

## Editorial

# Social Responsibility of Scientists

by Joseph Rotblat



Sir Joseph Rotblat addresses Marie Curie fellows at the MCFA thematic conference.

*This article is based on Sir Joseph's presentation at the Thematic conference.*

Science used to be a hobby; the main motivation for scientific investigation was curiosity, but without any expected applications; scientists simply wanted to understand the laws of Nature. However at the end of the 20th Century we have to ask the question: should scientists be concerned with the social consequences of their work? And with the human and environmental effects of their research?

Science has transformed the lives of each individual, and can determine the destiny of nations. Science has brought improvements in health, wealth and cultural riches but it has also brought adverse effects - the pollution of the environment; the misuse of resources and threat to the human species; science has clearly brought the potential for destruction. The development

of the atom bomb was, in the early days, a voluntary effort and the intention was good; scientists thought it was needed to prevent its misuse.

In 1970, Herbert York said: "The various individual promoters of the arms race are stimulated sometimes by patriotic zeal, sometimes by a desire to go along with the gang, sometimes by crass opportunism.... Some have been lured by the siren call of rapid advancement, personal recognition, and unlimited opportunity, and some have even sought out and made up problems to fit the solutions they have spent most of their lives discovering and developing".

Theodore Taylor stated in 1987 that the most stimulating factor of all was simply the intense exhilaration that every scientist or engineer experiences, when he or she has the freedom to explore completely new technical concepts and then bring them into reality.

I believe that every citizen must be accountable for her or his deeds; this applies particularly to scientists. Michael Atiyah gave the following reasons:

- First there is the argument of moral responsibility. If you create something you should be concerned with its consequences. This should apply as much to making scientific discoveries as to having children.
- Scientists will understand the technical problems better than the average politician or citizen and knowledge brings responsibility.
- Scientists can provide technical advice and assistance to solve the incidental problems that may emerge.
- Scientists can warn of future dangers that may arise from current discoveries.
- Scientists form an international fraternity that transcends natural boundaries so they are well placed to take a global view in the interest of Mankind.
- Finally it is necessary to prevent a public backlash against science. Self-interest requires that scientists must be fully involved in public debate and must not be seen as "enemies of the people"

Science needs to regain the trust and confidence of the public. Scientists need to show that they are human and creative, yet caring; that they roam into new horizons but have their feet firmly on the ground. Consider the words of Francis Bacon: "I would address one general admonition to all: that they consider what are the true ends of knowledge, and that they seek it not for pleasure of the mind, or for contention,... but for the benefit and use of life...that there may spring helps to man, and a line and race of inventions that may in some degree subdue and overcome the necessities and miseries of humanity".

I propose a type of Hippocratic oath for scientists: nowadays the whole community is in the hands of scientists and they should pledge that science and technology will be used in socially responsible ways. Scientists should not knowingly carry out research, which is used to the detriment of humanity; and should pledge "if research is used to the detriment of humanity the scientist will work to combat it". Whistle blowing should become part of the scientist's ethos. Ethical committees should be introduced to science and administered by the independent Academies of science.

How do you evaluate the scientist? There is pressure to cut corners and to produce results; but scientists must ensure they are not doing projects in secret - openness is important. What about curiosity? The scientist must think about the potential results of the research; if necessary suppress your curiosity and re-direct your efforts - do a different project; carry out different research.

Various formulations of oaths have been proposed, and there is a considerable literature on this. There is no need for a single formulation, however. I like the pledge initiated by the student Pugwash group in the United States, which has

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already been signed by thousands of students from many countries. It reads:

"I promise to work for a better world, where science and technology are used in socially responsible ways. I will not use my education for any purpose intended to harm human beings or the environment. Throughout my career, I will consider the ethical implications of my work before I take action. While the demands placed upon me may be great, I sign this declaration

because I recognise that individual responsibility is the first step on the path to peace."

For professional scientists another formulation has been suggested:

1. I will not, knowingly, carry out research which is to the detriment of humanity
2. If, in the event, research to which I have contributed is used - in my view - to the detriment of the human race then I shall work actively to combat its development."

**Sir Joseph Rotblat (born in Warsaw in 1908), Fellow of the Royal Society is emeritus Professor of Physics at the University of London and emeritus President of the Pugwash Conferences on Science and World Affairs. During World War II he initiated work on the atom bomb at Liverpool University, and later transferred to Los Alamos. When it became clear that**

**Germany was not working on the bomb, he resigned from the project - the only scientist to do so before the bomb was tested. He has devoted the subsequent 45 years of his life to averting the danger posed by nuclear weapons; he was awarded the Nobel Peace Prize in 1995 jointly with Pugwash Conferences, the organization he helped to found.**

## Reports from the Board

# 2nd Annual General Meeting

by Laure Ledoux

The 118 MCFA members who attended the second Annual General Meeting on 14 November 1999, in Brussels, heard about the year's activities, discussed the future direction of the Association, and received a preliminary copy of the First Annual Report.

