In collaboration with Dr. Phil Day of the University of Manchester, Olivia Marsden spent a month at the Australian National University, Canberra using accelerator mass spectrometry to measure the low specific activity isotope,  $^{236}\text{U}$ . This facility is not available in the UK and the results Olivia gained have already been published and will be a cornerstone of one of the chapters of her thesis. Andrew Gaunt, a final year PhD student, spent 3 months last year working with Professor Michael Pope at Georgetown University studying actinide polyoxometalate chemistry. As a world expert in the field, Professor Pope provided Andrew with a level of training in a specialist area of chemistry that was not possible at the CRR. This has enabled Andrew to bring this chemistry all the way to the transuranic elements back in Manchester. Also, in the next couple of months, Becky Aarons will be heading off to Portugal to work with Prof. Carlos Geraldes, at The University of Coimbra. Last, but not least, Leigh Martin has just spent 3 months working with Dr. Danny Fox at Sellafield where he was able to work with levels of radioactive material above those that we can safely manipulate at the CRR. This has given Leigh the opportunity to become the CRR's first plutonium chemist. All of these secondments have enhanced (or will enhance) the research training provided through the CRR and will in turn benefit these students in their future careers.

I have already touched on the use of facilities that we do not have access to directly at the CRR. Many of these facilities are centrally funded (either through the UK or the EU) and access can be limited. Over the past few years CRR staff have developed an extensive network of contacts at several of these central research laboratories, including the Daresbury Laboratory and the Rutherford Appleton Laboratory in the UK and the ESRF in Grenoble, France. These research links have greatly aided the process of applying for access and have resulted in many of our most interesting scientific discoveries. Examples include developing time resolved luminescence spectroscopy of the f-block elements, understanding the mechanism Np binding to mineral surfaces and determining iodine speciation in a real solvent waste tanks at BNFL Sellafield. Without exception, PhD students have accompanied staff and PDRA's on all of our trips to use these facilities, again enhancing student training.

Many of our network contacts are driven by the desire of academic staff at the CRR to collaborate with research scientists with common interests. This sharing of information can increase the knowledge and motivation of Centre staff and this in turn should raise the quality of our research output. It also encourages us to develop more innovative research programmes. There are many of these close research links including Steve Faulkner and Dr. Andrew Beeby (University of Durham), Nick Bryan and Dr. Gunnar Buckau (ITU, Karlsruhe) and Francis Livens and Prof. Richard Patrick (Dept. of Earth Sciences, The University of Manchester).

An area where we are putting in a lot of effort recently is in the integration of the CRR into national and international research networks. These large networks will give us access to a whole range of facilities and funding for future research activities. We are currently involved in four EU networks being developed for the 6<sup>th</sup> framework funding including networks for actinide chemistry, radionuclide migration, ionic liquids and a COST action D18 network for the development of lanthanides for imaging and therapy. We are also awaiting news of an EPSRC network grant bid to link the remaining UK actinide chemistry academics.

In summary, networking and the development of collaborative research programmes is vital for the continued growth of the CRR and it is an area that we have been extremely successful. The research links that I have mentioned above are by no means a complete summary of our extensive networks, which covers all aspects of 'radiochemistry' from nuclear technology through environmental molecular science to radioelement biological chemistry. Don't be surprised to hear reports of future collaboration with Prof. Jean-Claude Bünzli at The Institute of Molecular and Biological Chemistry, Lausanne, Risto Harjula (Institute of Radiochemistry, Helsinki) and the US DOE. Watch this space.

#### **Academic Staff**

Prof. Francis R Livens, Director, Centre for Radiochemistry Research. E-mail:[francis.livens@man.ac.uk](mailto:francis.livens@man.ac.uk)

Dr. Iain May, Lecturer in Radioelement Coordination Chemistry. E-mail:[iain.may@man.ac.uk](mailto:iain.may@man.ac.uk)

Dr. Steve Faulkner, Lecturer in f-element Chemistry. E-mail:[stephen.faulkner@man.ac.uk](mailto:stephen.faulkner@man.ac.uk)

Dr. Nick Bryan, Lecturer in Radiochemistry. E-mail:[nick.bryan@man.ac.uk](mailto:nick.bryan@man.ac.uk)

This information has been reproduced from the first of an occasional series of newsletters of the BNFL – The University of Manchester Alliance in Radiochemistry whose Project Manager is Steve Thomson, e-mail: [steven.thomson@bnfl.com](mailto:steven.thomson@bnfl.com)

