Institution: University of Reading

Unit of Assessment: 13 Electrical and Electronic Engineering, Metallurgy and Materials

a. Overview

The submission describes the research environment and the activity of the School of Systems Engineering (SSE).
Research is performed via three distinct research groups:

- Systems Neuroscience
- Cybernetic Intelligence (CI)
- Information & Communications Technology (ICT)

and two special purpose research units:

- Centre for Intelligent Systems
- Infrared Multilayer Laboratory

which both link in directly with the CI group.

This group structure allows for an interdisciplinary, flexible research environment which affords genuine engagement both between and within specific projects as well as providing a focus for the allocation of resource.

b. Research strategy

Vision: Our strategic vision is (1) to develop excellence in the areas of our particular research strengths (as a result there has been significant investment in Systems Neuroscience, Intelligent Systems and Wireless Communications); (2) to build new areas in which we have opportunities for interdisciplinary collaboration (e.g. Big Data Analytics), internally with Meteorology, Mathematics and the Centre for Integrative Neuroscience and Neurodynamics (CINN).

Our research is aligned closely both with University of Reading priorities of research to ensure secure and sustainable societies as well as an ability to respond to relevant externally driven directives, such as those from EPSRC (esp. Digital Economy, Energy, Healthcare and ICT). Research is organised such that in the school we can carry out internationally leading research in these areas and have a significant impact in their development. However it is in the integration of research across fields of interest and expertise that the real significance of the research is articulated. Major multidisciplinary projects are, and have been, a distinctive feature of the University of Reading Systems Engineering research landscape for many years, involving both internal and external collaboration. An increasing proportion of our research projects fit into the broad research programme areas, previously defined, which target issues of major global concern. The strategy is for investment and support to be focussed in these areas which represent the best opportunity for excellent research both in and by themselves and in collaboration with others in academia and industry, both nationally and internationally.

Position since 2008: At the time of RAE2008, research in the School was organized around six overlapping groups (Instrumentation & Signal Processing, Cybernetic Intelligence, Interactive Systems, Pervasive Intelligence, Parallel Algorithms and Software Engineering) and the School returned to two separate UoAs: Computer Science and Electronic & Electrical Engineering. Following the RAE2008 outcome research in the School was scrutinized and restructured, resulting in the departure of six members of academic staff, a reduction in the number of research groups and a decision to return a single UoA for REF2014. This restructuring enabled significant development in research strategy and ensured a focused and coherent approach to planning and investment, led by the School with the full support and encouragement of the University.

Our primary goal has been to identify and reinforce key areas of research strength and those areas in which there are opportunities for deeper interaction with University research priorities. We have sought to do this through appointments, equipment purchases, infrastructure developments

and the targeting of School and University funded research studentships.

The appointments of Bojak, Y Zheng, Hayashi, Roesch and Delivopoulos were made via the University's Academic Investment Project (AIP), a £50M investment programme designed to grow Reading's position of research strength across the University. All of the AIP appointments to our School fit under a University wide theme in Systems Neuroscience and Brain Computer Interfaces, which included appointments in Pharmacology and Psychology also. As such, our School's share of the total represents a significant investment by the University, is a demonstration of the value placed on our contribution to neuroscience research in the University more widely and has significantly enhanced collaboration with Pharmacology and Psychology under the University-wide Centre for Integrative Neuroscience and Neurodynamics (CINN).

The appointment of Qi as a new lecturer and Wang as BT Research Fellow have enhanced our internationally leading work in wireless communications (through our ICT group) and our relationship with a key industrial partner. The appointment of Stahl as a new lecturer has expanded our capability in Big Data Analytics, has increased the opportunities for research development with colleagues in Meteorology and CINN and has further enhanced our relationship with BT through the provision of a research studentship that will begin in 2014.

All of these new appointments have been supported by the allocation of University and/or School funded research studentships and the provision of appropriate laboratory space and initial start-up funds for the purchase of necessary equipment. Also, the development of the Brain Embodiment Laboratory (as discussed in Section d) has provided a significant infrastructure development in support of the systems neuroscience appointments.

