Institution: University of the West of Scotland

Unit of Assessment: 3

a. Overview

The Mission of the University of the West of Scotland (UWS) is to provide distinctive higher education supported by excellent research and knowledge exchange. The research landscape of the University reflects an organizational commitment to grow research capability and capacity. A strategic investment of £3.8million supports an ambitious academic development programme. The creation of 70 new academic posts across UWS (including 14 Professors), strategic partnerships with universities, practice and industry, and the formation of synergistic research institutions provide a vibrant and outward facing research community. The ***Institute of Biomedical & Environmental Health Research (IBEHR)*** is instrumental in developing an integrated and dynamic biopsychosocial approach to research in biomedical sciences, healthcare and living environments. Programmatic research has advanced through strategic links with partner universities and major investment in 10 new academic posts. The new research posts include 1 Professor and 9 Lecturers, and complements an existing staff base led by 5 Professors and supported by 3 Postdoctoral Research Fellows/Assistants, 3 Research Assistants, 91 PhD students and 6 Research Technicians during the assessment period. This submission includes 13 interdisciplinary academics who produced **180 peer-reviewed research journal articles since 2008, gaining 1477 citations**, including in top-rated biomedical/health journals. These publications include collaboration with University NHS hospitals and/or medical schools, Independent Care Homes, and are recognised by reciprocal visiting appointment with the Universities of Glasgow, Strathclyde, Newcastle, Lisbon and Hamburg. Research has been supported by £**3.35 million** of external funding, including from prestigious sources: BBSRC, EPSRC, NERC, AHRC, EU, CSO, Wellcome Trust, Arthritis Research UK, Carnegie Trust, Alzheimer's Society, McMillan Cancer Research, Cunningham Trust, Royal Society, Leverhulm Trust, Tenovus and industry).

b. Research strategy

The UWS research strategy is focused on applied and near market research that can be exploited by key partners in industry, commerce, government, and the professions for economic and societal benefit. The university has committed to research characterised by its strong scientific and theoretical base, interdisciplinarity and relevance to policy and practice. This is enhanced through investment in development that incrementally builds on areas of teaching and research excellence. This addresses feedback from RAE 2008, by providing more integrated research-teaching linkage. Formation of Institutes, Centres and research groupings, relevant to the stage of evolution, is enabling growth of a vibrant and inclusive research community.

These innovations are supported by plans for increasing research collaboration across the University, and beyond, and further development of research infrastructure. As part of organisational restructuring (2011/12), UWS is investing £1million per annum to accelerate growth and cultivate researcher development and innovative inter-faculty and inter-university (Hamburg) partnerships. Sustainability, growth and embedded researcher career pathways are key components of the UWS staffing strategy, with a short term focus on early researcher careers.

The overarching strategy and priority is establishment of world class multi-disciplinary Institutes with capability to translate discoveries from the laboratory to human environment and healthcare studies in areas of national and international importance. Implementation of research strategy and governance is overseen by the University's Research and Knowledge Transfer Board, with sub committees including a Graduate School Board and Subject Development Groups, which in combination ensure sustainability and the integration of research with teaching and learning.

The ***Institute of Biomedical and Environmental Health Research*** (***IBEHR***) builds on strengths in biomedical, human environment and nursing research, and is formed around research groupings successful in RAE 2008: the ***Centre for Musculoskeletal Science***, the ***Centre for Environmental Research*** and a newer grouping focused on ***Healthcare Policy and Practice***. Nursing & Midwifery (not returned in RAE 2008) has benefited from membership (2005-2011) of the former NMAHP research consortium known as HealthQWest.

IBEHR combines biomedical science and applied research that examines human health and disease in relation to the living, healthcare and public health environments. Researchers work mainly within one group with a demonstrable collaborative trajectory towards development of novel research programmes on humans, health and disease, and their environment, and importantly the interaction of one upon the other. For example the combined expertise of **Drs Williams**, **Butcher**

and **Professor Tolson** enables research at the interface of *IBEHR* microbiological research programmes centred on microbiome and its key importance in various diverse but relevant model environments e.g. hospital wards, the oral cavity and soil, sewage etc. A landmark discovery for patient safety within the acute hospital environment has been the demonstration of the differentiated prevalence of healthcare associated infections among hospital inpatients aged 65 years and older compared to younger patients. Future *IBEHR* plans respond to the high level drivers of human health and disease, ageing and later life conditions, drug design & discovery and health impacts of environmental systems and their management.

