

## European Association of Chemistry and the Environment

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approaching for the ACE awards or for submission of articles to the 3<sup>rd</sup> EMEC in Geneva in December – we are very much looking forward to seeing friends and colleagues again and to enjoying the delights of this beautiful city in the festive season.

**Dr. Stephanie N. Dudd**  
Newsletter Editor-in-chief

Please send all news items/comments to  
[ACE.news@totalise.co.uk](mailto:ACE.news@totalise.co.uk)



### 2. EMEC 3: SYMPOSIA ANNOUNCEMENT: *Enroll now!*

The highlight of the agenda for anyone with an interest in Environmental Chemistry has to be the annual European Meeting on Environmental Chemistry (EMEC) symposia, held this year in **Geneva, Switzerland** from **December 11 to 14**. The programme is designed to focus attention on the current and future status of environmental chemistry and includes keynote lectures and podium and poster sessions covering recent developments in the study of undisturbed ecosystems and anthropogenic impacts.



#### Deadline for abstract submission

Deadline for receipt of abstracts by the Conference Secretariat is **1<sup>st</sup> October 2002**. Visit the EMEC 3 website for further information: <http://www.unige.ch/emec3/>

Invited speakers include **Claude Boutron** from the Laboratoire de Glaciologie et Géophysique de l'Environnement, Grenoble,

### 1. EDITORIAL

Welcome! to the newsletter of the Association of Chemistry and the Environment (ACE), produced biannually to communicate the news and interests of members of the Association. As always we extend our thanks to everyone who has contributed to this issue. A notable inclusion this time round is the start of a new series of short articles describing the research interests of members. This issue features reports by Cyril Feidt and Nathalie Grova from the Animal Science Laboratory of Nancy, Branimir Jovancevic from the Belgrade University and Tomonori Kawano from Hiroshima University. The aim of this series is to promote discussion and provide food for thought. We would like to invite comments or opinions in response to these articles, which will be included in the next issue.

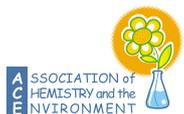
Jan Schwarzbauer has written to urge members to participate in the Collaboration Network Database (CND), which is already providing an invaluable platform for building new collaborations and partnerships. This issue also features abstracts of recently acquired PhDs from Emma Smith, University of Plymouth, and Petrena Edgar, University of Paisley, and news of Steve Rowland's research plans in the light of a new grant from UK Government Agencies. Of course, don't miss the application deadlines

**EDITOR-IN-CHIEF:**  
DUDD Stephanie N.

**ASSOCIATE-EDITOR:**  
LICHTFOUSE Eric

**ART-EDITOR:**  
ELBISSER Brigitte

**CONTRIBUTING AUTHORS:**  
BRÉAS Olivier, Belgium  
CHOVELON Jean-Marc, France  
DIBENEDETTO Angela, Italy  
FEIDT Cyril, France  
FITZSIMONS Mark,  
United Kingdom  
GROVA Nathalie, France  
HURSTHOUSE Andrew S.,  
Scotland  
JOVANCEVIC Branimir,  
Yugoslavia  
KAWANO Tomonori, Japan  
LICHTFOUSE Eric, France  
MOUGIN Christian, France  
ROBERT Didier, France  
MALATO R. Sixto, Spain  
ROGERS Karyne, New Zealand  
ROWLAND Steve,  
United Kingdom  
SCHWARZBAUER Jan,  
Germany



France, speaking on the subject of "Heavy metals in polar and alpine snow and ice cores dated from the Antiquity and the post industrial revolution period", and **Bill Davison**, Environmental Science Department, Lancaster University, UK, discussing "In situ measurements of metals in soils, sediments and water: challenges and solutions".

We welcome all our members and their colleagues to participate in a thoroughly interesting and creative experience while also enjoying the beautiful city of Geneva, well known for its hospitality. The Local Organising Committee has worked with enthusiasm to allow you to fully experience the wintertime charm of this great city.

Topics at the meeting include:

#### **Undisturbed (eco)systems and anthropogenic impacts**

- Characterisation of natural and affected environments
- Environmental processes
- Analytical tools (emphasis on stable isotopes, tracers, hyphenated techniques, intercalibration)
- Eco-toxicology

#### **Pollution treatment**

- Green chemistry and environmentally friendly synthetic pathways
- Source pollution treatment
- Remediation and control

#### **Development of new environmental tools**

- Automated analytical techniques
- Analytical techniques for on field/in situ measurements
- Modelling

#### **Teaching environmental chemistry**

### **3. AWARDS OF THE ASSOCIATION: *Deadlines approaching***

CALL FOR NOMINATIONS FOR  
THE 2002 ACE EUROPEAN  
YOUNG RESEARCHER OF THE YEAR:  
DEADLINE EXTENDED TO  
1<sup>ST</sup> SEPTEMBER 2002



In order to promote recognition of the work of young scientists in the field of environmental chemistry, the ACE and the Gareth Rieley Memorial Fund, generously backed by Micromass UK Ltd. ([www.micromass.co.uk](http://www.micromass.co.uk)) are promoting a new award. The 2002 ACE Young Researcher Of The Year Award is presented in honour of Dr Gareth Rieley, for his notable academic achievements in the field of biogeochemistry.

The award will be presented annually to a European-based M.Sc., Ph.D. or post-doctoral researcher within three years of their Ph.D., recognised as having made an outstanding contribution to our scientific understanding of Environmental processes.

Suitable candidates will be able to demonstrate research excellence, e.g. (but not restricted to) a published paper in a peer-reviewed journal or the development of an initiative that has been used to effect advancement/improvement in the way Man interacts with the environment.

This award consists of **500 Euros** and of free registration and travel expenses (up to £500) to the EMEC 2002 meeting in Geneva (<http://www.unige.ch/cabe/filella/emec3>) where the award will be presented. The recipient will be invited to give a paper at the meeting. The award is endowed by contributions from students, post doctoral associates and friends of Dr Rieley.