The School houses two directed specialist research units which have both strengthened their positions in their relevant sectors since 2008:

1. The Centre for Intelligent Systems Research (ISR) – led by Badii - is a multidisciplinary research unit which has achieved an unparalleled rate of success in secure pervasive technologies. The unit has obtained funding from a range of funding agencies (EPSRC, MOD, TSB, EU) and has been involved as lead partner on a variety of international, collaborative large scale research programmes. These projects have already delivered numerous ICT resultant systems including industrially deployed innovations. Examples include 3D Media: Spatial Sound and Vision for heightened reality and presence, Content Safari, DREAM and Fastmatch for security implementation.

2.The Infrared Multilayer Laboratory (IML) – led by Hawkins - as well as carrying out research in the area this unit is responsible for developing and manufacturing optical filters which are employed on all international space platforms – US, European, Russian and Chinese space programmes are all supported by the unit. The filters are able to finely select energy information in the upper atmosphere across a very small frequency range. The unit is internationally leading - no other unit in the world is able to realise filters of such high quality.

The importance and integration of these two units in the School is described in section e.

Whilst IML is well established in the school, ISR came into existence at the start of the REF period and has benefitted recently from a major infrastructure development (discussed in Section d). Both units are fully integrated in school life, housing research students and PDRAs.

Strategy for the future: Further to the appointments and developments set out above, our aim has been to increase collaborative multidisciplinary activity within the School, the University and more widely, both through School and University funded studentship opportunities and through major externally funded research projects. This will continue into the future. Crucially, we will continue to support the development of our systems neuroscience research. The AIP appointments, both in our School and in cognate areas, have ensured the establishment of a group that is truly world-leading in terms of the breadth and scope of the approaches it takes to research in this area and the range and depth of its collaborations with researchers in Pharmacology and Psychology. Second, we will seek to ensure that our work in ICT and Cybernetic Intelligence retains its position of strength through continued infrastructure and funding support, and through ensuring that our Big Data Analytics research develops in such a way as to complement and contribute to our existing strengths. Third, whilst continuing to target the highest quality journal

publications and funding sources, we will continue to develop our already strong position in research that has real world impact via industrial collaboration and engagement with those advancing policy and practice through the use of technology. As an example, we have already mentioned above our developing relationship with BT. We will seek to enhance this through further joint research activity including studentships, contributions to grant applications and the development of joint workshop activity. All of this will better enable us to increasingly focus on interdisciplinary projects targeted at major issues of critical concern, both within the scientific community and more widely. Future growth of staff numbers will be possible on the basis of increased grant income and the steady increase we are experiencing in research student numbers, from both the EU and overseas.

Our aim is to feed key observations from our latest research findings through into teaching and learning practices by means of research based teaching at all UG and PG levels. This aim is being brought about incrementally through the implementation of new modules and project work in order to directly involve students in making use of online resources in order to benefit from some of the excitement and rewards of hands on research. In this way, assessed feedback from students helps to train future researchers.

c. People, including:

i. Staffing strategy and staff development

The staffing strategy in Systems Engineering is directly aligned with the University-wide goal for the University of Reading to be a leading research-intensive University and to enhance the reputation and regard of the School as a world leading unit. The aim is to strengthen our core research areas by hiring excellent candidates. Overall the absolute number of academic staff has remained roughly constant over the period. However recently seven new appointments have been made to support the initiative - at the Professorial level Bojak as Professor of Computational Neuroscience and Ying Zheng as Professor of Systems Neuroscience. Both incoming professors bring with them a portfolio of high quality research experience and sustained success at obtaining major peer reviewed grants, supervising research students to completion and publishing high quality research output. They have been joined, in the same period, by five complementary new appointment lecturers: Roesch, Hayashi, Qi, Delivopoulos and Stahl. These appointments will be particularly supportive in the Systems Neuroscience, Wireless Communications and Big Data Analytics priority research areas.

