

SUPPORT AND INTEGRATION OF EDUCATION AND TRAINING FOR RADIATION PROTECTION RESEARCH IN THE EUROPEAN JOINT PROGRAMME CONCERT

V. SMYTH, A OTTOLENGHI
Physics Department, University of Pavia, Italy

A. WOJCIK
Stockholm University, Sweden

G. SAFRANY
National Research Institute for Radiobiology and Radiohygiene, Hungary

M. COECK
SCK-CEN Belgian Nuclear Research Centre, Belgium

M. ATKINSON
Helmholtz Zentrum Munich, Germany

ABSTRACT

CONCERT is a Euratom-funded European Joint Programme, set up as an umbrella structure to prioritise and support radiation safety research in the areas of low-dose risk, radioecology, nuclear emergency preparedness, radiation dosimetry, medical radiation protection, and the social sciences and humanities. It began in June 2015 and will run for 5 years. Members of the CONCERT consortium are national research funding agencies and the radiation protection platforms: Alliance (radioecology), NERIS (emergency response), MELODI (low-dose research), EURADOS (radiation dosimetry), and EURAMED (medical radiation protection). As well as organising open research calls, CONCERT undertakes integrative activities such as promotion of the wider use of the European radiation infrastructures, and the support of education and training.

At the level of radiation exposure associated with most scenarios of concern for radiation safety, the incidence of harmful effects can be obscured by the noise of natural occurrence rates. Studies over many years are required to obtain reliable risk estimates, employing a wide range of scientific disciplines. This long-term broad-scope process requires a programme of education and training specifically designed to ensure a continuing influx of new top-level students into the needed scientific areas. CONCERT includes a workpackage dedicated to the support of such a programme. (See http://www.concert-h2020.eu/en/Concert_info/Education_Training.) It consists of 5 subtasks:

1. Attracting and retaining students and junior scientists into the Radiation Protection research fields: A programme of travel grants will run for the duration of the EJP in order to provide greater opportunities for students to gain experience and networking through attending conferences, courses, and visiting other institutions.

2. Education and training as an essential part of dissemination and knowledge management within CONCERT: E&T should be an intrinsic part of all research programmes so that students can gain in-depth experience of the topic. The CONCERT open research calls require applicants to provide a plan as to how they will involve universities, and provide thesis and project opportunities for students.

3. Targeted E&T initiatives: There is an annual call for institutions to host short (1 to 3 week) courses in topics of their expertise. Sponsorship from CONCERT allows the courses to be offered at no cost and, in some cases, with accommodation provided.

The topics specified in the calls are aligned with the E&T priorities of the partner research platforms.

4. Coordination and collaboration on E&T policy and strategy: An annual forum is held to discuss the E&T priorities of the platforms and other interested parties to provide guidance for the overall programme.

5. European integration of junior scientist career development: A European network of students and professors is being set up as a way of information sharing and career development.

1. Introduction

Since the year 2000, Europe-wide studies have identified a problem with the maintenance of the range of expertise essential to keep up competence and run an effective programme of research into the risks to humans and the environment from low-dose radiation. The findings indicate that specific programmes aiming at knowledge management across generations need to be designed in order to achieve sustainable continuity and development. Furthermore, the science underpinning radiation protection is becoming more multidisciplinary, and embracing new and wider fields of study such, as it seeks to understand and control the risks to biological and social systems. The new science is powerful and has the potential to answer important questions, but it tends to be confined within specialist university departments and research institution. To respond to the challenge of developing and maintaining new competence within the radiation protection research community, there is a need for support of education and training in all the sciences providing the basis for radiation protection, and in particular specific research areas such as the hazards from low-dose radiation, medical applications of ionising radiation, radioecology, emergency and recovery management and dosimetry.

DoReMi was a Euratom-funded Network of Excellence which ran from 2010 to 2015 to promote and integrate European research into the risks of exposure to low doses of ionising radiation and to help set up the low-dose research platform MELODI. In addition, DoReMi began promoting training and education in support of the research programme within the NOE, and also making more widely available training opportunities in order to help attract top-level students into the field. The experience gained from DoReMi was carried over into European Joint Programme CONCERT, which will run from 2015 to 2020. The scope of CONCERT has expanded from DoReMi in that it incorporates not only MELODI, but 4 other radiation protection platforms. The contribution of CONCERT to the support of education and training in radiation protection is described in this paper.

