Institution: University of Hertfordshire

Unit of Assessment: Panel B (9): Physics

a. Overview

This submission comprises research carried out within two centres: the **Centre for Astrophysics Research (CAR)**; and the **Centre for Atmospheric & Instrumentation Research (CAIR)**.

CAR and CAIR are housed within the university's Science and Technology Research Institute (STRI), a dedicated research facility comprising 3,100 sq.m. of laboratory and office space, and a communal discussion room. The STRI houses two further research centres in Computer Science and Engineering, creating a dynamic research culture that fosters cross- and multi-disciplinary interaction. CAR and CAIR members are also staff in the School of Physics, Astronomy and Mathematics (PAM).

These research centres also made up the overall Physics submission in RAE 2008.

CAR has research strengths in the following areas: (i) searching for and characterising exo-planets, brown dwarfs and the lowest mass stars, (ii) star formation and resolved stellar populations in the Milky Way and Local Group, and (iii) high energy and extragalactic astronomy aimed at understanding galaxy evolution over cosmic time. Survey science is a cross-cutting activity relevant to all three main subject areas, and CAR staff currently lead several large-scale international surveys. 25.2 Category A staff are submitted.

CAIR undertakes interdisciplinary research across the Physics and Earth Systems boundary, addressing themes in (i) light scattering & radiative processes: fundamental theoretical and experimental research into particle light scattering and atmospheric radiative processes; (ii) particle instruments & diagnostics: exploiting outcomes of (i) in the form of specialist research instruments used by the academic atmospheric physics community, and by industry and government agencies concerned with particle/aerosol characterisation; (iii) atmospheric dynamics & air quality: dynamical modelling of physical atmospheric processes, from local to meso-scale, and their impact on tropospheric pollution. 7.8 Category A staff are submitted.

b. Research strategy

The university's overarching Research Strategy 2011–15 aims to achieve research excellence in specific areas that demonstrate the capability to create a dynamic culture and environment, raise the university's international profile, excel in impact, exploitation and dissemination, and develop the next generation of researchers. CAR and CAIR's research strategy has been shaped by these aspirations.

Background

CAR was established in 2003 following a university-wide review that identified astronomy research (which had been active at the University of Hertfordshire (UH) for more than thirty years) as a key internationally competitive area. CAIR was designated as a research centre in 2006, having been formed through the amalgamation of three cognate research groups that had similarly been active for more than two decades. Both CAR and CAIR achieved rapid growth up to 2008 and continued to raise the international profile of their research. This was reflected in the RAE 2008 outcome that placed UH Physics research 21st in the UK league table, the top post-92 university. Further evidence of research quality improvement has come, for example, from a report to *MNRAS* (*Monthly Notices of the Royal Astronomical Society*) noting that CAR astronomy in 2010 ranked 7th in the UK (15th worldwide) for citations of lead-author papers published in the journal in 2008–9. (In 2010, *MNRAS* had an ISI impact factor of 5.1).

Effectiveness of RAE 2008 strategy

The key elements of our research strategy specified in RAE 2008 were: to exploit opportunities that provided for further development and sustainability of research strengths; to ensure new resources

(including staff appointments) were targeted to complement and improve the balance of each centre's portfolio; and to capitalise on the co-location of CAR and CAIR to develop collaborative research in areas of common interest, such as in radiative transfer, atmospheric dust, and polarisation effects. These strategic aims have been largely achieved, as evidenced by increases in research income, Category A staff, PhD student numbers, and licences to commercial organisations wishing to exploit our research outcomes. Further detail is provided below.

CAR: A recent priority of CAR's strategy has been to make new appointments in nuclear astrophysics and extragalactic astronomy. This resulted in the appointments of **Rauscher** and **Kobayashi** who, with **Ryan**, developed the first of these themes. The addition of **Coppin** and **Kaviraj** to the extragalactic astronomy research staff has offset the departures of Granot and Jarvis. Furthermore, at a time when UK research councils have retrenched, the financial infrastructure of UH has continued to permit the funding of research fellows hired for their proven productivity and independence, and for their fit to CAR research strengths. The present complement is four and, together with grant-funded postdocs, they have been important in sustaining a lively and diverse postdoctoral community, improving the contact between academic staff and PhD students. The scheme will continue. CAR astronomers continue to take leading roles in a range of very large surveys that are starting to mature, particularly in Galactic/Local Group science.