----- x -----

#### · IAEA REPORT SUMMARY

##### **Summary of the IAEA Report into the “Assessment of the teaching and applications in radiochemistry.”**

In Europe and the United States, a gradual decrease of teaching and training opportunities in radiochemistry has been observed since more than two decades. Due to public misconception of anything nuclear related, the dramatic decrease of students enrolled in nuclear chemistry and radiochemistry resulted in closure of institutes via un-replaced retirements of faculty members and drastic reduction of financial support. Lack of teaching opportunities in radiochemistry as the basic discipline for radiopharmaceutical, nuclear medical, health physics, and nuclear energy technology has a strong multiplicity effect on various branches of applied and basic research and, hence, on some major parts of society's welfare.

However, the application of radioisotopes in medical diagnostics and therapy and the use of isotopes and ionizing radiation in food and safety technology (e.g. smoke detectors, de-mining, or detection of explosives at strategic places (airports, tunnels), in agriculture, water management, or the nuclear fuel cycle in the energy production, require expertise in radiochemistry and measurement of radioactivity. There is already a shortage in qualified personnel for maintenance of nuclear power plants (NPPs), decommissioning, or safeguarding of existing fissile material (e.g. plutonium (Pu) in the countries of the former Soviet Union). If no immediate action to preserve present knowledge and encourage young scientists to engage in nuclear chemistry and radiochemistry will be taken, the subjects might fade away in several industrialized countries within a few years.

This situation applies to Europe and North America and is well documented [1-3]. However, little has been done to improve the current situation. The mandate of the International Atomic Energy Agency (the IAEA) to

support peaceful uses of nuclear energy implies support to foster the human resources necessary to maintain and safeguard this technology. As radiochemistry is one of the pillars in nuclear sciences, the transfer of knowledge, training facilities, support of new applications and creation of new job opportunities should be within clear focus of the IAEA's activities to support its Member States.

Following the Consultants Meeting (CM) on Training Requirements in Modern Aspects of Radiochemistry organized by the IAEA and held in Munich in September 1987, an assessment of the current situation with respect to teaching and application of radiochemical procedures was undertaken in June 2002, in Antalya, Turkey by a group of experts on a regional context, i.e. North America, Latin America, Eastern Europe, East and West Asia and Africa. Major gaps and needs for further action were identified and recommendations to improve the desperate situation in the fields of nuclear chemistry and radiochemistry were given to the IAEA.

The outcome of this meeting represents a preliminary survey on the current state of radiochemistry and related subjects in education, training, and application in Member States of the IAEA. Qualified recommendations for corrective actions using the experience gained thus far in some countries are discussed and documented. Specific recommendations for further activities, to improve public perception, attract more students and stimulate the attention of decision makers in politics and industry, are given by the experts. As the meeting was timed immediately before the Seventh International Conference on Nuclear Analytical Methods in the Life Sciences (NAMLS7) in Antalya, Turkey, 16-21 June 2002, the findings of this meeting were also presented and discussed at the NAMLS7 Conference.

----- x -----

#### · CONFERENCE DETAILS

##### **International Meeting on Applied Physics (APHYS - 2003-02-28**

The forthcoming International Meeting on Applied Physics (APHYS-2003), to be held during October 14-18th 2003 in Badajoz (Spain), has now called for papers and participation. All the information regarding this interdisciplinary conference can be found at the following address:

[www.formatex.org/aphys2003/aphys2003.htm](http://www.formatex.org/aphys2003/aphys2003.htm)

Papers are requested in Radiation Physics, Chemistry and Engineering, as well as Radiation Protection and Safety and Medical Physics.

Some of the radiation-related topics will be:

- Environmental radioactivity
- Applications to biomedical and clinical sciences
- Radiobiology and Radioecology
- Radionuclides (bio)sorption
- Radionuclides for therapeutic pharmaceuticals
- Radionuclide Chemistry
- Radioanalytical Methods
- Naturally Occurring Radionuclides in Terrestrial and Marine Environments
- Environmental and Biokinetic Model Validation
- Bioassay, Dosimetry, and Radiation Protection
- Risk Assessment and Management
- Advances in radiochemical separation techniques

- Advances in nuclear instrumentation and software
- Applications to geochemical and energy-related studies
- Metrology Applications
- Measurement of actinides in environmental and biomedical studies
- Radon measurement and environmental behaviour
- Environmental Monitoring, Characterisation, Remediation and Restoration
- Quality assurance and standards for radioanalytical chemistry
- Medical Physics
- Health Physics

[Ed. Comment. Many of these titles are what we would include in a Nuclear and Radiochemistry Conference! I have long held the belief that physics and chemistry are much closer than we sometimes realise.]