This inflow of staff has been targeted to strengthen the research groups that comprise the school research infrastructure. In summary:

(A) Systems Neuroscience & CI - 5 appointments
(B) Wireless Communications (ICT) – 1 appointment (Also Wang as BT Research Fellow)
(C) Big Data Analytics – 1 appointment

Our aim is to continue to attract top level Postdoctoral Research Staff to SSE. The School presently houses 25 FTE PDRAs, all attached to strategic major research projects and we plan to increase this number to 35 by 2017. In particular we are targeting EPSRC and Royal Academy of Engineering stand-alone Postdoctoral awards. As a result, along with all research grant applications, we are bringing to bear new modes of communication and monitoring in order to ensure that all submitted applications are of the highest possible quality. To this end a key member of central staff, Matt Cross, has been appointed by the University to work in the School with the specific role of enhancing our research proposal procedures. Two individual research fellowships are presently held in the school. One is Wang who is the BT Fellow of green radio, the other is Walker who is an AHRC/EPSRC Science and Heritage Postdoctoral Research Fellow.

Staff development: Staff are given clear guidelines and objectives regarding career progression, and are strongly supported in achieving their full potential. For the PDRAs this is completely in line with the Concordat to Support the Career Development of Researchers, also implemented across the University. The University was one of the first 10 HEIs to win the European Commission's HR Excellence in Research Award in recognition of its work in implementing the Concordat. To ensure this support is in place from an early stage, we have introduced several mechanisms so that staff development is assisted and milestones are recognised promptly. Every new member of staff and early career researcher affiliated with the

school has a personalised induction process, and is assigned a senior member of the School who acts as a mentor, assisting informally in every aspect of school life. Mentors aid induction and address career development issues.

Staff involved in recruitment and selection complete training offered by the Centre for Staff Development, while all PIs are required to regularly attend leadership and management development opportunities. All staff undergo an annual Staff Development Review (SDR) with a regular reviewer, normally distinct from the mentor. In addition to the SDR, early career researchers are encouraged to identify activities that they feel would add to their CV and enhance future employment in academia and/or research.

Research training is provided by the University of Reading Centre for Quality Support and Development (CQSD) to enable senior staff to conduct appropriate Staff Development Reviews, to realise good practice mentoring and to raise awareness of all other issues concerned with the management and career development of research staff.

All SSE projects are subject to a management process that includes risk assessment and in some cases a formal ethical judgement must be made. For most research this is a formulaic judgement by the Head of School, but it can also include consideration by the university ethics committee and exceptionally where external facilities are needed may also require judgement by the regional health authority.

Early career researchers and PDRAs are actively encouraged to take advantage of the excellent institutional support for accessing information and writing research proposals. The University has an approved Code of Good Practice in Research that serves as the institutional platform to provide solid support for research at School level. Each mentor is reminded by the administration of all key transitional moments as evidenced by the staff development review.
In addition to School and research group funds, all permanent staff have a dedicated Staff Development Account (SDA) which receives an annual fixed sum from School funds and variable income relating to research grant awards and consultancies. The money in this account can be used at the individual's discretion for equipment purchases, visits, conference attendance and payments to research staff. During the current REF period we have had eight internal promotions to professor (based on merit) within the School – Badii, Becerra, Hong, McCrindle, Nasuto, Ruiz, Sherratt and Williams. In this period we have also appointed two members of staff who were on temporary research contracts to full time positions.

International staff: Among the permanent staff returned, 14 (13.2 FTE) are British or British-trained, the remaining four being international. Approximately half of all the PDRAs and research fellows in the School are international. We regularly host visiting international scholars, in the REF period the following have all spent time with us: Mo Jamshidi (University of Texas, USA), Serdar Iplikci (Pamukkale University, Turkey), Pablo Huerta (Universidad Rey Juan Carlos, Spain), Eduardo Boemo (Universidad Madrid, Spain), Wen-Chung Kao, (Chairman National Taiwan Normal University) , Velimr Jurdjevic (Toronto University), Claudiu Remsing (Rhodes University, Greece), Peter Kyberd (New Brunswick), Jesus Gomez de Gabriel (University of Malaga), Li Ping (City University of Hong Kong) – Royal Academy of Eng. Distinguished Visiting Fellowship.
In the REF period, members of our staff have held visiting professorships at the following institutions: Czech Technical University, Prague; Harrison McCain Chair, University of New Brunswick, Canada; University of Strathclyde; IIITM Gwalior, India; Microsoft Research Chair, Katholieke University Leuven, Belgium.