CAIR: Through NERC consortium grants, EU FP7 projects and the support of overseas commissions for instrumentation, CAIR has significantly expanded its national and international collaboration base since 2008. This has been particularly true in areas relating to cloud microphysics and radiative transfer research where our theoretical and experimental developments in fundamental particle light scattering research have been widely adopted by international meteorological organisations. We have described this in our case studies on spatial light scattering, bioaerosols, and volcanic ash. In addition, we have significantly increased our involvement in and leadership of European (FP7) projects, especially in atmospheric dynamics associated with air quality and health. CAIR has enhanced the already substantial levels of technology transfer and commercial uptake of our particle analysis instrumentation in areas of increasing international importance, including cloud microphysics and climate change, pollution monitoring, bio-security, and occupational aerosol exposure.

CAR and CAIR joint ventures: Collaborative links between CAR and CAIR were specifically targeted in areas where the underlying science was of significance in both astronomical and terrestrial fields. In such cases, investments have been made to facilitate and accelerate this collaborative research. For example, our Polarimetry Research Laboratory (£1.1m SRIF3-funded) and Remote Sensing Atmospheric Observatory (£265k RCIF-funded) have been fully commissioned. The former addresses areas including new femto-second spectroscopic methods for remote detection of trace biological materials. The latter, co-located with the university's Astronomy Observatory at Bayfordbury, is now part of NASA's worldwide AERONET (Aerosol Robotic Network) and studies atmospheric phenomena of importance in radiative transfer modelling. Investment (£280k) has also been made in a joint CAR–CAIR high-performance computing cluster used for computationally intensive research ranging from atmospheric radiative transfer modelling and atmospheric dynamics through to CPU-intensive chemo-dynamical simulations and processing the many TB of data generated by the large surveys that CAR leads.

Future strategic aims and goals

Our current strategic goals are defined within the university's Research Strategic Plan 2011–15 and are focused on ensuring sustainability and strengthening our core research activities via targeted investment in new staff appointments and infrastructure, and exploiting opportunities to enhance our many international and national collaborations. In support of these aims:

- Several CAR staff have taken major roles in Square Kilometre Array (SKA) pathfinder instruments, such as LOFAR, ASKAP, Apertif and MeerKAT, to position for eventual SKA exploitation. The centre has also joined the UK consortium preparing to participate in the Large Synoptic Survey Telescope, expected to see first light in 2019.

- The School has joined the next phase of the South East Physics Network (SEPnet). The anticipated benefits are: raised profile in the recruitment of graduate students; efficiencies in graduate training; participation in a network-wide impact development programme.
- CAIR recognises that developments in air quality monitoring, pollution control, occupational and environmental aerosol assessment and related epidemiological studies, will continue to be transformed by intelligent networks of low-cost and ultra-low cost (<£10) personal sensors that exploit mobile phone and other ubiquitous technologies. CAIR already has patents and patent applications in these areas and has a strategic aim to be in the vanguard of these advances through appropriate resource deployment, commercial and academic collaborations, and recruitment of research staff in key areas of expertise.

It is envisaged that any new future staff appointments will favour the growth of CAIR and/or linked physics research, while CAR will be sustained by and benefit from continuing conversion of longer-term externally funded fellows to staff appointments (as exemplified by the recent confirmation of Geach's transfer to staff after his Royal Society URF expires in 2018).

c. People, including:

i. Staffing strategy and staff development

CAR and CAIR staff are the product of international recruitment, and we presently have graduate students from five continents. Since RAE 2008, the policy of growing staff numbers by replacing departing academic staff and recruiting additional new staff has been continued in line with the School's rising physics undergraduate population. **Kobayashi** replaced Fritze in 2011 (who had returned to Germany), while in 2012–13 **Kaviraj** and **Coppin** replaced Jarvis, who left to join Oxford University, and Granot, who took up a lectureship in Israel. As a net addition, **Rauscher** was also appointed during 2012–13.