Applicants should submit a statement explaining the significance of their research/ accomplishment with suitable supporting evidence of its originality and bearing in English along with a letter of recommendation and CV before September 1<sup>st</sup> 2002 to Dr. Stephanie Dudd, Chairperson of the Award Committee, Micromass UK Limited, Atlas Park, Simonsway, Manchester, M22 5PP, United Kingdom (e-mail address: [ace.news@totalise.co.uk](mailto:ace.news@totalise.co.uk)). The recipient of the 2002 award will be notified in writing by 1<sup>st</sup> November 2002. Nominations will be held and automatically reconsidered for three years.



EUROPEAN YOUNG RESEARCHER OF THE YEAR  
The Award of the European Association of Chemistry  
and the Environment in memoriam of Dr. Gareth Rieley,  
sponsored by Micromass.

### **4. ACE COLLABORATION NETWORK DATABASE (CND): *Join the team!***

In January 2002 a first call for contributions to the ACE Collaboration Network Database (CND) was submitted to the ACE members. The aim of this Network is to be an information-based platform for collaborations among ACE members. Now a first version of the CND is available and the printed form is submitted with this newsletter. Until now, contributions are made covering the research fields of green chemistry, environmental photochemistry, environmental analyses of organic and inorganic pollutants/contaminants, transfer processes, atmospheric chemistry, waste and pollution management, monitoring of soil, air and water quality, development of trace analytical methods, humic substances, remediation/bioremediation, stable isotopes, degradation processes and many more. Offers for corporations and proposals of network installations are also presented. So have a look, the information is extremely interesting.

Future steps will be a periodical distribution of the next versions via e-mail, a successful development of the number of contributions as well as the installation of an electronic form of the CND on the web site. However, the presented first version is a good start for our network, but it has to be proceeded. Hence I want to use this opportunity to invite all ACE members to contribute to the CND, a contribution form can be requested by e-mail: [schwarzbauer@lek.rwth-aachen.de](mailto:schwarzbauer@lek.rwth-aachen.de).

**Dr. Jan Schwarzbauer**,  
Lehrstuhl für Geologie,  
Geochemie und Lagerstätten  
des Erdöls und der Kohle,  
RWTH  
Aachen, Germany



## 5. THESIS REVIEWS:

### *New PhD's report their recent success*

#### **Unresolved Complex Mixtures of Aromatic Hydrocarbons in the Marine Environment: Toxicity, Solubility and Photodegradation Studies**

**Emma L. SMITH**, March 2002  
Department of Environmental Sciences,  
University of Plymouth, Plymouth, U.K.

Unresolved complex mixtures (UCMs) of aromatic hydrocarbons have been found in a wide range of environmental matrices at high concentrations. However, limited consideration has been given to the potential detrimental effects of the accumulation of these compounds in the marine environment. In particular, there is a need to evaluate these compounds in the light of recent evidence that points to the long term effects of oil in the marine environment. The overall aim of this work was therefore to investigate unresolved complex mixtures of aromatic hydrocarbons in the marine environment with particular emphasis on assessment of toxicity, aqueous solubility and photodegradation behaviour.

A previously established link between the reduced scope for growth of mussels with the concentration of 2-3 ringed aromatic hydrocarbons in mussels from petroleum impacted sites was found also to correlate well with concentrations of aromatic hydrocarbon UCMs in mussel tissues found at the same sites. This suggests that aromatic hydrocarbon UCMs or components within may be responsible for the observed effects.

To determine whether an aromatic hydrocarbon UCM was capable of eliciting a toxic response in mussels, a monoaromatic UCM was isolated from a Gullfaks (North Sea) produced crude oil. At the highest nominal aqueous concentration tested, mussel feeding rate was reduced by ~40% in the 24 hour exposure period, during which the mussels accumulated a body burden similar to the body burden of monoaromatic UCM hydrocarbons in wild mussel populations, previously shown to exhibit reduced scope for growth.

Recent studies of hydrocarbon UCM composition using chemical degradation methods have led to the proposition of alkylcyclohexyltetralins as 'average' structures for some monoaromatic UCM hydrocarbons. The aromatic hydrocarbon 7-cyclohexyl-1-methyltetralin was synthesised herein in good yield and purity. This compound reduced mussel feeding rate by 50%.

The aqueous solubility of a compound is an important physicochemical parameter that influences behaviour within the marine environment and is thought to be a limiting factor in the onset of measurable toxicological response. The aqueous solubilities of three 'model' aromatic UCM hydrocarbons were determined in distilled water at 25°C using a generator column set-up. The effects of salinity and temperature on aqueous solubility were also investigated. An aqueous solution comprising an aromatic UCM was also generated.

Another influence on the fate of aromatic hydrocarbons in the environment is the action of sunlight (phototransformation). Therefore aqueous solutions of three model aromatic UCM hydrocar-

bons were exposed to light simulated under environmental conditions. The half-lives of these compounds suggested that if these compounds are indeed representative of the aromatic UCM, phototransformation may influence its fate in the marine environment. The results of this study have furthered knowledge on the environmental behaviour of unresolved aromatic hydrocarbons, and suggest that these compounds should be considered in the long term impacts of oil in the environment and also warrant further study.



Parts of this work have been published and the author (Smith, Emma L.) was awarded the **Procter and Gamble Eurocar prize** at the 3<sup>rd</sup> World Congress of the Society of Environmental Toxicology and Chemistry, 21-25 May 2000, Brighton, for the best presentation by a young scientist.

