Institution: University of Salford

Unit of assessment: UoA5 Biological Sciences

a. Overview: The **School of Environmental and Life Sciences** is committed to an active research base with links to both undergraduate and post-graduate training. Approximately 70% of academic staff are fully research active and returned under REF units (UoA3, 5, 17). In the RAE 2008 UoA12 Allied Health Professions and Studies included Salford`s life sciences research embedded in Centres for Parasitology and Disease, Molecular Drug Design, and Biophysics, located within the School. In 2010 the School re-aligned its research activities into two centres: a **Biomedical Research Centre**, and an **Ecosystems and Environment Research Centre**, to promote inter-disciplinary collaboration, engagement and enterprise between life sciences, environmental sciences and geography. Another advantage is a clearer alignment of research with graduate and post-graduate education. Research centres and their leads are recognised as formal administrative roles within the College of Science and Technology (CST). Cognate areas of research in the Biomedical Research Centre include: cancer therapeutics and drug design, inflammatory disease, and infectious diseases. Research in the Ecosystems and Environment Research Centre is broadly focussed in the areas of: ecology of infectious diseases, molecular ecology and conservation, systems ecology and ecosystems services, and landscape dynamics (research in the two latter areas will be returned in UoA17 for REF2014). A total of 26 academics (**Cat A 24.2 FTE**) and **3 Cat C** NHS staff are included in the current UoA5 return.

b. Research strategy: With the appointment of Professor Judith Smith as Head of School in 2010 and the strategic appointment of new academic staff since 2010, this enhanced capacity will contribute to the medium (5 years) and long-term strategy to build on our niche research areas. Those areas include **disease ecology and infection** (especially protozoan, helminth and bacterial zoonotic infections) and molecular epidemiology with collaborative applied research directed in field sites/communities in resource-poor regions in Africa and Asia. Another is **molecular ecology and conservation** (focussing on species of arthropods, fish, amphibians and mammals) with active studies in UK, Europe and the tropics and an increased emphasis on conservation genetics. The biomedical research focus in **cancer therapeutics, drug design**, **immune response,** also inflammatory disease and associated pathologies, will seek to expand regional clinical research links over the next 5 years that include Salford Royal NHS Foundation Trust and the Paterson Institute for Cancer Research. These research areas will be prioritised for post-graduate support and College/School research funds. Research active staff will typically supervise up to 5 PhD students and can apply to CST for research funding support in the form of consumables, equipment bids, travel etc. Professional Development Review and associated work load balancing at School level will reward academic staff for good research performance taking into account publications, grant bidding and awards, as well as PhD supervision. The School has an active enterprise presence which has included an on-campus spin off drug development company *Onco-NX*, and *Cestode Diagnostics* engaged in parasite sample identification/screening. *Salford Analytical Services* also operates as a service for biomaterials and environmental sample analysis.

Research areas, highlights and objectives

Disease ecology and infection (*Birtles, Bown, Craig, Foster, Hide, James, Nirmalan, Rogan, Smith*) (abbreviation in *section e*: RB, KB,PC, HF, GH, CJ, NN, MR, JS).

This group has a major focus on the ecology of parasitic and microbial pathogens (primarily zoonotic) and the epidemiology of the infections of medical and veterinary importance across Europe and around the world, especially resource-poor regions. Our studies focus on parasitic zoonoses associated with echinococcosis, cysticercosis, African trypanosomiasis,

toxoplasmosis, and tick-borne pathogens (including *Borrelia burgdorferi*). Diagnostic and molecular markers have been developed for studies on transmission ecology, population genetics and biodiversity of the pathogens and for epidemiological, clinical and surveillance purposes. Collaboration with GIS experts within the School have further enhances our capacity in these fields.