New posts are advertised internationally, and the policy of converting five-year fellowships into open-ended contracts has continued as a means of retaining high-calibre staff: four current staff were offered their contracts whilst STFC or Royal Society five-year fellows (**Lucas**, **Hardcastle**, **Napiwotzki**, and **Sarzi**). From October 2013, Geach joins with a Royal Society URF on the same basis. **Kobayashi** joined from a fellowship at Mount Stromlo, Australia, and **Coppin** has arrived from McGill, Montreal. A reader-level appointment to CAIR, **Mueller**, has been made specifically to exploit the new investment in experimental AERONET remote sensing facilities at the Bayfordbury Observatory.

The university's central Research Grants Team supports researchers in all aspects of applying for funding, including budgetary accounting, contracts and intellectual property. It also runs information events, provides training in project management, and has put in place a compulsory 'second reader' system to enable experienced researchers to pass on their knowledge of what strong applications require. The university has approval processes for studies involving human participants and potentially problematic ethical issues relating to research, and is a full member of the RCUK Research Integrity Office.

The unit fully supports the university's equality and diversity principles across all relevant protected characteristics. All new staff to the unit receive mandatory equality and diversity training as part of their induction to ensure the delivery of considerate and inclusive services. The university is a member of the Athena Swan Charter. The School is working towards Juno Practitioner status, so as to embed practices that promote diversity. Since RAE 2008 there has been an increase in the numbers of entered female staff from five to seven, representing an increased fraction of the total staffing, and the present Director of CAR is female (Drew). Four staff are of Asian ethnicity, including the Director of CAIR (Sokhi).

Research Staff: The university implemented the Concordat to support researcher career development in April 2010, and later that year was one of the first universities to receive the European Council HR Excellence in Research Award, which it has retained after a recent award reassessment.

The Concordat is implemented through the mapping of our researcher development provision to the Researcher Development Framework and Statement. This ensures our researchers have an opportunity for training and career development in all four domain areas. The university has research student and staff fora at both university and research institute level, in order to engage the research community in crafting their development needs. These allocate resources such as, for example, additional HEFCE funding that enabled us to specifically target leadership development for researchers. The university participated in the 2010, 2011 and 2013 Careers in Research Online Survey (CROS). The 2013 results show that in 12 out of 18 categories UH responses are above or more positive than the national average. The survey provides valuable feedback to the unit on its staff development strategy. Annual small grants schemes (<£25k) are run specifically for early career researchers.

All postdoctoral researchers are appraised annually, along with tenured academic staff, which ensures that they too receive ongoing career mentoring. They are also encouraged to access academic staff development programmes, provided centrally, as well as the Generic Training for Researchers Programme. The central provision includes CPD courses in career management, leadership and management, personal effectiveness, specialist research skills and techniques, PhD student supervision, and public engagement. There is a Research Staff mentoring scheme specifically aimed at early career researchers, and all staff are encouraged to participate in our extensive outreach programmes under both Research Council and Royal Society support.

ii. Research students

Every year, CAR has recruited three or four STFC-funded graduate students, plus two or three typically EU/overseas nationals funded from the School's QR account (currently the centre has students from a range of EU states and from Turkey, Chile and South Africa). CAIR typically recruits up to three studentships funded by NERC, commercial sources or QR. Total PhD student numbers in CAR and CAIR have essentially doubled since RAE 2008, now totalling thirty-seven full-time and three part-time students, compared to twenty and two respectively in RAE 2008.

We recently lengthened the funding duration for all PhD studentships to 3.5 years, in line with Research Council permitted levels, to enhance the benefits accrued from the student's training and development experience. Every student has a supervision team comprising a principal supervisor and at least one second supervisor. This team meets at least three times a year to monitor student progression, ensuring that:

- The student submits an annual report to the Research Degrees Board, providing a summary and reflection on work done and a plan for the following year. At the end of Year 1 and Year 2, this process incorporates a viva with two members of staff – one of whom is not a member of the student's supervision team.
- The student meets once a year individually with the Postgraduate Tutor, providing a formal opportunity to identify general/pastoral issues that may need attention.
- The student delivers a research centre-wide talk once each year.