Equality and diversity: The School recognizes the importance of equality and diversity. We are committed to supporting women in academia and engineering and have an application for Athena Swan recognition pending. The University as a whole has a bronze award. Our record of promotion of women is strong with five women professors in the School, Profs Williams, McCrindle, Ruiz, Hong and Y. Zheng all in post. We also have three female Associate Professors, Wei, Hwang and Sun in the school as well as seven female PDRAs. We offer flexible working to all staff coming back from parental leave and all staff with small children – Prof. Hong recently took advantage of these flexible working arrangements. Overall 23.8% of academic staff in the school are women and 25% of PDRAs are women.

ii. Research students

We have consistently increased the number of research students in recent years, with the annual intake now almost doubled from that in 2008 to 20 new research students a year. Research students are fundamental to the research environment, many being linked with ongoing major research projects in the School. Funding is obtained directly from research councils, international support or companies, including combinations such as EPSRC CASE awards. In particular those directly funded by industry carry out projects of immediate relevance to the concerns involved (e.g. Nissan, Thales, Jaguar Land Rover, CRESS, Scottish Southern Energy).

A total of 78 students were awarded PhDs in SSE in the 5 year period 2008/9 to 2012/13, realising an average figure of 0.91 students per FTE (returned) per year (4.55 students per FTE in total). The number of successful PhD completions has risen significantly and steadily from 0.22 students on average per FTE per year (1.12 students per FTE in total) in the previous 2008 assessment period to realise the new figure of 0.91. The realistic target, aligned with University strategy, is to increase this figure to 1.15 per FTE per year by 2017, with an agreed targeted recruitment of 26 new PG research students per annum at the ratio 15 home/11 Overseas. Student recruitment is both national and international, and is aided by a central Admission team. In 2010 the University established an institutional Graduate School that coordinates the activity of the University as a postgraduate institution and the generic training for research students, and has developed a Code of Practice on Research Students encompassing all aspects of the admission, support, progression, assessment and degree award for postgraduate students. Through the Graduate School, the University has developed several useful resources specifically for its cohort of research students, including research career advice.

We have made a substantial investment in funding, organising and holding short postgraduate courses and schools since 2008, raising our profile with prospective postgraduate students and leading to a large increase in applications. Examples include Royal Academy of Engineering Medical & Surgical Robotics Conference 2010 and CINN summer school in Neurofields 2011.

The School presently houses 80 registered PhD students (almost 5 per FTE returned staff) and 3 students registered for an MSc by research. A specific team has the role of targeting PhD student recruitment through advertising and international fairs. This aligns us closely with the University strategy to be a PG Research University. As well as a steady flow of UK students and several (in the period) from China, Malaysia and India, the School has been able to attract students from such places as USA, Canada, Japan, Germany and France. This realises an exciting multi-cultural environment which is strongly encouraged by senior staff.

The large group of postgraduate students is an integral part of the school's research environment, hosting their own seminars and research activities. PhD students are required to undergo a broad, advanced training in systems engineering and to develop a range of professional and generic skills, this in addition to making satisfactory progress with their specific PhD project. The training related to each of these aspects is described below.

Training in Systems Engineering: All PhD students in Systems Engineering are required to complete 100 hours of training within the first two years, and before their registration as PhD candidates is confirmed. This training can be obtained by auditing MEng and Masters modules (including research methods), attending approved external events such as conferences, workshops, industrial training courses, and research summer/winter schools such as those offered on neurofields, or foundations of enactive cognitive science. The individual training programme is agreed for each student at the beginning of their course of study by their supervisor(s) and ratified by the Director of Postgraduate Research Studies.