Prof **Craig** leads a research team working closely with Prof **Rogan**, on immunobiology, diagnosis, epidemiology and transmission ecology of cestode zoonoses (currently funded by Wellcome Trust). Profs **Hide** and **Smith** have significant expertise in molecular epidemiology of trypanosomiasis and toxoplasmosis with emphasis on practical application of novel molecular markers to help understand animal –human transmission patterns. The recent appointments of Prof **Birtles** and **Bown** and **James** has strengthened considerably not only our expertise in protozoan and bacterial vector-borne pathogens (particularly tick-borne), but also in parasite/pathogen community ecology and host biodiversity interactions. **Nirmalan** has significant expertise in developing novel quantitative proteomic and mass spectrometric methods for malaria and is currently working on repositioning patent expired drug libraries for use as anti-malarials. Prof **Foster** has assessed the biocide potential of inorganic surfaces against antibiotic resistant *E.coli* and other ubiquitous bacterial pathogens associated with hospital-acquired infections, and has quantified the effects of antimicrobial agents on dental plaque development and composition *in vitro* and in children.

Research highlights:

- Prediction modelling of geographical hotspots of echinococcosis transmission in Wales and western China (**Craig**).
- Development of first species specific coproantigen ELISA for human *Taenia solium* taeniasis (**Craig**).
- Highlighted impact of vertical transmission of *Toxoplasma* on sheep farms UK (**Hide**).
- First demonstration of concurrent discrete enzootic cycles for tick-borne pathogens, and demonstration of the importance of previously overlooked hosts in the maintenance of ticks and tick-borne pathogens (**Bown, Birtles**).
- Discovery that only few, rare genotypes of *Bartonella henselae* are associated with zoonotic infections (**Birtles**).
- Use of high throughput sequencing to generate whole genome SNP map to assess diversity and recombination in a eukaryotic pathogen *Toxoplasma gondii* (**Smith**).
- First annotated proteome map and first stable isotope-based quantitative proteomic labelling method for *Plasmodium falciparum* (**Nirmalan**)**.**

Main objectives and research activities over next 5 years: We will enhance our international standing as a centre of excellence for research and training in zoonotic disease, through targeted research bidding and recruitment of academic staff and early career researchers. Our research will establish the influence of environmental factors such as landscape, climate and host biodiversity on the transmission of zoonoses with the aim of devising ecologically smart approaches to control. More specifically we will:

- Model optimal intervention for the control of echinococcosis in resource poor endemic pastoral communities.
- Investigate the epidemiology of *Echinococcus* species in the UK and globally through our International OIE/DEFRA Reference Laboratory.
- Enhance our international prominence as a centre for the study of the ecology of tick-borne pathogens and the epidemiology of the diseases they cause.
- Establish a large scale collaborative study on biodiversity and zoonotic risk in a peri-urban setting.
- Launch new research initiatives focused on the dynamics and determinants of enteric

and respiratory bacterial pathogen persistence in environmental niches.

Molecular ecology and conservation (*Benvenuto, Boubli, Jehle, Mariani, Martin, Young*) (abbreviation in *section e*: CB, JB, RJ, SM, SJM, RY)

This research cluster primarily focuses on evolutionary and ecological mechanisms at the basis of biodiversity, and endeavours to use this knowledge to help preserve endangered species and populations and sustainably manage exploited living resources. Research tools include molecular genetics & genomics, gene expression, behavioural analysis, biometry, and ecological and interdisciplinary approaches, to understand the implications of evolutionary processes for biological conservation and management. Different levels of biological organisation are investigated, using several animal taxa as study systems, including bony fish, elasmobranchs, amphibians, mammals, insects, molluscs and crustaceans. Research activities have direct impact on important global productive processes (i.e. fisheries, forestry, agriculture, hunting, oil and gas exploration), as well as key conservation strategies (urban wildlife, zoos, natural parks and reserves).