In a summary of the period, the Chair underlined the principal activities of the outgoing Board: consolidating the MCFA by improving its structure and communication means; providing benefits to members - to new and current fellows through national meetings and welcome packs; to all members through scientific activities and networking; raising the prestige of fellowships and the MCFA; offering means of feedback, providing information and publication means. Establishing the MCFA as a strong partner with the EC and other European scientific organisations was also a focus for last year's activities.

Finally, ensuring financial sustainability, through securing extra funding, was a major objective. The new EC grant for the year 2000 is for approximately 70% of the previous grant, as was foreseen in the

original business plan; a consultancy company has been recruited to search for suitable sponsors for the Association, in order to maintain the overall level of funding. The Treasurer provided a financial summary and a breakdown of expenditure from the 1999 budget. This information will be included in a final annual report and will be available to all members once an external audit has confirmed the figures.

A brief outline of forthcoming activities was also given and there was an opportunity for questions before the discharge of the outgoing Board. Most of these concerned funding: evolution of EC funding, potential sponsors, consultancy hired to look for sponsorship, etc. The EC grant was a start-up grant, so it is expected to decline over time and indeed from the MCFA's point of view, more diversified sources of funding also mean greater independence.

Ave & Partners, a Brussels-based consultancy, has been contracted to find sponsors through targeting multinational companies; different advantages will be offered to companies according to the level of spon-

sorship. There has been no confirmed sponsorship yet, but names of sponsors will be disclosed as soon as there are some final decisions. National groups' participation in finding sponsors is welcome, as long as it is co-ordinated with the Brussels office to ensure companies do not get contacted twice.

Questions also addressed the efforts by the Board to recruit new members. An invitation to join the Association has been included in the welcome packages for the new 5th FP fellows. Earlier in the year a letter was posted to fellows at the addresses from the EU database; out of 3000 letters, 25% were returned. An article in **Nature** in November will help to raise awareness of the Association amongst potential members. The importance of providing benefits for alumni members was also mentioned.

In a plenary workshop following the elections, members were invited to consider the future of the MCFA. The discussion considered the roles of committees within the MCFA, and how to involve them more in future activities. Each committee and its function were presented. The ensuing debate was wide-ranging and very useful in suggesting new directions. Although the following is not a comprehensive account of the discussion, it outlines the more widely discussed points.

Significant interest was expressed in interdisciplinary research and the discussion on

whether to create interdisciplinary sub-groups, or groups within each discipline, for the exchange of ideas, concluded that both options had merits; an MCFA award for outstanding interdisciplinary research was also proposed. The inclusion of a few key words relating to the research field of each member, in the member's database, would also be useful to enable fellows to find other members with specific research interests.

Increasing the scientific reputation of the MCFA was also recognised as an important goal. This depends on the quality and publicity of fellows' publications, and the mention of being an MC fellow in acknowledgements. Training courses were considered as an important potential benefit to members. Given the MCFA's limited funds, it was questioned whether reduced rates would be a feasible way to provide more training, or whether additional funding for training courses could be obtained.

Information and communication should be increased and improved. Frequently Asked Questions would be a useful feature on the Web, and the discussion forum should be used more extensively. Post-doc and return issues were also the subjects of an extended debate and a working group will be set up to discuss post-doc issues and produce a policy paper.

The election results were announced by Barry McSweeney,  
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**By invitation**

# European Research and Young Scientists

by **Enric Banda** and **Tony Mayer**

We would like to provide a short description of the current structures for research in Europe and the role which the European Science Foundation (ESF) plays, the broad view of the conclusions of a Nature/ESF survey into the opinions of young post-doctoral researchers, and the way in which we could work together to address the future pattern of research in Europe.

The structure of science in Europe has evolved considerably over the past 50 years, matching not only the political evolution of Europe, but also the changes in research itself, which have demanded greater collaboration and a realisation that each country cannot do everything alone. The pathfinder in European collaborative research was the European Centre for Nuclear Research (CERN) in 1952 with a new 'burst' of European developments in the 1970s – the time when the bulk of the European institutions which we see today were founded. This includes ESF, established in 1974 from prototypes started in 1971, the same time as European Co-operation in Science and Technical Research (COST), with the European Molecular Biology Laboratory (EMBL) in 1974 and European Space Agency (ESA) in 1975.

Since then the most significant innovation has resulted from the political drive of the European Union which has led to the Framework Programme, now in the planning stages of its sixth phase. Although Framework Programmes represent only around 5% of the total spending on R&D across the Union, the significance and importance of Framework is that it represents maybe 25-30% of

the total public 'manoeuvrable' money in Europe and which, through its shared-cost actions, drives scientific priorities in the Member States.

Where does ESF fit into this complex picture? We are the European association of national funding agencies and research institutions, and academies of sciences from 23 countries (for details see the Website at [www.esf.org](http://www.esf.org)) set up to strengthen and develop European science. We do this principally through networking; members of the MCFA may be familiar with some of our activities such as the European Research Conferences (EURESCO) scheme, which we initiated ten years ago, our networks and à la carte programmes, which often include small fellowship and exchange schemes.