The school runs MSc degree programmes in Cybernetics, Digital Signal Processing & Communications and Advanced Computer Science and an MRes in Systems Engineering. These programmes are also a useful source of suitable candidates for our PhD programmes.

Professional Skills and Generic Training: In addition to subject-specific training, our PhD students are required to undertake training in professional and generic skills, equipping them with the knowledge and experience to be effective researchers whatever their subsequent career direction. In large part this training is provided through the Graduate School's Reading Researcher Development Programme, structured to meet the national Researcher Development Framework and hence EPSRC training requirements. The selection of courses and events from this programme is made jointly by supervisor and student, facilitated by the University's Learning Needs Analysis Tool. Additionally, our PhD students are required to attend School modules in

Communication and Research Skills, specifically designed to improve both written and oral presentation and, in a recent development, the School has funded specific training in academic writing in English, specifically targeted at students for whom English is an additional language, but available for all. These communication skills are further developed by a requirement to attend conferences and other meetings, supported by external funds and a School commitment of £500 per student per annum, and an expectation of at least one conference presentation per student during their PhD. Students are also strongly encouraged to take part in the weekly research seminar series given by speakers from a range of industrial/research establishments. All students are given the opportunity to contribute to the teaching of undergraduate courses, by taking an active part in our undergraduate programme. In addition to generic teacher training provided by the Faculty of Science, we organise an in-house training day specific to the teaching of systems engineering, for all first year research students.

Monitoring and supervision of PhD candidates: Each full-time student has at least one meeting a year with an individual monitoring committee, consisting of two members of staff other than their supervisor(s). This committee, operating in accordance with the Code of Practice on Research Students, follows the individual student's development through their entire course of PhD studies. Its aim is to review and advise on the progress of the course of study, to recommend registration, within the first two years, for a PhD degree, and to provide an informal point of contact and advice for any problem the student might encounter with the supervision or the course in general. Students are also expected to interact with their main supervisor at least weekly, which is confirmed through formal monitoring. Since 2010 all students receive joint supervision from two or more members of staff. The second supervisor is particularly important where the principal supervisor is a new appointment. Senior Research fellows are encouraged to supervise PhD students with the assistance of a senior member of academic staff. In some cases the second supervisor is from outside the School, and often students with industrial sponsorship will have an industrial supervisor.

d. Income, infrastructure and facilities

Income: Enhancing research quality, quantity and reputation is of high priority in Systems Engineering. Competing for and being awarded significant research income is deemed to play an important role in achieving this. To this end the School has achieved considerable success in obtaining grants to support its research over the REF period. We have pursued actively a policy of encouraging and supporting grant applications from staff, implementing internal peer review in doing so. In the financial planning of research proposals we have also had professional assistance from the University Research and Enterprise office, which advises on all the new and repeated research grant calls for which our staff may be eligible.

Our cohesive research strategy has resulted in income into the School that exhibits a marked increase over the previous assessment period. In the five year period 2002-7, the total research income per FTE returned per annum was £44k. In the 5 year period 2008-13 this figure has increased significantly to £140k and is still on an upward trajectory.

Considerable success has been obtained from EPSRC/NERC/AHRC, which we have attempted to balance by also attracting EU funding. The forward strategy is to (at least) maintain EU funding whilst gradually increasing research income from the research councils, charities and industry – all subject to the external financial climate and all with regard to School focussed research areas.

Since 2008 major awards have been made for the following projects:

Research Councils + Government: Total REF £4.65M. Awards include - SPHERE (Harwin, Holderbaum & Sherratt, EPSRC, £1.2M); Brain Computer Interface for Affective States (Nasuto, EPSRC, £509k); Delay Tolerant Block Coding (Zheng, EPSRC, £359k).

European Union: Total REF £5.56M. Awards include - Companionable & £D Media (Badii, EC, £1.14k); Virtual Centre of Excellence (Badii, EC, £1.08M); Climate KIC (Holderbaum, EC, £680k); Intelligent Tutoring Interface (Badii, EC, £558k); Integrated Security (Ferryman, EC, £403k); Cognitive Control for Robots (Badii, EC, £394k); EFFISEC-Innovation (Ferryman, EC, £392k).