Prof **Mariani** leads a new conservation genetics unit that primarily focuses on population identification of marine fish, seafood forensics and monitoring, landscape genetics, and adaptation and macroecology. **Jehle** focuses on spatio-temporal population structure of pond-breeding amphibians using field ecology and DNA fingerprinting, and investigates reproductive strategies and success, using molecular markers. Mating systems are also central to **Benvenuto**'s (new appointment) research programme, which uses behavioural, physiological and genetic techniques to address phenomena such as sex determination, sex allocation and intersexual conflict. Other new appointments: Prof **Martin** has led a highly successful long-term programme of study on the pests and pathogens of honeybees, in particular the *Varroa* mite and its association with viral pathogens that have caused world-wide loss of millions of honeybee colonies. Prof **Young** and **Boubli** spearhead modern practical wildlife conservation with a focus on biodiversity-rich regions facing encroachment of rapidly-expanding human populations (e.g. Brazil). Prof **Young** is also assessing the fitness of captive (zoo) animals to be used in successful reintroduction programmes, and **Boubli** is addressing biogeographical patterns in neotropical primates, aligning also with **Jehle**'s programme on molecular ecology of tropical vertebrates.

Research highlights:

- First genetically-validated demonstration of cod mislabelling in Europe (**Mariani**).
- Re-definition of stock assessment units for several important fisheries in the North Atlantic (**Mariani**).
- Discovery that a flagship vertebrate for wetland conservation (great crested newt) is a native to the Scottish Highlands (**Jehle**).
- Reassessing the phylogenetic relationships of New World Primates and testing hypothesis in Amazonian Historical Biogeography using molecular data (**Boubli**).
- Defining the behavioural relevance of call systems in primates (**Young**).
- Revealing mechanisms which contribute to the global collapse of honeybees (**Martin**).
- Demonstrating the precise chemicals involved in ant nest-mate recognition (**Martin**).
- Employing mixed mating system models to study intersexual conflicts and sex chromosome evolution (**Benvenuto**).

Main objectives and research activities over next 5 years: We will expand our developing research niche in biodiversity and conservation, in alignment with the Convention of Biological Diversity's global research priorities through extension of our current strong collaborative international network in Europe, South America (especially Brazil) and North America. We will combine phylogenomic, ecological, spatial and behavioural analyses to understand the

distribution and sustainability of species and conduct empirical studies into the mechanisms underpinning population structure and stability. Specifically we aim to:

- Become an established, international reference point for studies of genetic identification and molecular characterisation of wild fishery-supported seafood trade.
- Establish an international consortium project focused on monitoring and maintaining diversity in rainforest ecosystems.
- Explore the potential of acoustic monitoring for analysis of biodiversity and behaviour.
- Unveil genomic and epi-genomic mechanisms underlying chemical communication in social insects.
- Investigate the impact of sex change in wild populations.

Cancer- therapeutics, drug design, immune response (*Allen, Aziz, Bisby, Elkord, Ferry, Krstic-Demonacos, Hadfield, McGown, Ragazzon, Smyth;* abbreviation in *section e*: JA, AA, RB, EE, NF, MKD, JH, AM, PR, LS; *plus 3 Cat C NHS scientists- Carlson, Warhurst, Ammori*)

A major focus of the group is to develop new and improved treatments for cancer particularly paediatric cancers. This involves understanding those processes involved in the development of cancer, uncovering differences between tumour cells and normal cells and developing novel treatment strategies designed to exploit these differences to give maximal anti-tumour effect whilst reducing treatment side effects. The approach is to integrate laboratory based studies in molecular and cell biology, immunology, medicinal chemistry and pharmacology with clinical research. This approach is also taken in the study of immune response to infection and fibrosis.

Prof **McGown** leads the cancer therapeutics team that together with **Hadfield** has developed novel prodrugs that are activated selectively in tumours over-expressing DT-diaphorase and offer the promise of increased selectivity and improved therapeutic indices over current therapies. Combined with the photochemical expertise of Prof **Bisby** a new therapeutic approach is utilised whereby an inactive prodrug is converted by light to produce a vascular disrupting agent (VDA). This novel form of photo-surgery has the potential to treat both cancer and other vascular proliferative diseases such as macular degeneration. The appointment of **Ragazzon** -has further extended therapeutic targets to include quadruplex DNA and apatmers, both of which have application in both cancer and infection. Elucidating mechanisms of gene regulation in cancer biology has also been enhanced by the appointment of Prof **Krstic-Demonacos**. The applied immunology group are investigating the role of the immune system in cancer progression (**Elkord**), erythropoiesis (**Aziz**), infection, inflammation and fibrogenesis (**Allen**, **Smyth, Warhurst, Carlson**) and chronic obstructive pulmonary disease (**Smyth**). The role of natural products in the treatment of disease is a collaborative research focus (**Ferry**, **Hadfield**, **Ragazzon**).