2. The CONCERT European Joint Programme (www.concert-h2020.eu)

The 'CONCERT-European Joint Programme for the Integration of Radiation Protection Research' under Horizon 2020 operates as an umbrella structure for the research initiatives jointly launched by the radiation protection research platforms MELODI, ALLIANCE, NERIS, EURADOS, and EURAMED. Based on the Strategic Research Agendas developed by each of the platforms, CONCERT is developing a joint programme of research priorities in consultation with participating Member States. The research topics have formed the subject of two open Research and Technology Development (RTD) calls, in 2016 and 2017, administered by CONCERT and funded by the Euratom research and training programme 2014-2018. The ensuing research contracts are co-funding actions and are designed to stimulate and coordinate the EU national programmes of research into radiation protection.

CONCERT is made up of 7 Workpackages: one for administration, 3 for formulating and managing the RTD calls, one for stakeholder engagement, and two for integrative activities designed to facilitate and develop EU research capability and resources. These activities include promoting the use of and facilitating access to major European research infrastructures, such as exposure facilities including those for animal and plant experiments (both laboratory and field facilities), epidemiological cohorts, sample banks, databases and analytical platforms, models and tools (including e-infrastructures). There is also a workpackage dedicated to supporting and coordinating education and training for the development and maintenance of expertise in all of the areas having application to radiation research. A strict distinction is made between this action and more general training for radiation protection. There is of course a strong need for training in the understanding and practice of operational radiation protection, particularly in the workplace and in medical use of radiation. But there are other bodies, both commercial and nationally funded, that are very competently providing this service, and there is no call for CONCERT to compete with them.

3. Education and Training as an integrative activity in CONCERT

Workpackage 7 of CONCERT is dedicated to education and training for the support of radiation protection research. It is formed of 5 separate tasks:

Task 7.1 – Attracting and retaining students and junior scientists into the radiation protection research fields.

This is led by Stockholm University and is made up of 2 subtasks. The first offers grants on a competitive basis to junior scientists to attend conferences and training courses. The criteria for giving support are based on references provided by the applicant, and the appropriateness of the proposed grant for furthering the aims of CONCERT. Four grants are awarded every 3 months, each for a maximum of €625. The awards began in 2016, and have proved very popular. Typically there are more applications than there are awards that can be given.

The second subtask is investigating the possibility of increasing transferability of educational credits within the EU states, in order to facilitate cross-crediting university course modules (such as the MScs in Radiobiology and Radioecology), and to work towards full mutual recognition of pre-requisites and degrees. A dialogue with institutions involved will be maintained through a regular forum coordinated by this task.

Task 7.2: Education and training as an essential part of dissemination and knowledge management within CONCERT

This task is led by the National Research Institute for Radiobiology and Radiohygiene, Budapest. E&T is promoted as an integral part of all CONCERT-funded RTD research projects. Proposals in the 2 open calls were encouraged to include provision for:

- PhD thesis work; where possible students from new member states shall be encouraged to qualify for PhD Programmes.
- MSc project work; project partners will be encouraged to liaise with universities offering MSC Programmes in scientific disciplines required for radiation protection research to provide supervised projects.
- Offering short courses (1-3 weeks) or teaching seminars on the new science/technology being used or developed. Courses, seminars, and student opportunities within the RTD projects will be coordinated by this task and promoted through the EJP website.

The following text was included in the two CONCERT calls:

“Education and training is a part of all activities within CONCERT. Proposals should include a plan for integration of education and training into the research programme, with a description of the proposed activities. The proposal should also give details of collaboration or involvement with academic departments, and of intended PhD thesis work, MSc project work, teaching seminars, ad hoc courses on the topics of the proposal, etc., where possible.”

Task 7.3: Targeted E&T initiatives

This task is led by the University of Pavia, Italy. An annual open call is made for institutions to organise short courses (up to 3 weeks length), summer schools, or teaching seminars on topics of relevance to research into radiation protection. Initiatives under this task include professional training at the MSc /PhD level covering all aspects of the scientific research areas underpinning radiation protection and emergency and recovery management. Grants in support of courses are made on the basis of direct costs (travel, subsistence, consumables). The courses are generally free to students (including accommodation).