In comparison with Framework we are small (a total budget of around 12 million in contrast to the FP annual budget of 4 billion). However, what we are able to do is mobilise national research resources and even Framework money to address key scientific issues. As an organisation at 'arms length' from national agencies, we have a fortunate degree of independence, which enables us to provide advice on a wide range of subjects. Sometimes, this may be very influential as happened in the establishment of the European Research Synchrotron Facility (ESRF) in Grenoble as a result of ESF advice and pressure.

As we end our 25th year, we must look forward and try to develop and strengthen European science. We have a tendency in Europe to constantly

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head of the EC Marie Curie Fellowships unit. All eight candidates were elected and Marc Corluy was co-opted to fulfil Article 10 of the Statutes of the Association.

The new Board wishes to thank all members for their votes, and is looking forward in the year ahead to welcoming new members, further developing MCFA activities, and bringing more benefits to all members.

The following responsibilities were distributed during the first Board meeting:

**Laure Ledoux,** [L.Ledoux@uea.ac.uk](mailto:L.Ledoux@uea.ac.uk) **Chair of the MCFA carried out her Marie Curie fellowship in the Environment Department, at the University of York where she developed a hydrological economic model of water management in a Mediterranean**

Chair

**Laure Ledoux**

Vice-Chair and Treasurer:

**Ana M. Cerdeño**

Secretary General:

**Oliver Schwickerath**

Innovation and Technology, Sponsorship and Vice-Treasurer:

**Norbert Glaser**

Scientific Advancement:

**Christine Heller**

Membership Drive and Alumni:

**Norbert Mauser**

National Groups:

**Winfried Meining**

Marketing and Publications:

**Marco Valentini**

IT manager:

**Marc Corluy**

**wetland. She now holds a research post at the Centre for Social and Economic Research on the Global Environment at the University of East Anglia, working primarily on biodiversity and the interface of science, economics and policy.**

create new structures and organisations. We have to live with this but let us use this diversity to create partnerships and ensure that science and research can speak in a more unified manner. That will be a major challenge for ESF for the future. At this time, we have a number of aims, which include:

- a) to provide a system, beyond networking, which can assemble national funding in 'basic' science to tackle key topics;
- b) to encourage and develop multi-disciplinarity and trans-disciplinarity at a European level;
- c) to encourage the development of a research infrastructure in Europe to provide an attractive research environment for the future; and
- d) to provide an independent point of science policy advice, which will also tackle many of the issues, which currently impinge on society such as human stem cell research, public perceptions of risk and much else.

We also believe that it is important to look to the human

resources in science in Europe and to understand the concerns and opinions of young post-doctoral workers in Europe. To this end, in partnership with Nature, we surveyed some 628 young post-doctorals (under 40) from Britain, France, Germany, Italy, the Netherlands and Spain who had attended our EURESCO meetings. It may not have been a fully representative sample but it provided a useful guide to opinions.

The main conclusion is that most people were reasonably content with their lot, although almost all complained of lack of time to complete research projects, due to the demands of other tasks including teaching and administration. With an increase of short-term contract working in research, this will become a major problem. For the most part, respondents considered that they were reasonably in control of their research and received credit for their work, albeit only 31 % said that they received 'full credit'. Many blamed hostile attitudes of some of their senior colleagues,

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poor organisation in the workplace and excessive competitiveness for this situation. Underpayment was an important issue, principally with female researchers. What the survey revealed were regional variations, especially north and south, and gender differences. In many ways, this reflects the organisational structures and cultures of the workplaces. The most attractive places for research turned out to be the Netherlands and the UK, which gave most individual freedom and recognition in setting research goals. (The summary of the survey was published in *Nature*, Vol. 397, 25 February 1999 ([www.nature.com](http://www.nature.com)) by Quirin Schiermaier together with an editorial comment. For those who want more details, we suggest that you read this article.)

Turning again to the future, we need to look at Europe's science policy, if there is such an animal. From the ESF perspective, we believe that Europe should provide an attractive research environment for young scientists. This means not only providing good career structures and counselling, and adequate financial rewards, but also well-equipped laboratories and a research infrastructure equal if not better than elsewhere in the world.

We need this not only to attract and retain Europe's best brains but also to attract the best scientists from wherever in the world. In other words, we must turn a 'brain drain' into a 'brain gain'.

Eventually, most researchers as they advance in their careers become embroiled in science policy but, by then, they are no

longer young. We need to hear the voice of young scientists. After all, it is your future which we are planning. MCFA can help ESF in surveying and distilling the opinion of its members in order to create a dialogue between the younger generation and the national research agencies. Of course, MCFA only represents one group: those who have moved around Europe courtesy of the Framework Programme.

To be fully representative, we must also tap into the views of other similar international groups and also into the views of the non-mobile, nationally supported young post-doctoral researchers.

What we hope to do is to work with MCFA and others in creating this dialogue which we believe will be to everyone's advantage.