Research highlights:

- Development of Es5 a novel antitumour agent to a stage ready for clinical trial (**McGown** and **Hadfield**).
- Development of light activated VDAs (**Bisby**, **Hadfield**, **McGown**) for novel photo-surgical approaches to treatment of cancer and macular degeneration.
- Demonstration that Treg infiltration of tumours is correlated with a lack of responsiveness to therapy (**Elkord**).
- Predictive modelling of the response to cancer therapy (**Krstic-Demonacos**).
- Identification of natural products with anti-protozoal, anti-microbial and anticancer properties (**Ragazzon**, **Ferry**).
- Clinical trial of an electrochemical device designed to determine response of colon cancer chemotherapy (**Carlson/Warhurst**).

- Elucidation of epigenetic control during haematopoietic differentiation (**Aziz**)
- Identifying the importance of connective tissue growth factor (CTGF) expression and remodelling events in patients with lung fibrosis (**Allen**, **Smyth**).

Main objectives and research activities over next 5 years: We will build on translational aspects of our research through earmarked clinically focussed appointments maintaining our focus on the development of novel therapeutic agents and on understanding the mechanisms which underpin disease progression to inform and improve treatment regimens. Specifically we aim to:

- Develop novel cancer agents and therapeutic approaches.
- Develop novel anti-microbial agents.
- To progress agents to clinical trial.
- To investigate the role of Tregs in cancer and lung fibrosis.
- Evaluation of differences in epigenetic complexes in malignant vs non-malignant cells in myeloid lineage.

c. People:

i. Staffing strategy and staff development: Since the RAE 2008 return, 18 new academic posts have been appointed in bioscience (6 of whom are Professors in areas of parasitology, microbiology, biomedicine, marine ecology, entomology, tropical ecology; 5 lecturer/SL and 7 early career) to develop and strengthen our research base in disease ecology, molecular biomedicine and molecular ecology/conservation. All members of staff are positioned within one of the two Research Centres in the School of Environment and Life Sciences. In 2010, the University was one of only 10 institutions recognised by the European Commission for its work in supporting the professional development of its researchers, and meeting a concordat to support career development of research staff. In addition, the researcher development opportunities offered at Salford played a significant role in retaining the European Commission HR Excellence in Research Award in October 2012.

The research workload for staff members is set by the Schools based on a regular unified Performance Development Review which includes research activities as part of overall academic workload. Objectives for these reviews are set within the University's Academic Career Path descriptors, which provide graded expectations for academic staff by career progression. All staff are eligible to apply for research leave after seven semesters of normal service and shorter (3month) periods are negotiated under the discretion of the School. An annual opportunity exists for review against the Academic Career Path criteria, either for HERA to Senior Lecturer (in the case of Lecturers), or for promotion to Reader / Professor by the University Professorial Promotions Committee. External researchers are linked to activity within the School through the University's Visiting Research Fellow and Visiting Professor schemes (eg. Profs Warhurst, Carlson and Ammori).

Research training and development is included within the staff induction programme. This includes a portfolio of courses on research skills, funding and publication but also on research ethics and equality and diversity. There are University-wide staff schemes, such as the Vice-Chancellor's Research Scholarship to support early career researchers and members of staff new to research. Training is provided to all PhD supervisors as part of improving supervisory skills and to update all staff on new regulations.

ii. Research students : Postgraduate students form an important part of our research community. The University-wide Graduate Teaching Studentships which funds PhD studies and provides training for teaching has funded 18 PhD students during the review period; we

have also utilised external funds to provide studentship opportunities. In building our research capacity we are increasing our PGR provision and since 2011 have recruited 52 PhDs into Environment and Life Sciences. All students present an outline research project and are interviewed by a panel of academics prior receiving an offer. Postgraduate research supervision is supported by a supervisory team with dual supervision and a Personal Tutor for each candidate. Postgraduate Research Representatives are elected from the student body and work closely with academic staff, and sit on College and School committees.