Industry/Charities/Other: Total REF £1.82M. Awards include - Smart Meter Data for Energy Supply (Holderbaum, Scottish & Southern Energy, £603k); Content SAFARI (Badii, TSB, £430k).

Infrastructure: The School and University have invested considerably in the research infrastructure of the School during the REF period. In particular there have been two large scale repurposing and refurbishment exercises.

First, in response to the need to appropriately house several large-scale, multinational EU-funded projects the University has funded, to the order of £250k, the development of a new research facility for the Centre for ISR. This has increased the space available for research within the School by 30% through an extra 522 m^2 of additional office space and versatile laboratory space. Second, alongside the previously mentioned academic investment project appointments in systems neuroscience, the University has funded, again to the order of £250k, the development of existing space to house a special-purpose, state of the art Brain Embodiment Laboratory (BEL) under the Directorship of Nasuto. The laboratory co-locates a tissue-culture facility capable of culturing neurons and studying their use in a robot body (an area in which researchers from the School took a clear lead internationally during the REF period) with space devoted to EEG recording and other BCI research. The funding included the development of the space, underlying technical support and relevant equipment purchases including incubators, head stage and culture housing.

As part of routine business, the School provides funds to support research equipment purchases and provides additional support for major research activities including, for example, the recent commissioning of an experimental 16 node 1 Terabyte cluster to enhance our research in Big Data Analytics and Systems Neuroscience.

The University has invested heavily in several University-wide initiatives to underpin collaborative research efforts. This investment includes £10Million in the REF period for Shared Platform facilities in order to enhance the University's multi-disciplinary approach. Of particular relevance for us is the purchase of a whole body Magnetic Resonance Imaging (MRI) Scanner and a multi-node GPU cluster, both housed in the Centre for Integrative Neuroscience and Neurodynamics, which play an important part in our Systems Neuroscience research.
Overall the School has a large special purpose laboratory provision for research (2,235 m^2 which has increased from 1,713 m^2). Dedicated space is provided for academic and postgraduate students in Intelligent Systems and Systems Neuroscience (including BCI and Brain Embodiments) as mentioned above, but also for the Infrared Multilayer Laboratory and in other areas of Cybernetic Intelligence and ICT research, including: Robotics, Control Engineering, Haptics, Virtual Reality (a fully equipped CAVE), Terahertz Technology, Energy, Embedded Systems, Wireless Communications and Computational Vision. These are additional to several general purpose laboratory areas which can be used both for teaching and research, including one that received sponsorship from Microchip leading to refurbishment and significant equipment purchases. The School has the direct support of nine Technical and IT staff. Four engineering technicians (Gould, Dove, Tolson, Yeo) provide permanent support in the general purpose laboratories and a fully equipped mechanical workshop and rapid prototyping facility available for all research staff and students. Specific IT support is provided by five full-time technicians (Bland, Chapman, Gurr, Ogden and Worrall) and IT advice is also provided at University level with Bland assigned as liaison.

e. Collaboration or contribution to the discipline or research base

The School is involved in many interdisciplinary collaborations, both across the University and with external partners. These are supported by means of visiting fellow arrangements, supplying funds for travel and encouragement for the organisation of international meetings and workshops. In many cases staff are directly involved in the organisation of such projects, both internally within the University and externally, locally and internationally.

Systems Engineering either directs or is a member of several major projects involving international consortia. This strong international dimension places the School well in the global research community. Amongst its leadership of a number of large integrated research programmes, ISR operates as scientific and technical director of the VideoSense European Centre of Excellence which comprises leading research groups from Queen Mary, London, EPF Lausanne, Technical University Berlin and Thales Security Research. International research leaders who are (or have been in the period of assessment) part of ISR Consortia include David