The ***Centre for Musculoskeletal Science (CMS)*** derives from the core research group that was rated at 70% internationally-recognised research excellence in RAE2008, 15% as world-leading. Arthritis is an identified area of intensive research due to the considerable costs of this common disabling condition. Issues relating to existing therapies for rheumatoid arthritis concern cost and toxicity, as well as non-responsiveness in some patients, whereas there is still no effective treatment for osteoarthritis, this being recognised as a major unmet need. CMS is a formalised inter-institutional research collaboration led by **Professors Lockhart** (UWS) and Ferrell (Glasgow) linking externally with the Centre for Rheumatic Diseases (Glasgow Royal Infirmary) and the Institute of Immunity, Infection and Inflammation (University of Glasgow College of Medical, Veterinary and Life Sciences), with association to the Strathclyde Institute of Pharmacy & Biomedical Sciences. As a close collaboration between bone and cartilage physiologists, pharmacologists, immunologists, geneticists and clinicians, CMS provides a thriving scientific community directly linked to a clinical setting. **Professor Bank's** applied research on musculoskeletal disorders involves collaboration with the Scottish Muscle Network, the Scottish Dementia Clinical Research Network, and psychological medicine at the University of Glasgow. New dimensions to the expertise base have been introduced by the appointments of **Drs Litherland** (Cartilage/Matrix Biologist), **Crilly** (Immunologist) and **Rai** (Cell Biologist), enhancing existing capability of the University's arthritis-related research programmes. This critical mass of staff collectively work within facilities at the Universities of the West of Scotland, Glasgow and Strathclyde, for the combined investigation of joint disease at molecular, cellular (*in vitro*) and systems (*in vivo*) levels, for development and evaluation of anti-inflammatory drugs, and the identification of novel therapeutic targets for arthritis.

The ***Centre for Environmental Research (CER)*** derives from a core research grouping rated at 65% internationally-recognised research excellence in RAE2008. CER integrates chemists, biologists, with earth, waste and environmental scientists. Research covers mobility of potentially toxic agents in solid and liquid systems through to organism-environment interaction in terrestrial and aquatic media. The focus on human health risk assessment relates to waste and resource management and ecotoxicology, with links to international policy, environmental regulation and feedback on public and environmental health. The societal impact of this research is evidenced by the Gagnon / **Hursthouse** collaboration. CER includes three recently appointed microbiologists (**Drs Menzies, Williams, Butcher**) at the environment/biomedical interface and two chemists. Research led by **Professor Hursthouse** focuses on maternal health, microbiological systems and in intercellular drug delivery/transport mechanisms. This relates to the issues of environmental stressors on human health, and ongoing research into environmental impact on maternal health is supported by the appointment of **Dr Menzies**, who has expertise in reproductive and maternal health/fertility. Integration of environment with social and medical sciences has provided a holistic approach to studies on micronutrients in maternal health with nutritionally deprived communities in Malawi. This insight derived from an award to **Professors Taylor** (submitted in UoA22) and **Hursthouse**, arising from a RCUK Environment and Human Health (NERC) initiative to fund a study on micronutrient dynamics. The appointment of **Drs Williams** and **Butcher** enables focus on the response of microbial populations to environmental stress utilising the response for bioremediation strategies and in harvesting potentially valuable organisms and materials for new biomedical applications. This links directly with a long-term collaboration with Dr Silva-Periera, (Lisbon) on environmental microbial interactions in disturbed soil systems. A third activity strand relates to intra-cellular transport of e.g. metallic nanoparticles, presenting novel techniques for drug delivery. The appointment of **Drs Brucoli** and **Yaseen** brings expertise in physical and medicinal chemistry to investigate and develop biopolymer and drug delivery systems, linked to short range migration properties of e.g. metallic elements.