#### **The Biogeochemistry of Polychlorinated Biphenyls in the Clyde Estuary**

**Petrena EDGAR**, University of Paisley, Scotland  
andrew.hursthouse@paisley.ac.uk

The Clyde Estuary on the West Coast of Scotland has a known history of polychlorinated biphenyls (PCB) contamination and provides a "field experiment" to allow a comparison of factors responsible for long term behaviour of these compounds. An extensive survey of surface sediments was undertaken, detailing the concentrations of 24 congeners at 95 sites, covering areas previously unrecorded.

Surface sediments showed moderate to high concentrations (>20µg/kg), close to known industrial sites or effluent discharges. The contamination appeared to be localised, with non industrial sites showing concentration levels typical of atmospheric deposition.

The range of PCB congeners in the Clyde was similar to the industrial mixture, Aroclor 1254, although several distortions from that mixture occurred due to ageing processes in the estuary. In the upper estuary, ageing was less pronounced, suggesting a continued discharge, whilst lower down the estuary and in sea lochs, higher chlorinated congeners dominated. This suggested that sediment lost certain congeners and pore water analysis confirmed the presence of lower chlorinated CBs.

At one intertidal site, concentrations of >1800 µg/kg total PCB allowed the fractionation of sediment into grain size fractions and full characterisation of the geochemical properties, organic matter source and associated hydrocarbons. The most significant factor governing the sorption of PCBs to sediment was %TOC, but this was modified by the presence of Fe minerals. Individual CB congeners were associated with different sediment mineralogy.

Assessment of the impact of the contamination on biota was undertaken by analysing mussels (*Mytilus edulis*) from the area. Bioaccumulation was found to be influenced by sediment associations.

Edgar, P.E., Davies, I.M., Hursthouse, A.S. & Matthews, J.E. (1999) *Biogeochemistry of PCBs in the Clyde: distribution and source evaluation*. Marine Pollution Bulletin, **38** (6), 486-496.

## 6. REVIEW ARTICLES: *Feedback invited!*

**How could animal science be useful in environmental chemistry research?**

**Cyril Feidt and Nathalie Grova**

Laboratoire de Sciences Animales-ENSAIA,  
BP 172, 54505 Vandoeuvre les Nancy, France  
Cyril.Feidt@ensaia.inpl-nancy.fr  
Nathalie.Grova@ensaia.inpl-nancy.fr

Although many interesting results concerning green processes, analytical methods, monitoring tools or pollutant levels, were presented in Dijon, my opinion is that they could have been more synergistic. The ACE symposia represents a valuable platform from which to conceive more integrated approaches, e.g. based on food chain models (agricultural or not) and on new integrative monitoring tools. To this end, proposals concerning the possible implication of animal sciences in a synergistic project are presented in this article.

Ecotoxicology and toxicology  
*Biomonitoring of resource quality for environmental surveys*

An indicator organism is a member of the biota indigenous to a study region that accumulates pollutants from water and/or ingested food and sequesters these compounds in its tissues. By reference to biochemical, cytological, physiological, ethologic or ecological parameters, these organisms can be used to detect anthropologic alterations. According to Hopkin [1], a good bioindicator has:

- to play a key role in the ecosystem being studied;
- to be wide spread, and easily sampled/collected;
- to exhibit a readily detectable response, i.e. pollutant accumulation in tissues, or altered biological responses such as growth, fecundation, behaviour, etc.

Garden snails (*Helix aspersa aspersa*) are currently used as bioindicators of metallic pollution [2,3] close to highways and their use has been proposed for organophosphorus exposure monitoring [4]. Pollutant concentrations in tissue or physiological damage are often used in monitoring, but more original indicators, such as electrical discharges can also be used [5]. Even if such indicators have some limitations, e.g. inability to sequester specific compounds due to digestive tract, food way or metabolism characteristics, they can be used as an index of the general availability of pollutants at the biota collection site, and can supplement information obtained from concentration measurements in

snow, air, soil or water (about which there were several communications in Dijon in 2001). As proposed by Thomas [6], a new strategy could be developed, that integrates the physico-chemical data with biological responses obtained from various organisms, from bacteria to vertebrates.

Another field where animals play a key role is in pharmacology; rats and mice are widely used for toxicity assessments [7]. At the last ACE meeting, in December 2001, many remediation processes were explained, but metabolite toxicity was not assessed [e.g. 8]. I am concerned that, although discoloration of wastewater is clearly useful, it is not acceptable to release toxins. Clean up processes must also ensure the removal of toxic metabolites.

Food safety study  
*Level of the food chain*

Animal-derived food products are potentially toxic to humans. Sources of food toxins pathways of human exposures to lipophilic pollutants (organohalogen compounds) from food components (milk, fat, eggs) have been reviewed [9]. Organic micropollutants are often ubiquitous and produce low levels contamination of environmental matrix (water, air, soil). Their physical and chemical properties can lead them to enter food chain and to be accumulated in some compartments, especially at the end of the trophic chain. Therefore animal food products represent major pathways of human exposure to these compounds. Whereas models for well-known compounds like DDT or dioxins do exist [10], few data on PAH contamination and transformation in milk and dairy products is available [11,12,13]. Such studies indeed require the collaboration of specialists in each stage of the food chain.

*Bioavailability for human beings*

Evidence for the presence of pollutants in the environment and in food products is not sufficient for risk assessment, because real exposure and impregnation will depend on the bioavailability of pollutants to humans and animals. Some animal models can and do provide information on pollutant bioavailability. As an example, pigs have often been used as a model for nutrient digestion studies in humans [14], and more recently for ingestion studies of contaminated foodstuffs [15,16,17]. Rats provide a less expensive model, and have been used to indicate bioavailability of PAHs in contaminated soils [18,19].

A more integrated, long-term project incorporating all levels of the food chain in an holistic micro pollutant transfer model would be highly meaningful, binding all environmental components often individually studied.