All PGR students in the Research Centres complete their doctoral studies under the University regulatory framework for progression. Students are required to meet three formal points in their studies in order to proceed, a Learning Agreement (3 months); an Interim Assessment (within 12 months) and an Internal Evaluation (within 24 months). These are accompanied by monthly supervision records, annual progress reports by supervisors and student self-evaluation documents, which are scrutinised by the College Research and Innovation Committee. An Independent Chair oversees the viva process. During the REF assessment period 29 PhD students successfully completed their studies.

We implement a formal Learning Agreement between the PGR student and the University, allowing the optimisation of student experiences and expectations, and have close links with the North West hub of Vitae. All PGRs contribute to the School ELS Research Centre seminar series and the University also runs the Salford Postgraduate Annual Research Conference (SPARC) where students and early career researchers across the disciplines can present their research and gain feedback. ELS students are further expected to present annually at relevant external national and international research meetings. The aim of the programme is to assist researchers in developing effective research skills as well as transferable skills to enhance employability. The programme maps fully onto the national Researcher Development Framework (RDF). Within the College, a specialist adviser on PGR careers is available. In the last internal Postgraduate Research Satisfaction Survey (2013), PGR students recorded an overall Satisfaction Score of 92%.

d. Income, infrastructure and facilities

Research laboratories for molecular biology, microbiology/parasitology and cancer research were refurbished in 2005 (~1000 m2 in Cockcroft Bdg) and during 2009-10 a further £728K was used (SRIF) to upgrade laboratories in areas of drug design, tissue cell culture and microbiology. This has helped to attract 18 new academics since 2008. Investment has resulted in new pathogen suites for P3 and P2 containment and enabled the re-equipment of these laboratories, including a state of the art flow cytometer, an ELISA work station, robocyclers and a genotyper. Research student capacity in ELS has increased since 2008 and the current PGR number is 60. A dedicated academic oversees PGR recruitment, monitoring and milestone tracking.

Research in the School has been supported by external research income including from the following sources: Wellcome Trust, BBSRC, NERC, MRC, STFC, EC/FP7, NIH (USA), Cancer Research UK, Royal Society, GlaxoSmithKline (total income expenditure £1.55 million since 2008). *Key grants* include: £462K from the Wellcome Trust (*PI* ***Craig***) for a project on transmission of echinococcosis (2011-14); £117K from BBSRC (*PI* ***McGown***) for tissue models (2008); £196K from EC Interreg/DEFRA (*PI* ***Mariani***) for genetic control of fish and seafood labelling; £241K from Science and Technology Facilities Council, Central Laser Facility for free-radical studies (*PI* ***Bisby***). The Charity Kidscan contributes to 50% salary of Prof McGown.

The University manages research governance through a Dean of College of Science and Technology (also PVC for Research) which has dedicated administrative support for PGRs and research tracking, and in addition there is a separate campus Research Office for

management of external grants including an EU funding expert. The School of Environment and Life Sciences (ELS) has an Associate Head responsible for Research and Innovation (AHR), and they sit on the School Executive and are a member of the College Research and Innovation Committee (CRAIC). The two ELS research centre directors (Ecosystems and Environment; Biomedical) are responsible for research development and strategic initiatives and meet with the AHR and through a School Research Committee that distributes strategically or competitively any central research funds available. The CRAIC also has small grants available competitively for research support especially for pump-priming newly appointed staff.

e. Collaboration and contribution to the discipline or research base

National and international collaboration is strong and a prominent feature of much of the research in the School of Environment and Life Sciences. This includes other UK universities and research institutes, and also Institutes across Europe, and in North America, Latin America, Asia, Australia, Middle East and Africa. Staff make contributions through joint research grants, visiting professorships, academic exchange, joint publications, invited lectures and research meetings/workshops. Contribution to the discipline has also taken place through Advisory Panels, Peer review committees and grant reviews, Awards/fellowships and Journal Editorial Boards.