The ***Healthcare Policy and Practice Research Grouping (HPP)*** integrates directly into

IBEHR to strengthen the healthcare and practice environment dynamic, central to the future development of *IBEHR* programmatic research. **Professor Banks,** formerly a UWS HealthQWest researcher, focuses on the impact of musculoskeletal and neurological conditions, and learning disability, on the lives of people. **Professor Snowden's** studies investigate the impact of agreement within health consultations particularly within the field of mental health and medication management, but also extending into cancer and palliative care. Recently appointed **Professor Tolson** focuses on understanding and managing common later life conditions and syndromes which increase risks to the person arising from their living/care environment. Links with IBEHR generate both interdisciplinary and international opportunities, e.g. those derived from the joint work focusing on micronutrient malnutrition and maternal health in Malawi. In addition to working closely with partner NHS, social care, and third sector partners, *HPP* is proactive in building relationships with service users and implementing a public and patient user involvement. For example older people, people with dementia and family carers are invited to join proposal development teams and Peer Groups advising on project delivery and accessible dissemination. UWS partnership with Alzheimer Scotland and establishment of the Alzheimer Scotland Centre for Policy and Practice situated within the School of Health, Nursing and Midwifery, augments **user involvement** through close working with the National Dementia Working Group (people with dementia) and the National Dementia Carers Action Network.

c. People, including:

i. Staffing strategy and staff development

The University is committed to being an inclusive institution through development of the Equality Outcomes and Equality, Diversity and Human Rights strategies. Planned recruitment of new research academics was identified as a key strategy to ensure sustainability. The staffing profile of this submission reflects the restructuring strategy in that 9 of the 13 submitted staff are new academic posts to support identified areas in the *IBEHR*, co-led and directed by 2 established Professors. The research profile of new academic appointments was an essential recruitment criterion, thereby expanding research capacity to complement existing research strengths. These staff have all been integrated into the *IBEHR* research culture by being included as co-applicants on grants, co-supervisors for PhDs etc. For example, **Drs Crilly** & **Litherland** have as lead supervisors on PhD studentships expanded the expertise of CMS by incorporating a signalling/immunology component into ongoing research programmes, whilst **Drs Williams** and **Quinn** link environmental impact on human health.

Each new post was awarded £12k start-up funds by *IBEHR* to facilitate rapid deployment and integration of their research projects into *IBEHR*, and prioritised in bidding for *IBEHR* Academic Development Funds (£80.5k funds awarded in 2012/3), new PhD studentships (4 in 2013 round) and Capital Equipment funds (£256k in 2012/3). The submitted new lecturer posts all qualify as Early Career Researchers, and thus the *IBEHR* nurture plan for these staff dovetails with the University's existing support for Early Career Research staff: Enrolment onto the PgCert in Research Supervision; Mentoring to support publishing/grant application; Internal peer review and support for grant applications; Access to research training; Access to conference funds and research development funds; Dedicated Early Career Research Development and Knowledge Exchange Development programmes; Tailored grant assistance including support to identify funders and dedicated support through First Grant Schemes.

ii. Research students

The Graduate School provides the administrative and training hub for postgraduate research students (PGRS). Membership of the Scottish Vitae Hub is demonstrably enhancing PGRS experience. UWS continues to invest over £1m per annum to rapidly expand PGRS numbers, which have risen from 206 in 2008, to 388 enrolled (24 in process) in 2013, with a target of 500 by 2015. The increasing proportion of UWS staff that are research active has enhanced the university's supervisory capacity. The University has committed significant capital investment annually into research infrastructure across the University, and all students have access to a guaranteed fund of at least £1k to support development, including conference attendance. Additionally the University runs an annual student conference which attracts external sponsorship and engagement from business, industry and the public sector.

Since 2008, the 13 academic staff submitted in UoA3 have supervised a total of 62 full-time PhD students, 19 of whom completed to the successful award of PhD (4 at UWS, and 15 externally), and a further 43 PhD students currently ongoing (40 at UWS, and 3 externally). This

equates to **4.8 ongoing PhD research students per staff FTE**, and **5.5 PhD degree awards per in post staff since 2008 FTE.**

IBEHR promotes doctoral student development and progression by offering a **PhD Progression & Excellence Award Scheme** to recognise and award publication in high ranked journals, timely submission of thesis, supervision of BSc/MSc student projects, presentation at international conferences, membership of relevant professional bodies and active participation in *IBEHR* programmes. Awards include both financial stipend contribution and the *IBEHR* Certificate of Doctoral Excellence. The *IBEHR* seminar series is organised and run by a panel of doctoral students, supported by senior academics (Drs Henriquez, Sloman). The quality of *IBEHR* biomedical doctoral projects is reflected in the number of publications co/first-authored by PhD students, and the award of prizes from the Scottish Society of Rheumatology and the Celsus Research Seminars for best oral presentation. Jointly supervised PhD students significantly benefit from the collaborative arrangements between UWS and its external academic partners in Glasgow, Strathclyde, Edinburgh, Newcastle and Hamburg Universities.

d. Income, infrastructure and facilities

Income: The total external research grants awarded to the 13 staff at both UWS and (for new appointments) previous universities totals at **£6million** with £3.35million administered (£927k spent) through UWS since 2008. This equates to **£462k total external income per staff FTE**.