APHYS-2003 will also serve as a platform to search for partners for transnational collaboration projects, especially for the EU Sixth Framework Program (Networks of Excellence and Integrated Projects). "Projects Presentations" and "Call for Partners" presentations proposals are therefore encouraged and welcomed. If you are interested in taking part of this Conference feature, please send us the corresponding form available at the website.

### 2003 ANS Meeting

The call for papers for the 2003 ANS Annual Meeting indicates that there are three concurrent Topical

Meetings to be held June 1-5, 2003, at the Town & Country Resort and Convention Center, San Diego, CA.

The three concurrent Topical Meetings are:

1) Accelerator Applications in a Nuclear Renaissance (ACCApp 03). Presentations will focus on nuclear applications of accelerator technology, including medical imaging and therapy, transmutation of waste, security, isotope production, food irradiation, diagnostics, and basic research. See the call for papers for a comprehensive list of topical areas.

2) Decommissioning and Spent-Fuel Management. The program will include commercial and government project updates, technology and development. See the call for papers for submittal instructions and topical areas.

3) Risk Management - Now More Than Ever. The program will focus on the broad perspectives on the wide range of risks that face the nuclear and other high-hazard industries, and the innovative risk management approaches now used to balance asset protection, safety, and cost. See call for papers for additional information.

Call for papers for Annual Meeting and concurrent topical meetings available at:

<http://www.ans.org/goto/nad.cgi?id=1044597600-15>

### 3rd Topical Meeting on Advances in Nuclear Fuel Management

October 5-8, 2003, Palmetto Dunes Resort, Hilton Head, SC, USA. Call for Papers available at:

<http://www.ans.org/goto/nad.cgi?id=1044597600-16>

## •NEWS FROM THE INTERNET

### Nuclides.net

Nuclides.net is an integrated environment for computations on radionuclides and their radiation. The "integrated environment" is a suite of computer programs ranging from a powerful user-friendly interface, which allows the user to navigate the nuclides chart and explore the properties of nuclides, to various computational modules for decay calculations, dosimetry and shielding, etc. The main emphasis of Nuclides.net is on nuclear science applications using internationally evaluated data.

Developed by scientists working on daily basis with radionuclides, Nuclides.net has been designed to be user-friendly and is thus likely to appeal to both non-experts and experts alike for reference data on radionuclides and computations of these data. Based on the latest internet technology Nuclides.net is ideally suited for education and training purposes in the nuclear industry, health physics and radiation protection, and in nuclear and radiochemistry. With the Nuclides.net professionals can do calculations quickly and reliably using qualified radionuclide data in such diverse fields as nuclear science and engineering,

environmental monitoring and nuclear forensics, nuclear medicine, astrophysics and radioactive dating.

Nuclides.net has been developed at the at the European Commission's Institute for Transuranium Elements in Karlsruhe, Germany. For more information:

<http://www.nuclides.net>

### 4 Marie Curie Fellowships

BNFL have for 4 Marie Curie fellowships (2 years each) in the fields of electrochemistry and analytical chemistry.

Briefly the 4 fellowships cover:

1. applications of semiconductor colloidal photocatalysts to actinide redox reactions
2. the electrochemistry of AgII related to process applications in PuO<sub>2</sub> dissolution
3. the application of modern separation techniques in analytical chemistry (e.g. SCFE)
4. ligand design, synthesis for increased selectivity in analytical separations chemistry

All the fellowships are based at BNFL Sellafield in the Research & Technology labs (inc. the new BNFL Technology Centre), and include the possibility of collaborating with university partners.

If you have any students or colleagues who may be interested they can apply by post or email by sending a CV to myself. (NB they need to be eligible under Marie Curie rules)

The details are all on the web site (address below) & can be found by searching for analytical or electrochemistry  
<http://improving.cordis.lu/>

#### INSC Booklets Available

Available from ANS are two Intl. Nuclear Societies Council (INSC) booklets on radioactive waste and nuclear power and the environment.

<http://www.ans.org/goto/nad.cgi?id=1044597600-9>

#### New Book on Plutonium Chemistry

The American Nuclear Society with the support from the University Research Alliance (Amarillo, Texas) and the U.S. Department of Energy, Nuclear Materials Stewardship Program, publishes new book on plutonium chemistry.