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#### Identification, transformations and migration of petroleum-type pollutants in recent sediments and soil

##### Branimir Jovancicevic

Federal Institute for Geosciences and Natural Resources, D-510153 Hannover  
Department of Chemistry, University of Belgrade, POB 158, YU-11001 Belgrade, Yugoslavia  
B.Jovancicevic@bgr.de  
bjovanci@chem.bg.ac.yu

In spite of improvements in technology and equipment used for oil drilling, transport and processing by the petroleum industry, oil and oil derivatives represent a significant source of environmental contamination. This type of pollution has become such a serious problem that studying the fate of oil-type pollutants in the environment has developed as a separate scientific discipline.

This article discusses some efficient methods for the **identification** of oil-type pollutants in recent sediments, in order to address the nature of the **transformations** that are occurring to oil-type pollutants under specific conditions and, furthermore, to improve our understanding of **migration** mechanisms of oil-type pollutants in water/wet environments.

##### Identification

For the purpose of identifying oil-type pollutants in recent sediments it is necessary to possess reliable tools that allow a precise distinction to be made between the anthropogenic and native compounds, and which provide specific information on the type and composition of the autochthonous organic matter. Organic-geochemical investigations have shown that the main constituents of organic matter of recent sediments are fulvic acids, humic acids and humin, i.e. compounds insoluble in commonly used organic solvents. The soluble organic matter, bitumen, is present only in minor amounts. Hence, the elevated presence of bitumen in recent sediments often indicates oil-type pollution.

However, since the range of native bitumen content has not been precisely defined, either in recent or in other sedimentary formations, the quantification of hydrocarbons is not sufficient for detecting pollution in recent sediments. In most cases, the isolated extracts have to undergo a far more detailed analysis. For distinguishing the oil pollutant from the native organic substance of recent sediments, *n*-alkanes as well as isoprenoid aliphatic alkanes,





pristane (Pr) and phytane (Phyt), can be investigated. The distribution of these hydrocarbons in crude oil, which represents an advanced, mature organic substance of the Earth's crust is, in most cases, rather different from that in recent sediments. In addition, their analysis is relatively simply carried out, e.g. by gas chromatography (GC), or the analysis of alkane fractions isolated by column chromatography [1-3].

In some cases, GC analyses of *n*-alkanes and the isoprenoid aliphatic alkanes alone are insufficient to reach reliable conclusions on potential pollutants. This is the case with *n*-alkanes that show a uniform distribution of odd and even homologues, with C<sub>17</sub> as the most abundant member. No conclusion can be drawn in this example, since the same distribution can be found in marine oils, and also in recent sediments comprising organic matter that originates from marine algae. A possible solution to this problem is the analysis of additional hydrocarbons that show different distributions for oils and recent sediments (for example, the polycyclic alkanes of sterane and triterpane type). The identification (e.g. by GC-Mass Spectrometry; [4]) of thermodynamically more stable structural and stereochemical isomers characteristic of oil in recent formations unequivocally indicates pollution.

#### Transformations

Oil-type pollutants in recent sediments (including alluvial sediments) and ground waters, might be degraded microbiologically in a relatively short period of time. The intensity of microbiological degradation can be followed on the basis of changes in the abundance and distribution of *n*-alkanes, dominant hydrocarbons in most crude oils. Organic-geochemical investigations have shown that this class of hydrocarbons is most exposed to microbiological degradation. For example, based on detailed analyses of extracts (group composition, *n*-alkanes, isoprenoids, polycyclic alkanes) isolated from the ground water samples taken five times from the same borehole during a period of approximately two years (Danube River alluvion - in the area of an oil refinery), gradual but intensive microbiological degradation of oil-type pollutants has been asserted. However, following an almost complete degradation of "crude oil" *n*-alkanes, formation of "new" *n*-alkanes has been observed in the ground waters. The distribution of newly formed *n*-alkanes (dominated by even carbon number homologues and maxima at C<sub>16</sub> and C<sub>18</sub>) suggested that they most probably represent a product of metabolic processes of microorganisms which might have participated in the degradation of hydrocarbons originating from oil-type pollutants [5,6].

#### Migration

Knowledge about the migration and transformations of oil components in sediments is mostly based on organic-geochemical investigations of bitumen migration from source to reservoir rocks. Transformations occurring during organic substance migration, as well as the factors controlling these changes, can to a high degree be defined by comparing oil composition with source rock bitumens. Water plays a crucial role in bitumen migration from deeper sediments (higher pressures and temperatures) to sediments at relatively shallow depths (lower pressures and temperatures). Some minerals, especially clay minerals due to their adsorptive capacity, significantly contribute to the decrease in heavy and polar compounds during migration.

Although investigations of organic matter migration through water/wet sediments are of highest organic-geochemical significance, the migration mechanisms have still not been completely elucidated. There are four hypotheses: the formation of a true hydrocarbon solution in water, micellar or colloidal migration, migration in the form of droplets and globules and continuous organic phase migration.

In the case of oil pollution, the migration direction is opposite – from the surface towards deeper layers – but the mechanisms are unknown. The following approach could be interesting in solving this problem.

The content and composition of heavy fuel oil from an accidental oil spill near a railway station was determined in crushed rock samples from various depths and distances from the oil spill. The group composition (saturated hydrocarbons, aromatics, NSO-compounds and residue of heavy fuel extracts) was determined. *n*-Alkanes and isoprenoid alkanes, Pr and Phyt, were identified by GC. X-ray diffraction analysis was applied on the inorganic residue in order to determine its mineralogical composition. The observed differences in the group composition (increase in the content of NSO-compounds with depth and distance) and in the distribution of *n*-alkanes and isoprenoid alkanes (the shift of the *n*-alkane-maximum and the shift of Pr/*n*-C<sub>17</sub> and Phyt/*n*-C<sub>18</sub>-ratios towards higher values with depth and distance) lead to the conclusion that heavy fuel oil migration through the crushed rock environment occurred in the presence of water by the colloidal micelle mechanism [7].