Professor Lockhart has been awarded **>£2.16million** in total external research income since 2008, of which £776k was administered (£580k spent to date) through UWS. Sources of these funds include a diversity of prestigious research organisations. Principally these are research charities, specifically Arthritis Research UK, Wellcome Trust, CSO, Carnegie Trust, Cunningham Trust etc. Support from industry includes Scottish Biomedical, Johnson & Johnson. The strategic shift of focus since RAE 2008 to securing substantial programme research funding proved successful in raising the level of biomedical research at UWS. A **£1.2m Arthritis Research UK Programme** award has provided an excellent opportunity to add further dimensions and value to the main multi-institutional research programme by attracting new high calibre research staff and related satellite grant funding (Carnegie and Tenovus are early successes). **Professor Hursthouse** has been awarded **£1.5million** in total external research income since 2008, of which £368k was administered (£97k spent to date) through UWS. Funders include FP5, 6 & 7 RTD projects; RCUK (NERC, EPSRC, AHRC); NATO; UK government (DEFRA, Scottish Government; local authorities), environmental regulators and industry sponsored projects (e.g. STEMCOR; MARS). **Professor Banks** has been awarded **£1.5million** in total external research income since 2008, of which £608k was administered (£242k spent to date) through the UWS. Sources of these funds include a diversity of prestigious research organisations including Alzheimer's Society, NHS and ERASMUS. **Professor Snowden** has been awarded **£247k** in total external research income since 2008, of which £224k was administered (£6k spent to date) through the UWS. Sources of these funds include a diversity of prestigious research organisations including Scottish Government, Chief Nursing Office, and Macmillan Cancer Research etc.

The 9 new academics have been awarded **>£1million** in total external research income since 2008 at previous institutions, from various funding sources including: EPSRC; AHRC; Arthritis Research UK; CSO Scotland, Swiss Alzheimer's Association, JGW Patterson Foundation; Cunningham Trust, Maplethorpe Postdoctoral Fellowship; British Maternal & Fetal Medicine Society. External income totalling **£345k** was awarded to other *IBEHR* research staff from funders including: Royal Society of Chemistry; Royal Society of Edinburgh; Royal Meteorological Society; Ministry of Education & Science; BBSRC; EPSRC; RSPCA; MD Biosciences; Mars Waltham.

Infrastructure/Facilities: In response to RAE2008, and in context of recruiting 10 new posts to *IBEHR*, the University has invested in creating an integrated research environment to support capability of the IBEHR platform base.

Biomedical research facilities support CMS expertise in molecular, cellular and systems biology to dissect the pathogenic mechanisms driving arthritis. The infrastructure in place enables the CMS programmes to extend from *in vivo* models through molecular and cellular studies to translational research, with access to tissues obtained from arthritis patients at arthroplasty, buffy coats (Blood Transfusion Service) and patient blood. Dedicated facilities have been tailored specifically for this research, including: A histology suite; Expanded/upgraded tissue culture suite; Molecular analysis; Home Office licensed animal facilities; Breeding colonies of genetically modified (e.g. F2rl1-/-) mice; Flow cytometry suite; Matrix/cartilage biochemical analysis system; *in vivo* and *in vitro*

vascular assessment suites. As a well established cross-institution collaboration with the University of Glasgow, CMS has access to state-of-the-art core facilities in the *Institute of Infection, Immunology and Inflammation* (directed by Professor McInnes) which include IVIS technology for *in vivo* investigation. Through the Arthritis Research UK Programme consortium, CMS links with the bone group in the Edinburgh University for comprehensive bone analyses (μCT and histomorphometry) and with Newcastle University for matrix biology research.

Environmental and Microbiology research is supported by level II containment microbiology rooms and laboratories for chemical analysis of organic contaminants and inorganic species. High resolution Scanning Electron Microscopy and x-ray powder diffraction are accessible. Specialist facilities include Spatial and Pattern Analysis Research laboratory for spatial data handling and modeling. A dedicated Advanced Chemical Instrumentation Laboratory is used for environmental, bio/geoscience and forensic applications, underpinning relevant projects including metal mobility in living systems, biomedical applications e.g. metal nanoparticle-cell interactions.