The Programme is reviewed annually on the basis of student feedback and consultation with stakeholders, and modified if necessary. To date each of the participating platforms except EURAMED has hosted courses supported by this Task. This initiative of sponsoring short courses was a feature that proved very successful when developed in DoReMi, and this success is continuing in CONCERT. The courses currently running are advertised on the CONCERT website (www.concert-h2020.eu/en/Events).

Task 7.4: Coordination and collaboration on E&T policy and strategy

This task is led by SCK•CEN, the Belgian Nuclear Research Centre. It consists of 2 subtasks. The first seeks to develop coordination and collaboration in E&T by inclusion of the interests and requirements of the E&T Working Groups of all the radiation protection research platforms involved in the EJP (MELODI, ALLIANCE, NERIS, EURADOS, and EURAMED), and with networks such as EUTERP and the ENEN Association. Dialogue is entered into with other interest groups and stakeholders in order to take account of common policies, resources, and funding streams. The main activity of this subtask is to organise an E&T session at the Radiation Protection Research Workshops organised by MELODI (Munich 2015, Oxford 2016, and Paris 2017 – see www.icrp-erpw2017.com).

The second subtask, under responsibility of INSTTI, is to provide for vocational training for experts as foreseen in the new Euratom BSS directive and to ensure new findings from current research are taken up in training radiation protection experts.

Task 7.5: European integration of junior scientist career development (Lead: HMGU)

This task is led by the Helmholtz German Research Centre for Environmental Health, Munich. There are 5 subtasks. They are:

- Initiate and encourage interaction between CONCERT, the platforms and the EURAYS association of junior radiation research scientists.
- Establish a cross-border network of mentoring for junior scientists based on a selection and mentor-mentee matching Programme.
- Conduct career days for junior scientists during CONCERT meetings, to include meetings with senior scientists, job fair, career advice and networking.
- Hold “Meet the Professor” lunches during international conferences held in Europe (including the IRPA, ERR, ICRR, MELODI and DoReMi meetings), to allow junior scientists contact with leaders in the community from academia and stakeholders, regulators and policy makers.
- Establish the NEWS (north, east, west, south) network to facilitate dialogue between junior faculty members in new and established member states.

4. The E&T priorities of the participating Radiation Protection Platforms

4.1. MELODI (www.melodi-online.eu)

The focus of the MELODI platform is research into the risks from levels of ionising radiation in the region where it is still unclear whether the linear no-threshold model applies, or whether the risks are significantly greater or less than predicted by this model. Significant deviations in either direction would be significant both socially and economically. Less risk if proven scientifically would be of considerable reassurance to the public. More risk would have implications for the justification and optimisation of practices that involve the controlled use of radiation, particularly in the medical area.

MELODI acknowledges that at the relevant level of radiation exposure the incidence of harmful effects can be obscured by the noise in natural occurrence rates, and that to obtain reliable risk estimates requires studies over many years, even decades, employing a wide range of scientific disciplines. This long-term broad-scope process requires management to ensure continuity and cross-fertilisation of all the necessary disciplines. It is precisely this stewardship of the necessary resources of knowledge, skills, and expertise that calls for a strategic programme of education and training specifically designed to ensure a continuing influx of new top-level students into the needed scientific areas.

There are many ways in which E&T can provide support to the low-dose research community:

- Providing entry points for attracting new students into one of the relevant disciplines.
- Supporting students with career development to help them continue in the area
- Integration of university teaching departments with institutions engaged in cutting edge research programmes for the benefit of both
- Providing continuing education for working researchers in order to provide access to new and emerging developments and infrastructures, and to help penetrate the walls of the silos of specialisation
- To provide a conduit for new research results to a wider scientific and operational radiation protection audience in order to raise the profile of the topic of fundamental radiation risk research.