<http://www.ans.org/goto/nad.cgi?id=1039500000-11>

----- ✕ -----

#### · AND FINALLY

Please send information for inclusion in future issues to your Liaison Person or myself Dr Tony Ware, Avoncastle, South Lane, Sutton Valence, Maidstone, Kent ME17 3AZ, UK. Tel: +44 (0)1622 842627, e-mail: [tonyware@compuserve.com](mailto:tonyware@compuserve.com)

IMPORTANT PLEASE send me your e-mail address so that I can inform you when websites have been updated and any other news of immediate interest.

----- ✕ -----

#### LIST OF CURRENT LIAISON PERSONS

##### Dr Max Bichler (Austria)

Technische Universität  
Wien, Atominst.  
Abteilung Radiochemie Stadionallee 2,  
A-1020 Wien, Austria  
Tel.: 43 1 58801 14192  
e-mail: [bichler@ati.ac.at](mailto:bichler@ati.ac.at)

##### Dr Ales Fajgelj (IAEA, Austria)

IAEA, Agency's Lab Seibersdorf  
A-2444 Seibersdorf, Austria  
Tel: 43 1 2600 28233  
e-mail: [a.fajgelj@iaea.org](mailto:a.fajgelj@iaea.org)

##### Prof Dr P Benes (Czech Republic)

Czech Technical University  
Nuclear Sciences & Physical  
Engineering  
115 19 PRAHA 1  
Brehova 7, Czech Republic  
Tel: (2) 231 76 26  
e-mail: [benes@br.fjfi.cvut.cz](mailto:benes@br.fjfi.cvut.cz)

##### Dr H Dahlgaard (Denmark)

Risoe National Laboratory,  
P O Box 49, NUK-204  
DK-4000 Roskilde, Denmark  
Tel. 45-46775314  
e-mail: [hennning.dahlgaard@risoe.dk](mailto:hennning.dahlgaard@risoe.dk)

##### Dr J Lehto (Finland)

Laboratory of Radiochemistry  
P.O.Box 55  
00014 University of Helsinki  
Finland  
Tel: +358-9-19140137  
Fax: +358-9-19140121  
email: [jukka.lehto@helsinki.fi](mailto:jukka.lehto@helsinki.fi)

##### Dr D Trubert (France)

Institut de Physique Nucleaire  
Division de Radiochimie

BP 1  
F-91406 Orsay Cedex  
France  
Tel. (33) 16 1 69 41 73 45  
e-mail: [trubert@ipncls.in2p3.fr](mailto:trubert@ipncls.in2p3.fr)

##### Prof. Dr. R. Michel (Germany)

Zentrum für Strahlenschutz und  
Radioökologie  
Am Kleinen Felde 30  
D-30167 Hannover  
Germany  
Tel.: +49-511-762-3312  
Fax: +49-511-762-3319  
e-mail: [michel@zsr.uni-hannover.de](mailto:michel@zsr.uni-hannover.de)

##### Dr P Misaelides (Greece)

Dept. of Chemistry, Aristotle  
University  
PO Box 1547  
GR-540 06 Thessaloniki  
Greece  
e-mail: [misailid@chem.auth.gr](mailto:misailid@chem.auth.gr)

##### Dr Z Homonnay (Hungary)

Department of Nuclear Chemistry  
Eotvos Lorand University  
H-1117 Budapest  
Pazmany Peter setany 2  
Hungary  
Tel: (36) 1 209 0593  
e-mail: [homonnay@para.chem.elte.hu](mailto:homonnay@para.chem.elte.hu)

##### Prof. Z B Alfassi (Israel)

Department of Nuclear Engineering  
Ben Gurion University  
Beer Sheva, 84102 Israel  
Tel. 972-57-461347  
e-mail: [alfassi@bgumail.bgu.ac.il](mailto:alfassi@bgumail.bgu.ac.il)

##### Prof Dr Mauro Bonardi , (Italy)

Nuclear and Radiochemistry,

Universita' degli Studi and National  
Institute of Nuclear Physics,  
INFN-Milano,  
via F.lli Cervi 201, I-20090 Segrate  
(Milano), Italy  
Tel : +39 02 5835 9575  
E-mail : [Mauro.Bonardi@MI.INFN.IT](mailto:Mauro.Bonardi@MI.INFN.IT)