IBEHR has secured funds and is in the advanced stages of developing a new microbiology and ecotoxicology suites tailored specifically to support the strategic forward plan promoting research at the interface of the research Centres. To develop the Drug Design Discovery & Molecular Science research group, a dedicated 400<Hz NMR suite was installed in 2010 facilitating accelerated deployment of medicinal chemistry to support the breadth of research activity.

Health, Nursing and Midwifery research facilities include the Domus Initiative, which is a highly adapted domestic environment to study the impact of the built environment on dementia. Person-centred approach to risk enablement involves use of telehealth and telecare. The Virtual Dementia Tour© reflects a distorted cognitive and sensory experience and provides an opportunity for individuals to use a variety of equipment to mimic mobility challenges, and serves as a research tool reflective of some of the progressive difficulties faced by the older adult with dementia.

e. Collaboration or contribution to the discipline or research base

The submitted staff significantly impacted on biomedical research by publishing **170** reviewed research journal articles since 2008, gaining **1477 citations**, including in top biomedical journals such as *Annals of Rheumatic Diseases*, *Journal of Clinical Investigation* and *Nature Genetics*.

IBEHR management structure includes a Research Management Board, with key external members Dr Goodyear (Senior Lecturer, University of Glasgow) and Dr Lord (Senior Lecturer, University of Strathclyde), who have advisory roles in the development and management of the research institute. Centrally embedded in the structure is also an Industrial Advisory Board consisting of members from industry (Johnson & Johnson, Servier Laboratories Ltd, Life Technology, Mars etc.) and relevant research councils (e.g. NERC, British Geological Survey).

The Centre for Musculoskeletal Science is an established inter-institutional collaboration consisting of a stratified profile of research staff directed jointly by 2 professors (**Lockhart**, UWS; **Ferrell**, Glasgow) and including 3 senior lecturers (2 at UWS; 1 at Glasgow), 4 lecturers, 2 research fellows/assistants and 4 research technicians (P/T). CMS has recently established a substantial and highly novel programme of research, integrating with Centres of expertise across three other UK universities (Strathclyde, Newcastle, Edinburgh). This consortium is able to comprehensively address osteoarthritis at molecular, cellular and system levels, and has an established international lead in this area. UWS is now directly partnered with two recipients of the prestigious EULAR Centres of Excellence award (Glasgow & Newcastle 2010-2015), enabling UWS to compete for and secure programme grant funding. The successful award of the Arthritis Research UK Programme grant funding was a key objective post-RAE2008, and has enabled the formalized consortium of universities to span the pathogenesis of osteoarthritis from its inception, through protease-mediated signaling via a key receptor, to joint pathology. Furthermore, it demonstrates forward progression to long-term multicentred research programmes, enabling UWS to compete internationally in achieving ambitious research objectives. **Professors Ferrell**, **McInnes** (Glasgow), **Rowan** (Newcastle) and **Plevin** (Strathclyde) are all appointed as Visiting Professors at UWS. **Dr Goodyear** (Glasgow) holds an honorary lectureship, is a key member or the *IBEHR* Research Management Board, and as co-supervisor on five ongoing PhD projects, brings expertise in osteoclasts and B-cells. UWS staff also have reciprocal appointments at the University of Glasgow (**Lockhart**, Visiting Professor; **Crilly** & **Litherland**, Honorary Lecturers) and at the University of Newcastle (**Litherland**, Visiting Lecturer). This consortium forms a central pillar of biomedical research at UWS, and plans to expand to introduce a 'pain' dimension into the osteoarthritis programme with the University of Nottingham (Profs Walsh & Chapman; Pain

Centre), and extended bone analysis with the University of Liverpool. **Professor Lockhart** is a Fellow of both the Higher Education Academy and the Institute of Biomedical Sciences. He co-Heads *CMS*, together with Professor William Ferrell (University of Glasgow), and is co-Director of *IBEHR*. Since his appointment in 2005 as Visiting Professor in the College of Medical, Veterinary and Life Sciences at the University of Glasgow, he has been involved in supervising 5 PhD students on the prestigious Oliver Bird Rheumatism PhD Programme headed by Professor McInnes. Research grants in the last six years from mainstream biomedical sources include the Wellcome Trust, the Arthritis Research UK, the Chief Scientist Office, the Nuffield Foundation, the Cunningham Trust, Tenovus Scotland and the Carnegie Trust. Since 2008 Professor Lockhart has raised in excess of £2 million of external research income, and publications include 6 peer-reviewed papers in biomedical journals with impact factors >6, including the seminal publication on PAR-2 as a critical checkpoint in osteoarthritis.