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## Combining plant responses to toxic metals and environmental salt stress - An unified theory

Tomonori Kawano

Department of Biological Science, Graduate School of Science, Hiroshima University, Higashi-Hiroshima 739-8526, Japan  
kawanotom@hotmail.com



Salt stress may be causing damage to plants via hyperosmolality and accumulation of toxic ions [1]. It has been well documented that plant response to salt stress often accompanies production of oxygen radicals such as superoxide [2]. The author has demonstrated that addition of various salts (LiCl, NaCl, Na<sub>2</sub>SO<sub>4</sub>, KCl, K<sub>2</sub>SO<sub>4</sub>, CaCl<sub>2</sub>, MgC<sub>2</sub>) to tobacco cells results in burst of superoxide production [3,4]. It is noteworthy that the observed effect of salts is due to the action of metal cations, thus excluding the impact of osmotic changes. It has been shown that this mechanism is applicable to the phyto-toxicological study of metals such as lanthanides (La, Gd) and aluminum (Al).

Here the experimental results are summarized:

- induction of superoxide by salts is solely due to the action of cations;
- metal cations with higher valence induce greater responses;
- when the valence of metals were higher, lower concentrations are required for induction of maximal response;
- the cation-induced superoxide production is sensitive to NADPH oxidase inhibitors.

In conclusion, our knowledge on metal phytotoxicity and that on plant response to salt stress are unified in part.



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## 7. MEMBERS' PUBLICATIONS

2001-2002:

*Raise the profile of your research*

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Vulliet, E., Emmelin, C., Grenier-Loustalot, M.F. and Chovelon, J.M. (2002) Sunlight simulated-induced photodegradation of triasulfuron and cinosulfuron in aqueous solutions. *Journal of Agricultural and Food Chemistry* **50**, 1081-1088.

Vulliet, E., Emmelin, C., Scrano, L., Bufo, S.A., Chovelon, J.M., Meallier, P. and Grenier-Loustalot, M.F. (2001) Photochemical degradation of acifluorfen in aqueous solution. *J. Agric. Food Chem.* **49**, 4795-4800.



Solar photoreactor installed at Plataforma Solar de Almería, Spain.

The following book is available on-line "free of charge": Solar Detoxification by: Julian Blanco Galvez and Sixto Malato Rodriguez (Plataforma Solar de Almeria, Spain) <http://www.unesco.org/science/wsp>.

## 8. EUROPEAN RESEARCH: 6<sup>th</sup> Programme news

<http://www.cordis.lu>



### Priority thematic areas of research

The Commission proposals for the Sixth Framework programme identify three main avenues of approach in implementing the European Research Area. The framework programme 2002-2006 will be restructured around these three targets:

1. Integrating Research
  - Priority thematic areas of research;
  - Specific activities covering a wider field of research;
2. Structuring the European Research Area;
3. Strengthening the foundations of the European Research Area.

The activities will be carried out in a limited number of priority thematic areas. Seven priority areas have been selected:

1. Genomics and biotechnology for health;
2. Information Society technologies;
3. Nanotechnologies, intelligent materials, and new production processes;
4. Aeronautics and space;
5. Food safety and health risks;
6. Sustainable development;
7. Citizens and governance in an open European knowledge-based society.

<http://www.cordis.lu/rtd2002/fp-activities/areas.htm>

### Integrated projects and networks of excellence

The Commission proposal concerning the Sixth Framework Programme for research, technological development and demonstration activities (2002-2006), adopted on 21 February 2001, includes two new instruments which will be used, where deemed appropriate, as priority means of carrying out activities in the priority thematic areas with the objective of integrating European research. These instruments are: integrated projects and networks of excellence. <http://europa.eu.int/comm/research/fp6/networks-ip.html>

## 9. NEW EUROPEAN PROJECT:

### Oil spills

Professor **Steve Rowland** from Plymouth University has recently received notification of a grant proposal on oil spill research. The abstract follows. We will hopefully see the fruits of his work presented at forthcoming EMEC meetings.

### DOES SPILLED OIL PRODUCE TROUBLED WATERS?

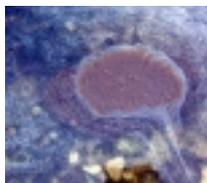
Following oil spills at sea, spraying with dispersants is often used to help oil to disaggregate-but does this treatment affect the longer term toxicity of the weathered oil? This is the question that oil pollution scientists at Plymouth University, UK, are all set to investigate, following the award of Euro 309444 from UK government agencies. Given the vast size of the world's oceans, the million tonnes of oil spilled every 10 years into the sea from tankers may not seem very much - and any dramatic short-term consequences are usually



fairly quickly alleviated by natural weathering, in many cases helped by dispersant spraying. However, the effects of dispersants and

natural weathering processes on the longer-term effects of the oil, if any, are not well known. This is where a 2 year program to be conducted at the University of Plymouth and funded by the Maritime Coastguard Agency, Department of Environment Food and Rural Affairs and the Department of Trade and Industry, should provide some answers.

"Over the years, with DEFRA funding, we have assembled a first class team of chemists and biologists at Plymouth who now have the skills needed to tackle this demanding task" remarked Professor Steve Rowland, who first published work in this field over 20 years ago. Professor Rowland is joined in the research by an experienced team, including former Plymouth Marine Laboratory scientist, Dr Peter Donkin and toxicologists Drs Tamara Galloway and Emma Smith. With the National Marine Aquarium,



Plymouth Marine Laboratory and the University of Plymouth all recognised as international centres for marine science, Plymouth was well placed to make a strong bid for the contract but the funds

were awarded only after an open national competitive tendering process. The UK Natural Environment Research Council also recently awarded two grants for marine research to Professor Rowland's group, PEGG (Petroleum & Environmental Geochemistry Group).