4.2. ALLIANCE (www.er-alliance.org)

The 2014 Strategic Research Agenda for Radioecology identified that the key challenge in E&T was “To maintain and develop a skilled workforce in Europe and world-wide, through university candidates and professionals trained within radioecology” since “Scientific research in radioecology and application of that knowledge in the radiation protection of man and the environment requires scientists and workers with adequate competence and appropriate skills.” The people in need of E&T in radioecology are both students and professionals within research, industry and radiation protection. Radioecology is a multidisciplinary science, requiring teachers from many fields, who need to reach out to students with a range of backgrounds. Being a relatively small science, teachers and students are widely scattered geographically, which leads to the need for intensive courses to minimize costs, and/or online E&T. The COMET (COordination and iMplementation of a pan-Europe instrument for radioecology) project is funded by the EU as part of the 7th Framework programme until May 2017. In order to address these needs, COMET has developed an E&T web platform and arranged a number of courses and workshops for students and professionals. COMET has given refresher courses in conjunction with conferences, field-courses, hands-on training courses and full PhD and MSc courses for international audiences. The most important contribution from COMET is that the courses can draw on expertise from the COMET partner organisations to assemble relevant experts to teach courses as COMET holds the best expertise within radioecology topics. In addition, COMET has been engaged in discussions with stakeholders for more long-term solutions to maintain the sustainability of radioecology E&T after the end of the project. A list of all the courses given by STAR, COMET and the MSc in radioecology is to be found at the Radioecology Exchange website. Despite progress in some areas, many of the challenges

outlined in the 2014 SRA unfortunately remain, mainly due to the lack of sustainable dedicated funding. For example, increasing student and teacher mobility, development of web-based learning tools and distance courses all require sustainable funding mechanisms. Development and implementation of e-learning tools also requires the engagement of experts in digital learning, which has not been possible in COMET due to lack of dedicated resources. Future plans within the ALLIANCE and OPERRA must urgently address this lack of sustainability if radioecological competence is to be maintained in Europe.

4.3 NERIS (www.eu-neris.net)

NERIS is the European Platform on preparedness for nuclear and radiological emergency response and recovery. The mission of the NERIS Platform is to establish a forum for dialogue and methodological development between all European organisations and associations taking part in decision making of protective actions in nuclear and radiological emergencies and recovery in Europe. NERIS has an active programme of education and training covering both the practical aspects of responding to an emergency, and the science basis necessary for making decisions when faced with an emergency situation. In each of the following examples there are opportunities for training students new to the field as well as experienced personnel. Each of the courses of 2017 was assisted by grants from CONCERT Task 7.3.

Preparedness and response for nuclear and radiological emergencies (20-24 March 2017, Mol, Belgium): this training course focused on the early to intermediate phases after a nuclear/radiological accident, and addressed the state of the art in nuclear and radiological emergency management including the international recommendations and the lessons learned from the Fukushima accident. It included principles of intervention; radiological evaluations; decision-support tools; different aspects of planning and organization in off-site emergency response; economic, social and psychological impact.

Late phase nuclear accident preparedness and management (19-23 June 2017, Gomel) The main objective of the course for late phase nuclear accident preparedness and management is to provide principles and practical guidance for the key players involved in the preparedness and recovery of living conditions in contaminated areas in the aftermath of a nuclear/radiological accident. The course offers a comprehensive overview of the various dimensions and challenges of the long-term rehabilitation. It includes also practical elements for the implementation of countermeasures for managing long-term contaminated rural and urban environments, notably through the planning of direct meetings and dialogue with local stakeholders (inhabitants, pupils, local authorities, etc.) living in the areas affected by the Chernobyl accident.

Modelling and measurement (6-17 March 2017, Roskilde, Denmark): The course was aimed at providing the participants with an understanding of how to assess by measurements and modelling the long-term radiological risks from releases to the environment of radionuclides. The course built on decades of international research work, including unique experience from extensive practical investigations in contaminated areas and laboratory assessments. It comprised a hands-on introduction to laboratory measurement techniques including state-of-the-art radiochemistry methods for determination of radionuclides that can not easily be determined. It also included a hands-on decision support modelling session using a state-of-the-art computerised decision support system for nuclear and radiological emergency management.

Analytical platform – scientific methods and tools for information collection and exchange (7-9 October 2015, Trnava, Slovak Republic): The training course was developed providing the necessary information on the Analytical Platform, the scientific methods and tools developed for collecting information, analysing any nuclear or radiological event and providing information about the consequences and its future development. A particular attention was

given to the conditions and means for pertinent, reliable and trustworthy information to be made available to the public in due time and according to its needs in the course of nuclear emergency and post-emergency context.

The main objective was to train participants to use the new tools for the purpose of further active participation in exercises and to use the Analytical Platform as a focal point for collecting information, analysing any nuclear or radiological event and providing information about the consequences and its future evolution.