The Centre for Environmental Research is directed by Professor Hursthouse, and includes 1 senior lecturer, 4 lecturers and 2 research technicians. From RAE 2008, staff have maintained core environmental expertise, developed external partnerships (SFC Pooling and Hamburg) and promoted stronger integration with life and physical sciences, including new *IBEHR* appointments. **Professor Hursthouse** is a Fellow of the Royal Society of Chemistry and was elected International President of the Society for Environmental Geochemistry & Health in 2013. He Heads the *CER* and is co-Director of *IBEHR*. He is a member of expert pools for NERC Technology review and has been invited to serve a second term on the NERC peer review college, and on the Editorial Board of Environmental Chemistry Letters and Environmental Geochemistry & Health journals. Since 2008 Hursthouse has published 24 peer-reviewed papers (243 citations), and secured funding in excess of £1.5million from a range of bodies including industry (William Tracey Ltd, CORUS UK Ltd, Stemcor); NERC; MAFF; NATO; EU-framework and Scottish Government.

Healthcare Policy and Practice is an emergent research grouping within the ***IBEHR*** research community comprising researchers from the School of Health, Nursing and Midwifery. **Professor Banks** is a Chartered Psychologist, member of the British Psychological Society and serves on the committee for the British Society of Gerontology (Scotland). As the UWS lead on older persons' research and wellbeing research at UWS, Banks interest in ageing and disability has allowed her to carry out a range of projects focusing on health, social care, education and employment across all ages, so as to influence and evaluate policy and policy changes. Bank's applied research on musculoskeletal disorders involves collaboration with the Scottish Muscle Network, the Scottish Dementia Clinical Research Network, and psychological medicine at the University of Glasgow. Recent work assesses the appropriateness of using the SF-36, a commonly used measure of quality of life, with different clinical populations. Since 2008 Banks has published 21 peer-reviewed papers (87 citations), and secured funding in excess of £1.5million from a range of bodies including Scottish Government Chief Scientist Office, the Scottish Government, NHS Education Scotland, the Department of Work and Pensions, the Alzheimer's Society, Chest Heart and Stroke Scotland, and the Parkinson's disease Society, as well as Local Authorities, and the NHS. **Professor Snowden** is a mental health nurse and NMC recorded teacher, specialist practitioner and independent prescriber. He chaired the inaugural Scottish Mental Health Nurse Research Conference (2011), funded by Scottish Government, and is on the editorial board of Quay books and the *Journal of Nurse Prescribing*. He has external partnerships with clinical/ medical colleagues in Canada, Australia, Denmark and UK, most notably in NHS Lothian, NHS A&A and NHS Lanarkshire. His research has included validation of the staff engagement tool that has been instrumental in the Scottish Government considering the tool as likely replacement for the staff survey in NHS Scotland. Since 2008 Snowden has published 40 peer-reviewed papers, 1 book and secured £247k external funding including from the Macmillan Cancer Research. **Professor Tolson** was recently appointed at UWS, and is a Fellow of the Royal College of Nursing, an Honorary Fellow of the Queen's Nursing Institute, Scotland, and through her applied dementia research received the Jim Flood Memorial Alzheimer's Distinguished Lectureship (St Louis University Medical School USA, 2010). Her appointment as the UK and Nurse Leader on the International Association of Gerontology and Geriatrics - World Health Organisation Taskforce testifies to international standing. She is an inaugural member of ELTECA (the central and eastern European virtual faculty on long term care), an international editorial board member for JAMDA and an executive board member of the Scottish Dementia Research Consortium. International visiting Professor appointments include the Universities of Queensland and Toronto. Tolson's

Scottish football studies inspired and informed the UWS-St Louis Cardinal's Baseball Memories project, and attracted media attention in the St. Louis Post Dispatch, *AARP Bulletin*, Associated Press, and prime time news coverage by local affiliates for FOX and NBC. The American Alzheimer Association has recently announced that this is to become a national programme. Since 2008 Tolson has published 20 peer-reviewed papers (276 citations) presented 28 invited keynote lectures (16 international), and secured grants (at previous institutions) from Research Councils, Chief Scientist Office, EU, industry, UK and overseas charitable organisations.