**Enric Banda has been Secretary General of the European Science Foundation since June 1998. He has had a distinguished career in geophysics, both in Spain and at a wider European level, and has served in the Spanish Government as State Secretary for Universities and Research. Earlier in his career he was General Secretary of the Spanish National Plan for R & D, and headed the CSIC Earth Sciences Institute in Barcelona.**

**Tony Mayer is Head of the Secretary General's Office, and Scientific Co-ordinator for the ESF Network Scheme. He is responsible for the development of the ESF Plan and the ESF Science Policy agenda. He is a geologist by training and prior to joining ESF, he was Head of International Relations at the UK Natural Environment Research Council.**

## MCFA local groups

### Irish Group Meets National Contact Point

by Audrey Hobson and William Gallagher

After arriving back from an exciting few days in Brussels in mid-November while at the MCFA Conference, myself and William (Liam) were spurred on to initiate our first official meeting with our National Contact Point. Within a couple of weeks, we had generated a lot of interest from a number of MCFA members, as well as other interested individuals, and organised a meeting at the Department of Pharmacology, University College Dublin (UCD) on 15th December 1999. It involved four speakers, Liam (Department of Pharmacology, UCD), Dr. Conor O' Carroll (National Contact Point and Delegate for the EC 5th Framework Programme, Enterprise Ireland), Ms. Bridgeen McCloskey (Chair-Elect of the Irish Research Scientists Association, UCD), and Dr. Carmel Hensey (Wellcome Trust

New Blood Fellow, UCD). Liam opened the meeting with an overview of the MCFA and what it currently offers to its members. He also discussed the variety of career options open to researchers and the role of the MCFA in the area of career development.

A major objective of the meeting was for past, current and prospective fellows to meet with the Irish National Contact Point and discuss any matters relating to the Marie Curie Fellowship Scheme. There were 25 attendees: 12 were Marie Curie fellows and 13 individuals who were interested in finding out more about Marie Curie fellowships and the relevant application methods in the 5th Framework Programme. The participants included researchers from UCD, Trinity College Dublin, National

University of Ireland - Maynooth, and Dublin Institute of Advanced Studies.

Dr. O' Carroll gave an overview of the Marie Curie Fellowship Scheme, the career situation of scientists in Europe and the role of the National Contact Point in assisting new fellows who come to Ireland. He discussed the benefits of receiving a Marie Curie fellowship and of having an interdisciplinary network of scientists throughout Europe, as facilitated by the MCFA.

Ms Bridgeen McCloskey from the Irish Research Scientists Association (IRSA) gave an overview of the IRSA and its role in lobbying various government agencies in order to improve the conditions for Irish scientists. She was very interested in hearing about the MCFA and thought that it would be very useful for the IRSA and the MCFA to hold a joint scientific meeting at some stage during the year 2000. She further highlighted UCD policy on intellectual property rights and the role of the University Industry Programme within UCD in encouraging academic staff to develop their research ideas into viable businesses. The MCFA

could also provide a useful role in this respect in terms of the education of fellows in contemporary business strategy and the foundation of small enterprises, through regular courses organised by the local groups.

Dr. Hensey of the Department of Pharmacology, UCD, described her career to date. Having spent 10 years in the USA as a research scientist (after completing a PhD in Switzerland), she recently returned to Ireland following the award of a Wellcome Trust New Blood Fellowship. This novel fellowship scheme offers hope to promising young researchers wishing to embark on an independent research career within academia, without having extensive teaching commitments at the outset. It provides a considerable research budget along with other benefits; e.g. all fellows have to be offered a permanent academic position following completion of the 5-year programme. Indeed, the Wellcome Trust has been an important lobbying force in Irish scientific policy decision making.

Attendees, who were hearing about Marie Curie fellowships for the first time, commented that

the meeting had been very useful for them. They suggested that information sessions with the National Contact Point should be held on a regular basis so that young researchers can be informed about the opportunities that Marie Curie fellowships and the MCFA can offer. A number of participants were hoping to apply for a Marie Curie fellowship by the next deadline in March 2000. The meeting was also very useful to current and past fellows as it provided an opportunity to meet with their National Contact Point and discuss various issues and queries

that they had about the Marie Curie Fellowship Scheme.

An intriguing issue raised by several members of the audience concerns the current bias towards exclusivity of membership of the MCFA. It was generally felt that the MCFA might achieve more by including interested non-Marie Curie fellows, such as fellows who are currently working or have participated in European Network Programmes. Thus, a discussion on the proposal for inclusion of currently ineligible, EC Network fellows into the MCFA is proposed for our next Annual General Meeting.

**Audrey Hobson**, [ahobson@mcghanltd.com](mailto:ahobson@mcghanltd.com), spent her two-year post-doctoral Marie Curie fellowship at the Centre for Genome Research in the University of Edinburgh, Scotland. She obtained a Marie Curie Return Fellowship to carry out research in the Ocular Genetics Unit, Department of Genetics, Trinity College Dublin. Currently, she is working as a Regulatory Affairs Project Co-ordinator in a medical device company and is a co-ordinator of the MCFA Irish Group.