External collaborations: UK- Universities of Liverpool (*RB, KB, CJ, PSC, SM, PR,JS*), Manchester (*AM, MKD, GH, NN, RY*), Sheffield (*RJ, SJM*), Newcastle, Durham (*NF*), Nottingham (*MR*), Keele (*SJM*), Bristol, York (*CJ*), Imperial College (*RJ*), Oxford (*AA*), Leeds (*NN, JS*), Aberdeen (*KB*); Glasgow (*PC*), and Edinburgh (*GH*); Manchester Metropolitan University (*PR*); Salford Royal and Aintree Hospitals (*JA, EE, AM, LS*), Paterson Institute for Cancer Research(*AM, EE*), Natural History Museum London (*RJ,JS*), Central Laser Facility Rutherford Appleton Laboratories (*RB, JH*), National Oceanographic Centre Southampton (*SM*), Institute of Zoology London and Scottish Natural Heritage (*RJ*); Pirbright Institute (*KB, RB*), Welsh Assembly Govnt (*PC*), Protein Technologies Ltd *(NN)* . **Europe-** University College Dublin (*SM*), CIIMAR University of Porto (*CB*), Universite de Franche-Comte, University of Zurich (*PC*), Universities of Basel (*RJ*), Aix Marseilles (*CJ*), Jyvaskyla Finland (*KB*), and Helsinki (*SJM*), Universities of Vienna, Salzburg, and Bergen, also Museum Naturalis, Leiden (*RJ*), University of Athens (*MKD*), Danish Technical University (*SM*), Universite de Neuchatel and University of Urbino (*RY*); INRA France (*RB, PC*), Agroscope Reckenholz Research station Switzerland (NF). **North America-** Princeton (*PC*), Universities of Seattle, Stanford, Oregon State, Montana, Massachusetts, University of Wisconsin-Madison (*RY*), University of Calgary,and UBC Vancouver (*SM*), University of Louisville (*PR*) and Hawaii (*SJM*). USDA Beltsville (JS) **Latin America-** Universidad Peruana Cayetano Lima and UNAM Mexico (*PC, JS*), University de los Andes Colombia (*RJ*), University of Chile (*MKD, PC*), in Brazil Federal University of Sao Joao del Rei, Federal University of Minas Gerias, Federal University of Rio Grande do Norte, University of Vila Velha (*RY, JB*); **Asia-** In China, Xinjiang Medical University (*PC, MR*), Ningxia Medical University, Sichuan Center for Disease Control (*PC*); Sun Yat-Sen University, Anhui Medical University, and Lanzhou Veterinary Research Institute (*GH*), Institute of Plant Protection Chinese Academy of Agricultural Sciences (*NF*), China West Normal University (*RJ*); in Japan, Asahikawa Medical University (*PC*), Osaka University (*CJ*) and Kobe University (*SJM*); Seoul National University and Indian Institute of Technology Roorkee (*MKD*). **Australia-** Queensland Institute of Medical Research, and Charles Sturt University (*PC*), University of Queensland (*RY*). **Middle East/N.Africa-** Al-Ain University UAE (*EE*)**,** Al-Fateh University Libya (*HF*), Ecole Nationale de Medecine Veterinaire Tunisia (*PC*). **SSAfrica**-National Institute for Pharmaceutical Research and Development Nigeria, Makerere University Uganda (*NN, JS*), and AMREF Kenya (*MR, PC*).