The recently appointed **Early Career Researchers** being submitted in UoA3 have all been invited reviewers for prestigious biomedical journals (e.g. *Arthritis & Rheumatism, PLOS ONE)* and are members of relevant biomedical societies (e.g. Osteoarthritis Research Society International, American Society for Reproductive Immunology, Institute of Physics, Royal Society of Chemistry, American Association for Cancer Research, General Pharmaceutical Council). **Dr Litherland** was appointed as Lecturer in Cell & Cartilage Biology, and has since secured as lead investigator external research income (total £42k) awarded by Tenovus Scotland and the Carnegie Trust. His expertise in cartilage biology enhances existing proficiencies within CMS, reflected in his appointment as Honorary Lecturer at the University of Glasgow. Previously at Newcastle University's Musculoskeletal Research Group, Dr Litherland secured as co-applicant £440k external funds, including Project Grants and a PhD studentship from Arthritis Research UK, 8 peer-reviewed (131 citations) including 2 in the lead rheumatology journal (*Arthritis & Rheumatism*), and one successful PhD completion (co-supervisor). As Visiting Lecturer, Dr Litherland retains close collaboration with Newcastle, and co-supervises two ongoing PhD students (including an Oliver Bird PhD studentship). Dr Litherland presented at the 'Hot Topics' symposium of the 2012 joint meeting of the Federation of European Connective Tissue Societies/International Society for Matrix Biology, and was session chair at the 2011 British Society Matrix Biology meeting in Newcastle. **Dr Crilly** was appointed as Lecturer in Immunology, bringing expertise (27 publications) in immunopathology of rheumatoid arthritis, with 3 of her 4 recent peer-reviewed papers published in *Annals of Rheumatic Diseases*. She has been both principal and co-applicant on awards from Tenovus Scotland and the Cunningham Trust, and is an Honorary Lecturer at the University of Glasgow. **Dr Williams** was appointed as Lecturer in Environmental Microbiology. He is currently supervising a PhD student linked with CER on soil health and microbial diversity for remediation of contaminated allotments in Scotland. Previously from the University of Strathclyde, Dr Williams has published 7 peer-reviewed papers (63 citations) since 2009, including publications in *Autophagy, Journal of Biological Chemistry* and *Plos Pathogen*, and remains part of the Scottish Metabolomics team. **Dr Menzies** was appointed as Lecturer in Immunology. Previously from the Department of Reproductive and Maternal Medicine at the University of Glasgow, Dr Menzies has published 5 peer-reviewed papers since 2008 (58 citations), been awarded grants from Tenovus Scotland and the British Maternal & Fetal Medicine Society, and presented at SET for Britain meeting held by the Parliamentary and Scientific Committee at the Houses of Parliament (2010). Since joining UWS Dr Menzies has been invited to speak at the 15th International Congress of Immunology in Milan. **Dr Butcher** was appointed as a Lecturer in Microbiology. Previously from the University of Glasgow he has published 4 peer-reviewed papers (50 citations) since 2008, including publication in *Arthritis & Rheumatism.* Since joining the UWS, Dr Butcher has presented research at the annual meeting of the American College of Rheumatology in 2013. Dr Butcher has been a committee member of the *Scottish Microbiology Society* since 2005 and the Treasurer since 2008. **Dr Yaseen** was appointed as Lecturer in Physical Sciences. Previously from the University of Manchester, he has published 11 peer-reviewed papers (182 citations) since 2008, and been awarded £87k in external funding within areas of nanotechnology, biomaterials, responsive materials, formulation and graphenenanocomposite production, including from EPSRC. **Dr Brucoli** was appointed as Lecturer in Medicinal Chemistry, bringing expertise in design, synthesis and biological evaluation of small probes for therapeutic intervention in various diseases including cancer, tuberculosis and MRSA infections. Previously from the University of Reading, after completing a prestigious Maplethorpe Fellowship at the UCL School of Pharmacy, Dr Brucoli has published 5 peer-reviewed papers (16 citations) since 2008. **Dr Rai** was appointed as Lecturer in Life Sciences. Previously from the University of Glasgow, he has interest in cellular senescence and healthy aging and has published 17 peer-reviewed papers (264 citations) since 2008 in various biomedical journal including *Journal of Clinical Investigation* and *Nature Genetics*.