**William Gallagher**, [william.gallagher@ucd.ie](mailto:william.gallagher@ucd.ie), is a co-ordinator of the MCFA Irish Group. He is presently an Enterprise Ireland Research Fellow and is also a Core Investigator within the Conway Institute of Biomolecular and Biomedical Research, University College Dublin. Upon completion of his PhD in Scotland, William travelled to France to undertake a two-year post-doctoral Marie Curie fellowship within the major French pharmaceutical company, Rhone-Poulenc Rorer.

## MCFA local groups

# Marie Curie Fellowships in Germany - Present and Future

by Meinhard Ober

The MCFA German group, along with the German National Contact Point, the Ministry of Science, Research and Arts of the State of Baden-Württemberg, and the University of Stuttgart, has initiated a conference for German academia and industry, to discuss the current situation and the future prospects of the Marie Curie fellowships. It is a follow-up event of a conference in Rostock October 1994, which had a great impact on the Marie Curie fellowship programme. By the way it was also the birthplace of the idea to create the MCFA.

We are organising the conference to try to improve the situation of the fellows in Germany by increasing the attractiveness of Germany as a host country; we hope also to inform industry about the potential of MC fellows. In more detail: **Part A** of the conference provides a forum to discuss the situation of the fellows in Germany: what are the administrative and social problems that they have to face daily? What can host institutes do to integrate the fellows more easily in order to improve the attractiveness of Germany as a host country? What

are the prospects for the young researchers once their fellowship has ended?

**Part B** addresses the prospects of the Marie Curie fellowships for industry as well as for small and medium-sized enterprises. The opportunity to take young researchers into a company will be introduced and proposal writing will be explained. In addition, the potential of the former, highly-qualified fellows will be pointed out.

We invite all German fellows abroad, as well as fellows in Germany, to come to Stuttgart, to discuss with us the future of the Marie Curie fellowships. The results of the conference with, maybe, new ideas for improvements, will be published in this newsletter as well as distributed with the proceedings in March.

Marie Curie Fellowships in Germany - Present and Future,

Stuttgart, 23/24 February 2000. Part A Problems and prospects of Marie Curie fellows in Germany. Part B Prospects of the Marie Curie fellowships for Industry. [www.dlr.de/PT/marie-curie/Programm-eng.htm](http://www.dlr.de/PT/marie-curie/Programm-eng.htm)

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studied at the Ecole Centrale de Paris and Ohio State University and graduated from the University of Stuttgart, Germany. He now works in the Department of Remaining Life Assessment as head of the group software modules at the MPA Stuttgart, Germany. His MC fellowship was in the field of defect assessment of power plant components at high temperature at Imperial College, London.

## Thematic conference

# Challenges and Opportunities for Young Scientists in Europe

by Josep Gari, Maziar Nekovee and Jennifer McClarey

The MCFA held this 2-day thematic conference in Brussels on 12-13 November 1999 and welcomed over 150 MC fellows, speakers and other participants from all over Europe.

In her address to the conference Laure Ledoux, chair of the MCFA, highlighted the problems that even the most promising young researchers face: the lack of sufficient permanent academic

posts in most European countries which can provide young researchers with long-term career prospects. In southern Europe, in addition, young researchers returning to their home countries from a post-doc or PhD abroad are confronted with the difficulty of re-entry. Laure emphasised that since the MCFA is well organised at European level, and because of its interdisciplinary character, the MCFA is in a good position to raise awareness on issues of concern to all young scientists.

Sir Joseph Rotblat from the Pugwash Conferences on Science and World Affairs spoke on the social and moral responsibility of scientists; he said scientists are well placed to take a global view in the interests of mankind. He further proposed that scientists should take an ethical oath to carry out research, which is not to the detriment of humanity, and that "whistle blowing" should become part of the scientist's ethos. A proposal to the conference that the MCFA should



Discussion panel at the MCFA thematic conference, from left to right: Yola Verhasselt (ICSU), Enric Banda (ESF), Barry McSweeney (EC), Laure Ledoux (MCFA), Christine Heller (MCFA), Olivier Sparagano (MCFA).

adopt a similar ethical oath for its members was warmly welcomed by those present at the conference.

Dr Barry McSweeney, Head of the European Commission Marie Curie Fellowship Unit, said that the EC is extremely interested in following the career paths of Marie Curie fellows - young researchers who will become future scientific leaders. He emphasised the importance of mobility and said that the EC is committed to identifying and breaking down any barriers that might restrict mobility; to optimising the transfer of scientific knowledge gained through the experience of the Marie Curie fellowship; and to helping the career advancement of Marie Curie fellows through the prestige and acceptance of the Marie Curie fellowships.

Both the European Science Foundation (ESF) and the International Council for Science (ICSU) expressed interest in collaborating with the MCFA on issues of common concern. Professor Enric Banda from ESF noted that if communication were improved within the extensive network of scientific institutes, foundations and research centres, they would all be more effective.