##### Dr. I Z Kolar (The Netherlands)

Interfaculty Reactor Institute  
Delft University of Technology  
2629 JB DELFT,  
The Netherlands  
Tel. (+31) 15 78 66 19  
e-mail: [kolar@iri.tudelft.nl](mailto:kolar@iri.tudelft.nl)

##### Prof P Hoff (Norway)

Nuclear Chemistry Section,  
Department of Chemistry,  
University of Oslo, PO Box 1033,  
Blindern N-0315 Oslo  
Norway  
Tel: + 47 22 85 54 84  
Fax: + 47 22 85 54 77  
e-mail: [per.hoff@kjemi.uio.no](mailto:per.hoff@kjemi.uio.no)

##### Dr R Bojanowski (Poland)

Polish Academy of Sciences  
Institute of Oceanology  
Dept of Marine Chem. and Biology  
Powstancow Warszawy 55  
81-712 Sopot  
P.O.Box 68, Poland  
Tel. (48 58) 51 72 81  
e-mail: [rbojan@ocean.iopan.gda.pl](mailto:rbojan@ocean.iopan.gda.pl)

##### Dr V P Kolotov (Russia)

Verdnasky Institute of Geochemistry  
and Analytical Chemistry  
Kosygin str., 19  
Moscow B-334, 117975  
Russia

Fax:7 (095) 9382054

**Prof. Dr Fedor Macasek (Slovakia)**

Department of Nuclear Chemistry  
Comenius University  
Mlynska dolina  
SK-842 15 Bratislava, Slovakia  
Tel. +421 7 60296308,  
Fax: +421 7 65424685  
e-mail: [macasek@fns.uniba.sk](mailto:macasek@fns.uniba.sk)

**Dr Milka Benedik (Slovenia)**

Laboratory for Radiochemistry  
J Stefan Institute  
1000 Ljubljana  
Slovenia  
Tel:+ 386 1 5885 450  
e-mail:[ljudmila.benedik@ijs.si](mailto:ljudmila.benedik@ijs.si)

**Dra C Gasco (Spain)**

CIEMAT (DIAF)(Ed3A)  
Avda de la Complutense 22  
Madrid 28040  
Spain  
e-mail: [cata@ciemat.es](mailto:cata@ciemat.es)

**Prof. Gunnar Skarnemark**

(Sweden, Gothenburg area)  
Dept of Nuclear Chemistry  
Chalmers Univ of Technology  
S-412 96 Goteborg  
Sweden  
Tel. +46 31 7722914  
e-mail:[gunnar@nc.chalmers.se](mailto:gunnar@nc.chalmers.se)

**Prof. T Eriksen (Rest of Sweden)**

Dept of Nuclear Chemistry  
S-10044 Stockholm 70,  
Sweden

**Prof. Dr Heinz W Gäggeler  
(Switzerland)**

University of Bern  
Labor Fur Radio- and Umweltchemie  
Freiestrasse 3  
CH-3012 Bern, Switzerland  
Tel;4131-6314264  
e-mail:[gaeggeler@iac.unibe.ch](mailto:gaeggeler@iac.unibe.ch)

**Prof Turan Unak (Turkey)**

Ege University, Faculty of Science  
Dept. of Chemistry, Div. Nuclear  
Chem.  
Bornova, Izmir 35100, Turkey  
e-mail:[jncs@alpha.sci.ege.edu.tr](mailto:jncs@alpha.sci.ege.edu.tr)

**Dr A R Ware (United Kingdom)**

Avoncastle, South Lane  
Sutton Valence, Maidstone  
Kent ME17 3AZ, UK  
Tel. (44) (0)1622 842627  
e-mail:[tonyware@compuserve.com](mailto:tonyware@compuserve.com)

**Mr S Jerome (International  
Committee for Radionuclide  
Metrology)**

National Physical Laboratory  
Queen's Road  
Teddington  
Middlesex TW11 0LW, UK  
Tel:+44 20 8943 6204

e-mail: [kolotov@glas.apc.org](mailto:kolotov@glas.apc.org)

Fax:+44 20 8614 0490

e-mail:[ICRM\\_LLTWG@npl.co.uk](mailto:ICRM_LLTWG@npl.co.uk)

**Dr G Hunter (International Union  
of Radioecology)**

7A Park Ave.  
Stirling, Scotland  
UK FK82QR  
e-mail:[twohunters@bopenworld.com](mailto:twohunters@bopenworld.com)