More information about PEGG can be found at [www.pegg.org.uk](http://www.pegg.org.uk)

Professor **Steve Rowland**  
s.rowland@plym.ac.uk



## 10. SYMPOSIA ANNOUNCEMENTS

### NEXT ACE MEETINGS

#### 11-14 December 2002 - 3<sup>rd</sup> European Meeting on Environmental Chemistry GENEVA, SWITZERLAND

The conference will take place from the 11<sup>th</sup> to the 14<sup>th</sup> December 2002 and NOT from the 18<sup>th</sup> to the 21<sup>st</sup> December 2002, as initially announced. The University of Geneva was founded in 1559, and has a truly International attendance, with students from 130 different countries and a long tradition in environmental scientific study. This lively city and the outstanding natural beauty that surrounds it promises to provide the perfect setting for the next European Meeting on Environmental Chemistry.

**Dr. Monserrat Filella**  
CABE, Sciences II,  
Quai Ernest-Ansermet 30,  
CH-1211 Geneva 4,  
SWITZERLAND.



montserrat.filella@cabe.unige.ch  
<http://www.u-bourgogne.fr/ACE>

#### 10-13 December 2003 - 4<sup>th</sup> European Meeting on Environmental Chemistry PLYMOUTH, UNITED KINGDOM

Looking ahead to December 2003, Mark FITZSIMONS from the Department of Environmental Science, Plymouth, UK is already, making preparations for the 4<sup>th</sup> ACE meeting. Allow yourself to be stunned by picturesque Dartmoor, the breathtaking coastline and combine that with deliciously fresh seafood, traditional beers and ciders and seasonal enter-tainment from Christmas classical concerts. Not to be missed!

**Dr. Mark Fitzsimons**  
mfitzsimons@plymouth.ac.uk



#### December 2004 - 5<sup>th</sup> European Meeting on Environmental Chemistry BARI, ITALY

**Dr. Michele Aresta**  
aresta@metea.uniba.it



### OTHER MEETINGS

**8-13 September, 2002 - Gordon Research Conference on Green Chemistry,**  
Queen's College, Oxford, UK  
<http://www.grc.uri.edu/programs/2002/green.htm>  
<http://www.users.waitrose.com/~kybett/index.htm/page3.html>

**24-27 September, 2002 - 1<sup>st</sup> ASEM Conference on Bioremediation,**  
Hanoi, Vietnam  
Environmental Biotechnologies for a cleaner environment.  
[http://www.aetec.org/cf/BioConf\\_home.htm](http://www.aetec.org/cf/BioConf_home.htm)

**26-27 September, 2002 - 6<sup>th</sup> International Dioxin Conference,**  
Krackow, Poland  
The aim of the conference is to shed light onto problems concerning dioxin and PCB.  
<http://www.dioksyny.pl/>

**6-9 October, 2002 - Environmental Protection**  
Glasgow, Scotland

The annual conference of the UK's National Society for Clean Air & Environmental Protection.  
admin@nsca.org.uk, <http://www.nsca.org.uk>

**10 October, 2002 - Research and Commercial Opportunities for Green Chemistry,**

University of York, UK

A 1 day course and 1 day workshop organised by the Green Chemistry Network.

Dr. Jeff Hardy, [jjeh102@york.ac.uk](mailto:jjeh102@york.ac.uk)

<http://www.chemsoc.org/networks/gcn/>

**13-16 October 2002 - Green Solvents for Catalysis, Environmentally Benign Reaction Media**

Bruchsal (near Heidelberg), Germany

The aim of the conference is to highlight innovative concepts for the substitution of volatile organic solvents in fluid phase catalysis. Emphasis will be laid on the development and industrial application of alternative reaction media and phase-separable catalysts (aqueous phases, ionic liquids, supercritical phases, fluorinated phases, thermoregulated systems, etc.). Dr. Dana Schleyer, [schleyer@dechema.de](mailto:schleyer@dechema.de)  
<http://www.dechema.de/gsf2002>

**14-16 October, 2002 - 7<sup>th</sup> Meeting of the Central and Eastern European Regional Section: Trends and Advances. In Environmental Chemistry and Ecotoxicology,**

Hotel Santon, Brno, Czech Republic

A symposium on the relationships between environmental pollutants and their biological effects - from science and research to management and legislation.

<http://recetox.chemi.muni.cz/konference/secotox/secotox2002.htm>

**30 October, 2002 - ReachOut-Chemicals from Crops: the green and sustainable option?**

CSL, Sand Hutton, York, UK

A 1-day course organised by the Green Chemistry Network.

Dr. Jeff Hardy, [jjeh102@york.ac.uk](mailto:jjeh102@york.ac.uk)

<http://www.chemsoc.org/networks/gcn/>

**4 November, 2002 - Environment 2002, online**

An online conference covering waste and environmental management issues in the UK and Ireland.

<http://www.environment-2002.com/>

**11-13 November, 2002 - European research**

Brussels, Belgium

The EC research conference and brokering event.  
[http://europa.eu.int/comm/research/conferences/2002/index\\_en.html](http://europa.eu.int/comm/research/conferences/2002/index_en.html)

**18-21 November, 2002 - 10<sup>th</sup> British Crop Protection Council Exhibition,**

Brighton, UK

Combining the Trade Services and Scientific & Educational Exhibitions.

<http://www.bcpc.org>

**16-22 March, 2003 - 5<sup>th</sup> International Workshop on Field Techniques for Environmental Physiology,**

Tenerife, Spain

This workshop will be the 5<sup>th</sup> one week symposium of next generation environmental physiologists, instrument manufacturers and established experts.