We heard from Dr. Norbert Glaser, patent examiner at the European Patent Office and member of the Euroscience Board, where he has responsibility for young scientists' activities, who presented the results

of a 1998 Euroscience report on **Future of Young Scientists in Europe**. He explained that post-doctoral studies do not meet modern challenges: changing labour markets affect career structures in science and technology, yet young scientists are faced with traditional working environments which have not adapted for future needs. A truly scientific perspective would involve training, which is adapted to personal, societal, and market needs. International research programmes should ideally provide recognised career steps and offer interdisciplinary options.

The theme of interdisciplinary research arose again when Dr. Joanne Linnerooth-Bayer, a research co-ordinator at the Austria-based International Institute for Applied Systems Analysis (IIASA) noted that no single science discipline could offer adequate solutions when addressing problems of a global nature. She emphasised the high professional risk with interdisciplinary work; individuals are required to have at least a small amount of knowledge in a range of disciplines.

Alternatives to traditional careers in science were considered through presentations from representatives from EARMA, Unilever, and McKinsey. This was particularly mind-opening for those scientists who to date have remained in academia. It is important to be aware that other options exist. But all speakers,

whether talking about research administration, industry or consultancy careers agreed that it had to be a positive, pro-active choice, and not a default option. An alternative career requires additional training to enable the acquisition of new and necessary skills – e.g. communication, finance, and the ability to manage people and resources.

Graham Farmelo, from the London Science Museum, underlined that scientists need to be trained in communication and presentation skills to enable them to become good communicators. David Dickson, News Editor from Nature also insisted that it is vital to develop good relationships between scientists, science journalists, and the public. The MCFA recognises that science communication doesn't come naturally and that the Association can take steps to provide such training as a service to its members.

The conference provided a forum for the presentation of the external points of view of speakers, on issues of concern to young scientists. The issues raised, ranging from the training of young scientists to careers and new roles for scientists, will

be debated within the MCFA and will be the object of future events where young scientists will be able to interact directly with key actors.

**Josep A. Gari**  
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**Maziar Nekovee**  
[m.nekovee@qmw.ac.uk](mailto:m.nekovee@qmw.ac.uk) is Editor of the MCFA News. He is a research fellow at the Center for Computational Science, Queen Mary and Westfield College, University of London. Maziar spent a two-year post-doctoral MC fellowship at Imperial College, London.

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## Research focus

# Magnetism with Frustration

(Or, you cannot get a triangular peg into a square hole.)

by Andrew S. Wills

Frustrated magnetic systems provide one of the most remarkable areas of study in solid state physics. The cause of the interesting, and often unique, properties observed is nothing more than a simple change of geometry: from systems based on 'tiles' with an even number of sides to those with odd, e.g. from squares to triangles. In fact, many of our ideas of magnetic systems hold only for 'square-like' lattices.

Magnetism arises from the electrons in a material, in particular

the unpaired electrons. The magnetic moments of these can be visualised as tiny bar magnets, and can be represented by an arrow (pointing 'North-South' for example). In an antiferromagnet (AFM), the energy is minimised when neighbouring moments are antiparallel - this may be realised on a square lattice, as shown in the Figure. On a triangular lattice, however, only two moments can be antiparallel at any one time. The third is left wanting to be antiparallel to both of its neighbours, but this is not allowed by

the geometry of the triangle- it is said to be frustrated. The system makes a compromise in which neighbouring moments are at  $120^\circ$  rather than  $180^\circ$  to each other.

There are two ways of doing this and we say that the moments on the triangle have a handedness, or chirality. These two configurations have exactly the same energy and are described as "degenerate". This degeneracy is not present in non-frustrated systems and can affect the low-temperature physical properties drastically. Two particular geometries of interest are the kagomé (vertex sharing triangles) and pyrochlore (vertex sharing tetrahedra) lattices. They are special as they feature classical lowest energy states that are infinitely degenerate, a situation that can lead to an amazing variety of low-temperature physics: superconductors, heavy fermions (where the mass of electrons becomes very large), colossal magnetoresistance (which forms the basis for the new technolo-

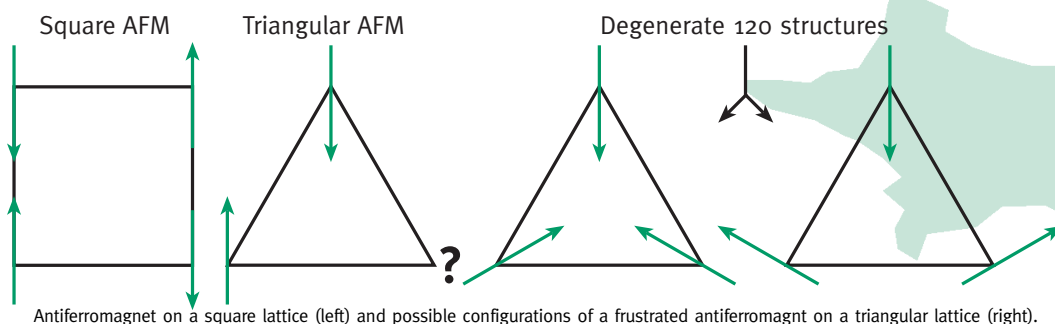
gy in magnetic hard drive heads) and spin glasses (which are the magnetic equivalent of window glass). These represent some of the most studied subjects in solid state physics, and can all be found within the realm of frustrated magnetism.