4.4 EURADOS (www.eurados.org)

EURADOS is a non-profit association, made up of more than 50 European institutions and 250 scientists, for promoting research and development and European cooperation in the field of the dosimetry of ionizing radiation. There are 8 Working Groups focusing on different applications of dosimetry in the fields of occupational, medical, environmental, and public exposure, and also technological development. The policy of EURADOS is not to duplicate or overlap with any other EU projects and international organisations activities, but to promote collaborations in existing international activities. The focus is on radiation dosimetry, which is only one of the various topics of radiation protection. While EURADOS provides education and training it does not test or provide a certificate of competence.

EURADOS activities contribute to education and training through:

- Working Groups: senior and junior researchers work together and for the younger the work within of the WG is itself a learning process mainly for the younger members
- Workshops and training courses sponsored by EURADOS to respond to the need for training in the field of radiation dosimetry and implementation of technical recommendations and/or good practice in dosimetry
- Winterschool: a one-day refresher course held in conjunction with the EURADOS Annual Meeting
- Grant&Award: collaboration and contribution of young scientist in EURADOS WG is promoted; grant support a research stay of young scientists within the WG activities and the grant is a gift for an excellent research scientific work within the activities of an EURADOS working group.
- Support of organization conferences: IM series, NEUDOS series, occasionally support for attendance of young scientists in various international events on dosimetry (e.g. Individual Monitoring series, NEUDOS series),
- Publications: Eurados Reports and European Technical Recommendations in the Radiation protection series through EU project funding (DG TREN) (e.g. EU RP160 "Technical Recommendations for Monitoring Individuals Occupationally Exposed to External Radiation (2009), EU RPXX Technical Recommendations on Internal Dosimetry, in press)

4.5 EURAMED (www.eibir.org/scientific-activities/joint-initiatives/european-alliance-for-medical-radiation-protection-research-euramed)

The EURAMED platform was formed in 2016 to jointly improve medical radiation protection through sustainable research efforts, and is made up of the five medical societies involved in the application of ionising radiation (European Association of Nuclear Medicine, EANM; European Federation of Organizations for Medical Physics, EFOMP; European Federation of Radiographer Societies, EFRS; European Society of Radiology, ESR; European Society for Radiotherapy and Oncology, ESTRO). The platform has identified research areas of common interest and developed the first edition of the Common Strategic Research Agenda (SRA) for medical radiation protection. The SRA identifies two areas where sportive E&T is needed: education of staff to gain greater awareness and competence in dealing with radiation protection issues, and education of researchers.

Education of researchers is essential to provide the expertise for carrying out the investigations and development identified in the SRA. This includes the aspects of research

methodology particularly required in medical research. This especially holds true for research working with humans or biological material, but also with any data related to humans. There needs to be a programme of training reflecting the actual state of the art for research procedures, with the goal of fostering the efficiency of projects reflecting the research topics identified above especially in terms of optimal patient care and radiation protection.

In this respect it is important to deal with best practice regarding:

- literature and citation practices;
- statistical power of investigations;
- uncertainty budget calculation of measurements and calculations/simulations;
- clear hypothesis-driven project definition;
- pre-research feasibility estimates of proposed outcomes.

4.6 Social sciences and humanities

The SSH do not have a platform dedicated to radiation protection, but there are activities in CONCERT that explicitly engage expertise in this area. Input and comments from the SSH are actively encouraged in Workpackage 2 where the platform Strategic Research Agendas are developed and research priorities identified. Also, Workpackage 5 is concerned with development of dialogue with stakeholders, and this is an area where topics such as risk perception and the ethics of accepting risk as part of the use of radiation must be considered. There is a provision for courses in this area within CONCERT Task 7.3. One of the suggested course topics is “Risk governance and stakeholder dialogue”.

5. Conclusion

The CONCERT European Joint Programme is providing co-funding support and coordination for the European programme of research into radiation protection, in collaboration with the platforms MELODI, ALLIANCE, NERIS, EURADOS and EURAMED. As well as supporting research, the EJP has integrative activities designed to facilitate and develop EU research capability and resources in the area of radiation protection. One of the integrative activities is carried out by Workpackage 7, which provides a programme of support and integration of E&T initiatives in the radiation protection research area. The Workpackage provides encouragement for new students to enter the topic area by awarding grants to present at conferences and to go to training courses, and also sponsors short courses in topics relevant to the RP platforms so that students can be offered attendance at no cost.

CONCERT will run until 2020 and is providing a valuable point of entry for new researchers, and a source of continuing education, dialogue, and collaboration for the present research community.

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