<http://www.ierm.ed.ac.uk/instrument.workshop>

**23-27 March, 2003 - Molecular studies of soil organic matter, 225<sup>th</sup> ACS Meeting**

New Orleans, Louisiana, USA

Molecular characterization (ESI-MS, GC-MS, NMR...). Isotope studies, e.g. <sup>13</sup>C, <sup>15</sup>N, and <sup>14</sup>C dating. Dynamics of soil organic matter etc.

<http://oasys.acs.org>, <http://www.acs.org>

<http://membership.acs.org/g/geoc>,

[bruno.glaser@uni-bayreuth.de](mailto:bruno.glaser@uni-bayreuth.de),

[James\\_Rice@sdstate.edu](mailto:James_Rice@sdstate.edu), [wwells@wlgore.com](mailto:wwells@wlgore.com),

[Eric.Lichtfouse@u-bourgogne.fr](mailto:Eric.Lichtfouse@u-bourgogne.fr)

**7-11 April, 2003 - EGS-AGU-EUG Joint Assembly**

Nice, France

<http://www.copernicus.org/egsagueug/>

**12-16 May, 2003 - ConSoil 2003: The 8<sup>th</sup> International FKZ/TNO Conference on Contaminated Soil,**

Ghent, Belgium

<http://www.consoil.de/>

**15-19 June, 2003 - 7<sup>th</sup> International Conference on the Biogeochemistry of Trace Elements**

Uppsala, Sweden

An conference dedicated to link biosphere.  
<http://www-conference.slu.se/7thICOBTE/index.htm>

**7-11 September, 2003 - 6<sup>th</sup> International Conference on Environmental Geochemistry,**

Edinburgh, Scotland

<http://www.iseg2003.com/index.htm>

**11. WEBLINKS:**

*Information at your fingertip*

**Cranfield Centre for EcoChemistry**

<http://www.cranfield.ac.uk/ecochemistry>

**The Green Chemistry Network**

The Green Chemistry Network was launched by the Royal Society of Chemistry and is based within the Department of Chemistry at the University of York.

<http://www.chemsoc.org/gcn>

**The Green Chemistry Research Network**

GCRN is funded by the EPSRC and provides an ideal opportunity to bring together the various individuals and organisations with interests and expertise relevant to Green Chemistry so as to enhance the rate of research progress and technology transfer.

<http://www.york.ac.uk/res/gcrn/GCRNHome.htm>

**EU Research opportunities**

European Union research activities are implemented for the most part under multi-annual research, technological development and demonstration (RTD) framework programmes. EU-funding is available through calls for proposals or tenders.

[http://www.cordis.lu/rtd2002/fp-activities/sustainable\\_development.htm](http://www.cordis.lu/rtd2002/fp-activities/sustainable_development.htm)

**Bioremediation resource**

A dynamic bioremediation database was set up in September 2001 and is available on-line free of charge!

<http://www.aeetc.org/index.html>

**Contaminated land management**

NICOLE is the principal forum that European business uses to develop and influence the state of the art in contaminated land management.

<http://www.nicole.org>

## 12. PRINCIPLES OF GREEN CHEMISTRY

Many aspects of our lives have been enhanced by chemistry. One of the most dramatic examples is the increase in life expectancy from 47 years in 1900 to 75 years in the 1990s. Much of this increase can be



attributed to improved health care, including the development of pharmaceuticals that cure what ails us and ease our pain and suffering. Chemistry can make our water and food safe to consume and the cars we drive safer, more comfortable, and longer lasting. Chemistry helps to make our computers faster and more efficient, our TVs bigger and better, and our houses more comfortable and more efficient. These examples illustrate the positive way in which chemistry has affected our lives.

While chemistry has unquestionably improved our lives, these advances have also created environmental problems. Many starting materials (reactants) can be harmful to human health and the environment unless properly handled and stored. If a chemical process uses hazardous substances - for example, those that are highly toxic, harm lung tissue if inhaled, damage skin on contact, or are explosive - there is always the danger that accidents can occur, exposing workers and others to these chemicals or releasing them into the environment.

Therefore, green chemistry principles dictate that chemists investigate whether it is possible to reduce the hazards by using safer reactants to produce the same products. A number of chemical companies have made progress in doing this, and others are beginning to look more closely at their processes to reduce hazards. This is particularly important in industrial processes for which very large quantities of chemicals are used. However, even on a smaller scale, safer substitutes might be found for chemicals used in research and student laboratories. The following principles provide overall guidelines.

- Prevent waste. Waste prevention is better than treatment or clean-up.
- Maximize atom economy.
- Design less hazardous chemical syntheses. Chemical synthesis should ideally use and generate non-hazardous substances. Chemical products should be designed so as to be non-toxic.
- Chemical synthesis should maximise the incorporation of all starting materials. The use of auxiliaries should be minimised.
- Design safer chemicals and products.
- Use safer solvents/reaction conditions.
- Increase energy efficiency.
- Use renewable feedstocks. Raw materials should increasingly be renewable.



- Avoid chemical derivatives. Derivatives should be minimised.
- Use catalysts, not stoichiometric reagents. Catalysts are superior to reagents.
- Design chemicals and products that degrade after use. Chemical products should break down into benign products.
- Analyse in real time to prevent pollution. Chemical processes require better control.
- Minimize the potential for accidents. Substances should have minimum potential for accident

**Dr. Eric Lichtfouse**  
University of Burgundy,  
Dijon, France



Note: this article is a compilation of informations found on the websites of the following organisations:

U.S. Environmental Protection Agency ([www.epa.gov/greenchemistry](http://www.epa.gov/greenchemistry)), Green Chemistry Network of ChemSoc ([www.chemsoc.org/networks/gcn](http://www.chemsoc.org/networks/gcn)), Green Chemistry Institute of the American Chemical Society ([www.acs.org/education/greenchem](http://www.acs.org/education/greenchem)).