My Marie Curie fellowship project involves the experimental study and theoretical description of frustrated magnetic systems, particularly those with the kagomé and pyrochlore geometries. An early success of this fellowship was the first detailed study of the nonconventional spin glass phase of  $(\text{H}_3\text{O})\text{Fe}_3(\text{SO}_4)_2(\text{OH})_6$ , which represents a new class of glass-like magnetic physics.

Not all frustrated antiferromagnets show these unconventional ground states. Some possess long-range ordered arrangements of static moments; however, the competition between magnetic interactions that is the source of the frustration again enters the game and highly complex magnetic structures are

generally the result. The determination of these magnetic structures from neutron diffraction data, collected at sources such as the Institut Laue-Langevin (France) or the ISIS Rutherford Appeltorn Laboratory (UK), is itself a problem as there are a large number of possible structures. Even today, this determination is typically carried out by trial and error by making comparisons with known structures or from educated guesses.

Another aspect of this project is the development of new computer algorithms and codes for the determination of magnetic structures based on analysis of the symmetries of the systems and new curve-fitting algorithms. The aim is the creation of a next-generation protocol that will allow, for the first time, the determination of magnetic structures to be carried out automatically. Studies such as these continue to open new directions in solid-state physics and to challenge our most basic understanding of magnetism.



**Andrew Wills**  
wills@drfmc.ceng.cea.fr  
is a Marie Curie fellow at the Centre D'Etudes Nucléaires de Grenoble (France) where he is working as a post-doc on synthesis and characterisation of frustrated magnetic systems. He obtained his Ph.D. in Chemistry from the University of Edinburgh.  
This article is based on a talk given by Andrew at the MC Fellows Workshop: Research Training in Progress held in Grenoble last year.

These interdisciplinary, regional workshops are organised by the European Commission in collaboration with the MCFA. They provide MC fellows with a local forum to communicate their research to fellows from other research disciplines and to stimulate the creation of new bridges between disciplines. For more information on this work see A.S. Wills, A. Harrison, S.A.M. Mentink, T.E. Mason, and Z. Tun, *Europhysics Letters* 42, 325 (1998), J.E. Greedan, N.P. Raju, A.S. Wills, C. Morin, S.M. Shaw, and J.N. Reimers, *Journal of Chemical Material* 10, 3058 (1998), A. S. Wills, V. Dupuis, E. Vincent, J. Hammann, R. Calemczuk (pre-print, cond-mat/0001344 xxx.soton.ac.uk). For more information on MC scientific workshops contact Dr. Wolfgang Kerner (Wolfgang.KERNER@cec.eu.int) at DG Research, the European Commission.

## Careers in science

# MC Fellows: Taking Up Careers in Management ?

by Janice Cullen and Sigurd Lettow

Completing a Marie Curie fellowship is a useful preparation for a range of careers. Many fellows will hope to continue within an academic stream while others, through preference or necessity will move towards other employment. The skills that fellows develop in research and analysis

could support a successful move into information management. The experience that an enterprising fellow could gain through managing his/her research project in a laboratory in another country, and in another language, could be turned towards a career in management.

As a result, some fellows might take a post in the management and administration of research, and the MCFA has been forging links with EARMA (European Association of Research Managers and Administrators) for an exchange of information. A position in research management or administration will be far from boring! With the evolution (reduction in many cases) of national funding for research, the concept of a national administration "career for life" is disappearing. Modern managers have to be flexible, willing to add to their skills base throughout their working lives, and to take initiatives

to find new financial partnerships to support research in industrial and national research facilities.

If you would like to know more about opportunities and posts in the UK look at [www.thesis.co.uk/](http://www.thesis.co.uk/)

One of the principle objectives of EARMA is to promote the effective training of young research administrators and to this end it regularly organises specific training courses in Brussels. (e.g. "How to Write a Competitive Proposal for the Fifth Framework Programme" on 1st & 29th February 2000 and "How to Negotiate, Administer, Manage

and Finish an EU R&D Contract; From the Proposal to the Final Payment" on Wednesday 2nd & 1st March 2000.) Moreover these courses are also organised at other European cities and information is available from Ms Ruete at the EARMA office (earma@skynet.be).

EARMA also includes special training sessions on the day before its Annual Conference (e.g. The EARMA 6TH Annual Conference on **Knowledge Management and Evaluation in Science and Research**, 6 – 9 JULY 2000, at the Deutsches Krebsforschungs-

zentrum, Heidelberg, Germany where the programme on Thursday, 6 July 2000 will include a training course on **Industrial Research Cooperation** covering the topics: **What Industry Are Fond Of, How To Collect Information and What Start-Up Companies Need**.