Advisory panels/committees:

- **Bisby:** Member Science & Technology Facilities Council- Central Laser Facility; member EPSRC College.
- **Craig**: Member WHO Neglected Tropical Diseases (NTD) working group on Neglected Zoonotic Diseases (2005-2012); Chair- WHO Informal Working Group on echinococcosis (2003-2011); World Animal Health (OIE) Reference Laboratory on echinococcosis (from 1999); CNRS (France) member Scientific Management cttee (2013-) Ecosystem health and environmental disease ecology.
- **Jehle**: Council Member, British Herpetological Society (2009-); Council Member, Tropical Biology Association (2007-); Executive Committee Member, World Congress of Herpetology (2008-)
- **Mariani**: Chair of the ICES Stock Identification Methods Working Group (SIMWG: http://www.ices.dk/community/groups/Pages/SIMWG.aspx).
- **Martin**: International Bee Research Association (2008-); DEFRA Honeybee cttee (2011-) and Pollinators Advisory Group(2013-)
- **Smith:** NERC Panel of Chairs (2009-), NERC review of postgraduate training (2010) Executive committee member, Heads of University Biosciences (2012-); Vice President, British Society for Parasitology (2012-13).

Peer-Review processes: Birtles INRA Scientific Review Panelist (France); BBSRC and NERC reviewer. **Craig** member of Infection and Immunity funding Panel, Wellcome Trust (2007-11); Ecology and Evolution of Infectious Diseases funding Panel, National Science Foundation USA (2013);reviewer for NIH, MRC, EU, DFG (Germany). **Elkord** grant reviewer for MRC, Wellcome Trust, Qatar Foundation. **Foster** reviewer of grants for Swiss National Science Foundation. **Hide** reviewer for BBSRC, MRC, Wellcome Senior Fellowship Scheme. **Jehle** member Wilhelm Peters Fund of German Society of Herpetologists. **Krstic-Demonacos** reviewer for MRC, Wellcome Trust and CRUK. **Mariani**: reviewer for BBSRC, US National Oceanographic and Atmospheric Administration (NOAA) National Marine Fisheries Services section, the Academy of Finland, the Flanders Research Foundation (Belgium), the Agence Nationale de la Recherche (France). **Martin** NERC peer review college member. **Rogan** Reviewer for MRC, Wellcome Trust and British Council. **Young** reviewer for Conselho Nacional de Desenvolvimento Cientifico e Tecnologico (CNPq Brazil).

Awards/fellowships: Bisby Fellow Royal Society of Chemistry (2011); **Boubli** Alexandre von Humboldt Fellow (2012); **Craig** Medal of the International Association for Hydatidology (2011); Sichuan Jinding Prize for Foreigner contribution to Public Health (2008); **Hide** Fellow of Royal Society of Medicine (2008); **Martin** OECD Research Fellowship to Hawaii (2010); Furosato Award from Japanese Society for Promotion of Science (2008). Fellow of the Royal Entomological Society (1985); **Rogan** Certificate of Merit - International Association for Hydatidology (2011); **Young** Scientific Productivity Fellowship from CNPq Brazil (2013-17).

Journal Editorial Boards: Craig (*Experimental Parasitology*, *Journal of Helminthology*); **Elkord** (*World Journal of Gastroenterology*, *Clinical & Developmental Immunology*, *American Journal of Immunology*, *Advances in Medicine (Immunology)*; **Hadfield** (*Conference Proceedings in Oncology*, *International Journal of Medical Engineering and Informatics*); **Hide** (*Parasitology*, *Parasites and Vectors*, *Clinical Epidemiology*); **Jehle** (*The Herpetogical Journal*-Chief Editor, *Animal Conservation*); **Krstic-Demonacos** (*Global Journal of Breast Cancer Research*, *Oncology Reports*); **Mariani** (*Frontiers in Ecology and the Environment* – Guest Associate 2012); **Martin** (*Applied Environmental Microbiology*, *PlosOne*, *Chemoecology*); **Nirmalan** (*Proteomics:Clinical Applications*); **Ragazzon** (*FEBS letters*, *Spectrochimica Acta*); **Rogan** (*Parasite Immunology*);**Young (***Applied Animal Behaviour Science*).