## 13. CLEAN TECHNOLOGY NEWS FROM THE SCHOOL OF CHEMISTRY,

University of Nottingham

The Clean Technology Research Group, co-directed by **Martyn Poliakoff**, **Steve Howdle** and **Mike George** covers a wide range of research activities largely aimed at understanding fundamental chemistry or at developing environmentally acceptable processes and materials. The core themes of their work are supercritical fluids, infra-red spectroscopy and lasers.

One particularly high profile aspect of their current work is the development of methods to produce chemicals on an industrial scale using carbon dioxide as a solvent. This has been so successful that the first multi-purpose chemical manufacturing plant to use supercritical carbon dioxide in this way has now opened in the UK, in conjunction with the fine chemicals manufacturer Thomas Swan and Co. Ltd. This is a multi-purpose plant using supercritical fluids for a new generation of faster, cleaner and more selective synthesis.

The benefits of the SCF approach are both environmental and commercial, with the potential to avoid the use of volatile organic solvents and the problems of their subsequent separation together with the greater efficiency of the reaction resulting in less waste material.

The group recently exhibited at the Royal Society's Summer Science Exhibition in London, UK, and feature on their web site <http://www.sc1.ac.uk/discover/fizz.cfm>. Further information and news from the Clean Technology Research Group can be found at <http://www.nottingham.ac.uk/supercritical/>.



## 14. FORTHCOMING ACE SPRINGER BOOK

Springer-Verlag, Berlin, and the ACE will publish a selection of the proceedings from the 2<sup>nd</sup> European Meeting on Environmental Chemistry (Dijon, 2001) in a book, due to be issued early 2002/early 2003.



Springer



3. The dentition pattern evident on the "skull" is more consistent with the common domesticated dog than it is with the "ravenous man-eating Pliocene clams" you speculate roamed the wetlands during that time. This latter finding is certainly one of the most intriguing hypotheses you have submitted in your history with this institution, but the evidence seems to weigh rather heavily against it. Without going into too much detail, let us say that:

- A. The specimen looks like the head of a Barbie doll that a dog has chewed on.
- B. Clams don't have teeth.

It is with feelings tinged with melancholy that we must deny your request to have the specimen carbon dated. This is partially due to the heavy load our lab must bear in its normal operation, and partly due to carbon dating's notorious inaccuracy in fossils of recent geologic record. To the best of our knowledge, no Barbie dolls were produced prior to 1956 AD, and carbon dating is likely to produce wildly inaccurate results. Sadly, we must also deny your request that we approach the National Science Foundation's Phylogeny Department with the concept of assigning your specimen the scientific name "Australopithecus spiff-arino." Speaking personally, I, for one, fought tenaciously for the acceptance of your proposed taxonomy, but was ultimately voted down because the species name you selected was hyphenated, and didn't really sound like it might be Latin. However, we gladly accept your generous donation of this fascinating specimen to the museum.

While it is undoubtedly not a hominid fossil, it is, nonetheless, yet another riveting example of the great body of work you seem to accumulate here so effortlessly. You could know that our Director has reserved a special shelf in his own office for the display of the specimens you have previously submitted to the Institution, and the entire staff speculates daily on what you will happen upon next in your digs at the site you have discovered in your back yard. We eagerly anticipate your trip to our nation's capital that you proposed in your last letter, and several of us are pressing the Director to pay for it. We are particularly interested in hearing you expand on your theories surrounding the "trans-positating fillifitation of ferrous ions in a structural matrix" that makes the excellent juvenile Tyrannosaurus rex femur you recently discovered take on the deceptive appearance of a rusty 9-mm Sears Craftsman automotive crescent wrench.

Yours in Science,  
Harvey Rowe  
Curator, Antiquities

This message is intended only for the use of the person(s) ("the intended recipient(s)") to whom it is addressed. It may contain information that is privileged and confidential within the meaning of applicable law. If you are not the intended recipient, please contact the sender as soon as possible. The views expressed in this communication may not necessarily be the views held by The Association of Chemistry and the Environment.

## 15. NEW ACE MEMBERS

New members to the association are always welcome and details regarding membership are available at: <http://www.u-bourgogne.fr/ACE>

ACE welcomes new members:

**AMOURA Karim** LUYNES, FRANCE  
**DOUCET Frédéric** BIRMINGHAM, UNITED KINGDOM  
**ROWLAND Steven J.** PLYMOUTH, UNITED KINGDOM  
**BELT Simon** PLYMOUTH, UNITED KINGDOM  
**RICKING Mathias** BERLIN, GERMANY  
**SIGRE Marie-Alexandrine** GIF SUR YVETTE, FRANCE  
**HAGEMAN Kimberly** CORVALLIS, USA

## 16. HUMOUR:

### *Archaeological findings in soil*

*This is an actual letter from the archives of the Smithsonian*

Paleoanthropology Division  
Smithsonian Institute  
207 Pennsylvania Avenue  
Washington, DC 20078

Dear Sir:

Thank you for your latest submission to the Institute, labeled "211-D, layer seven, next to the clothesline post. Hominid skull." We have given this specimen a careful and detailed examination, and regret to inform you that we disagree with your theory that it represents "conclusive proof of the presence of Early Man in Charleston County two million years ago." Rather, it appears that what you have found is the head of a Barbie doll, of the variety one of our staff, who has small children, believes to be the "Malibu Barbie". It is evident that you have given a great deal of thought to the analysis of this specimen, and you may be quite certain that those of us who are familiar with your prior work in the field were loathe to come to contradiction with your findings. However, we do feel that there are a number of physical attributes of the specimen which might have tipped you off to its modern origin:

1. The material is molded plastic. Ancient hominid remains are typically fossilized bone.
2. The cranial capacity of the specimen is approximately 9 cubic centimeters, well below the threshold of even the earliest identified proto-hominids.

<http://www.u-bourgogne.fr/ACE>