Wolpert, NASA Ames, USA : Londa Schiebinger, Stanford, USA: Thomas Sikora, TU Berlin: Ann-Sophie Rigaud, University of Paris: Guido van Steendam, University Leuven, Belgium: Zenn Bien, NIST, Korea: Horst-Michael Gross, TU Ilmenau, Germany and Touradj Ebrahimi, EPFL, Switzerland. Meanwhile the IML collaborates in an ongoing project basis with Commissariat à l'Energie Atomique (CEA), France; Indian Space Research Organisation (ISRO): SELEX GALILEO, Italy: SOFRADIR, France: Stockholm Observatory, Sweden: Thales Alenia Space, France: Université de Liège, Belgium and University of California, Davis, USA.
Industrial partners include IBM, Microsoft, Intel, Thales, Siemens, INRIA, BAE Systems, HP, BBC and Fraunhofer Institute. The School is involved (jointly with MIT and Oxford University) in the 2020 vision project of Jaguar Land Rover. The FP7 Robolaw project also involves partners from Humboldt University, Berlin: Tilburg University and University Santa Ana, Pisa. Other on-going projects involve Georgia Tech and Dartmouth College, both USA. Neuroscience research includes collaboration with the John Radcliffe Hospital, Oxford and University Hospital, Coventry.
Important in Systems Engineering are direct collaborations with industrial partners, including IBM, Microsoft, Intel, Thales, Siemens, INRIA, BAE Systems, HP, BBC and Fraunhofer Institute. The Thames Valley Vision project is a collaboration between Scottish and Southern Energy, Systems Engineering and a number of commercial SME partners. Many projects have been carried out in the School through the Knowledge Transfer Partnership (KTP) scheme. Riding for the Disabled Assoc.(RDA) involved IT infrastructure change and won the KTP Best Partnership Award in 2009.

Leadership: The School enjoys exceptional esteem in the international academic community. The most important element of this is the large number of national and international research consortia that we join and, more importantly, lead, e.g. VideoSense European. Often these are funded to carry out research on a specific topic by the European Union, the European Space Agency and others. Other collaborations involve planning and participating in a wide range of national or international workshops and think-tanks such as ongoing advisory involvement in setting up the UK Government's Longitude 2014 awards with NESTA and National Security strategy (re. Cyber Crime) with the Cabinet Office.

The University and the School fully support the engagement of members of staff in services to the wider community. Several members of staff are prominent in this and hold leadership roles in industry, commerce, Research Councils, learned societies, editorial boards or professional Bodies. The following is an indicative list of the scope and breadth of our contributions:

Advisory board membership examples: Carnegie Mellon University (Instinctive Computing Centre), Exeter University (Centre for Intermedia), IET Innovation Awards panel Chair, Cabinet Office Advisory on Cyber Crime, Analytical Science Committee of the Royal Society of Chemistry.
Keynote/Plenary lectures: In total staff in the School have given a minimum of 10 keynote/plenary lectures every year over the REF period (well over 60 Keynotes in total), examples being IEEE Systems, Man and Cybernetics, Istanbul, 2010: IEEE BioCAS, Cyprus, 2010: ICAMechS, Tokyo, 2012: EUROS, Prague, 2008: IEEE ROBIO China, 2012: IEEE ICORR 2009, World Science Festival, New York, 2009.

Learned Societies examples: EPSRC College members (Bowen, Guy, Hadjiloucas, Harwin, Nasuto, Warwick): Nuffield Council on Bioethics Working Party: Scientific advisory board of Swiss National Science Foundation (SNSF): The faculty includes five FIETs, one FBCS and one FIEEE.
Editorial boards examples: IEEE Trans. Consumer Electronics (Editor-in-Chief): IEEE Trans Haptics: Robotica: IJ of Adaptive Control and Signal Processing: ACM Trans Acc Computing.
Prizes: The School regularly wins academic prizes at all levels, examples include Mountbatten Medal 2008 (Royal Academy of Engineering/IET): Ellison-Cliffe Medal 2011 (Royal Society of Medicine): Golden Eurydice (Brussels): Marcellin Champagnat Award 2009 (Mexico).

Distinguished Awards: In the REF period the School has witnessed one election to the Fellowship of the IEEE and six Honorary Doctorates (DScs) have been awarded to staff from other UK Universities for excellence in research.