Further details about EARMA and its training activities can be found at [www.cineca.it/earma/](http://www.cineca.it/earma/)

**Janice Cullen is the editor of the EARMA Newsletter and Sigurd Lettow is Chairman of EARMA.**

## News bulletin

In the next couple of months all members will be issued with a MCFA membership card which will bring you some benefits. A leading car rental company is willing to offer MC fellows a 10% price reduction with this card and other benefits are currently under negotiation. The postal address from the database will be used to send you the card so we would like to remind you to keep this information up-to-date.

The **MCFA News** would like to introduce a new section to enable members to notify other fellows about recent accomplishments or major successes in their careers. This could be the publication of a book or an article in a major science publication; an innovation or patent; a significant career move or a major breakthrough in the field of research. Send your short message and email address to [mcfaz@mariecurie.org](mailto:mcfaz@mariecurie.org).

## Diary of events

### Marie Curie Fellowships in Germany: Present and Future

Stuttgart, Germany, 23-24 02 2000. Organisers: MCFA German group, German National Contact Point, The Ministry of Science, Research and Art of Baden Württemberg and the University of Stuttgart Contact: [Meinhard.Ober@mpa.uni-stuttgart.de](mailto:Meinhard.Ober@mpa.uni-stuttgart.de)

More information: [www.dlr.de/PT/marie-curie/Programm-eng.htm](http://www.dlr.de/PT/marie-curie/Programm-eng.htm)

### Innovation in the Biosciences

Colworth, UK, 21-22 02 2000. Organisers: Unilever/MCFA, contact: [buano397@tumorbio.uni-freiburg.de](mailto:buano397@tumorbio.uni-freiburg.de) or [g.kersteins@lan-caster.ac.uk](mailto:g.kersteins@lan-caster.ac.uk)

More information: [www.mariecurie.org](http://www.mariecurie.org)

### Workshop of Marie Curie Fellows: Career Opportunities in Academia and Industry

Linacre College, Oxford, UK, 13-14 03 2000.

### Registration and Information:

Please contact Wolfgang Fischer ([wolfgang@bioch.ox.ac.uk](mailto:wolfgang@bioch.ox.ac.uk)), Karen Lüdtke ([karen.ludtke@linacre.ox.ac.uk](mailto:karen.ludtke@linacre.ox.ac.uk)) or Onofrio Maragò ([marago@physics.ox.ac.uk](mailto:marago@physics.ox.ac.uk)) More information: [www.robots.ox.ac.uk/~jens/MCFA-Oxford](http://www.robots.ox.ac.uk/~jens/MCFA-Oxford)

The MCFA UK National Group meets in Edinburgh 6-7 May 2000. More information from the UK co-ordinating team [marie-curie-fa-request@mailbase.ac.uk](mailto:marie-curie-fa-request@mailbase.ac.uk)

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Letters and other contributions should be submitted to the editor ([m.nekovee@qmw.ac.uk](mailto:m.nekovee@qmw.ac.uk)) and a copy to [mcfaz@mariecurie.org](mailto:mcfaz@mariecurie.org)

Letters may be shortened and edited for clarity. Please include a full postal address in your e-mail and mention as subject "MCFA News".

### Advertising

Contact Jennifer McClarey [mcfaz@mariecurie.org](mailto:mcfaz@mariecurie.org) at our office in Brussels

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## What is the MCFA ?

The Marie Curie Fellowship Association (MCFA) is the representative body of all former and current holders of a Marie Curie fellowship. Marie Curie fellowships are research and mobility training grants awarded to scientists from EU countries by the European Commission. The Association was initiated in November 1996 by the European Commission, in recognition of the enormous potential of Marie Curie fellows as future scientific leaders, and in acknowledgement of the need for an interdisciplinary European network of young scientists.

The MCFA is a non-profit organisation, governed by an elected administrative board, with national groups in all EU member states. MCFA members span the biological, physical, and social sciences and are represented in both acad-

emia and industry. The major aims of the Association are to:

- help advance science in Europe and increase the appreciation and understanding of science by the general public
- create a clear and visible identity for Marie Curie fellowships
- establish a structured interface between fellows and the world of research and industry
- develop and foster the international dimension of Marie Curie fellowships

### Membership benefits :

- national and international scientific meetings
- an electronic careers network and an interface between the members and potential employers
- assistance and advice for current fellows on issues related to their fellowships and integration in the host country

- feedback to the EC on the implementation of the fellowship programmes
- a strong voice for young European scientists within the scientific community

If you are a current or former holder of a Marie Curie fellowship, you are eligible to join the MCFA; your registration details can be completed and submitted electronically on our Web site.

### Further information

For further information consult the Association's Web site: [www.mariecurie.org](http://www.mariecurie.org) or contact our European office:

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