All PhD students undertake the comprehensive programme of Generic Training for Researchers (GTR) offered by the university's Doctoral College. This programme underpins students' research work by providing knowledge and skills that will help them to progress successfully through their research degree studies and subsequent career. The programme, open to staff as well as students, covers key areas of supporting studies, including the process of research degrees, personal development and employability. A GTR Summer School runs each year, usually in September, for part-time research students. As part of annual progression, students are required to identify the elements of the GTR programme attended so that verification of essential components, such as those required by external funders, can be established.

In addition to the above, all first year students are expected to attend a lecture course given by research-active staff that runs from October to May (two hours per week) and covers both the academic and practical aspects of modern research. All graduate students are also assigned to self-managed journal clubs to ensure they remain in contact with the literature. These are mixed

topic groups led by postdoctoral staff. CAR and CAIR also run a one-year masters-by-research programme, open to self-funding students. This attracts up to five students per annum. Those demonstrating an aptitude for research use it as a bridge to a successful PhD application to a broad range of UK HEIs.

The university participates in the Postgraduate Research Experience Survey (PRES). Physics has consistently performed well: in 2013 we scored at well above the national average for all core aspects of the graduate student experience (based on returns by 70% of our students).

d. Income, infrastructure and facilities

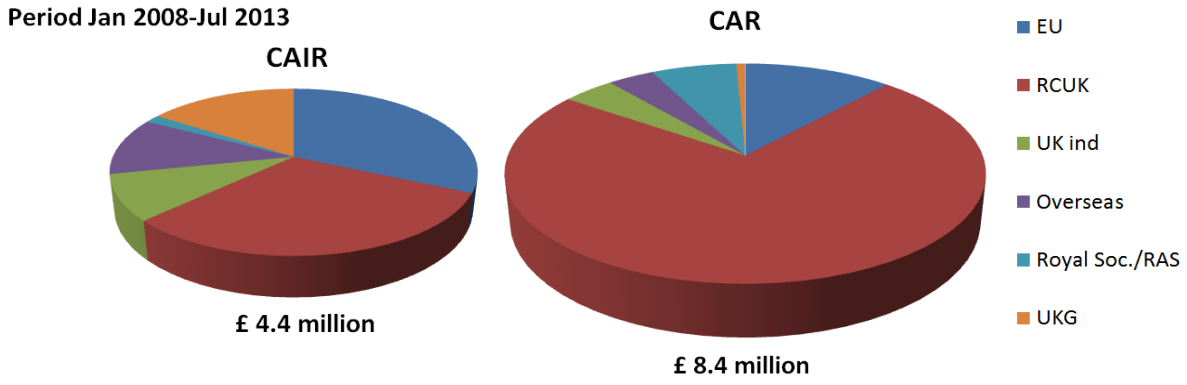
Income

Physics research income from grants and contracts has grown continuously over the past decade in terms of both announced grant value and central facilities usage, as shown below.

Period to:	Category A Staff	Announced Grants	Central Facilities	Total
RAE 2001	20	£4.2m	£3.8m	£8.0m
RAE 2008	28	£9.2m	£17.4m	£26.6m
Jul 2013	31.2	£12.8m	£9.97m + £7.58m*	£30.38m

* The second figure is an estimate of in-kind income associated with competitively awarded public surveys and Principal Investigator time not captured by STFC data (see below).

For both CAR and CAIR, the dominant source of grant income has been the Research Councils, principally STFC, NERC and EPSRC. EU FP7 awards have also become an important and growing source of grant funding. The pie-charts below show announced grants by source for CAIR and CAR over the period January 2008–July 2013.



CAIR also received significant funding from UK Government (UKG, especially the Defence Science & Technology Laboratory, Met Office, Home Office and DEFRA) and from overseas sources via the commissioning of research instruments by organisations such as NASA, NCAR, the Japan Agency for Marine-Earth Science and Technology, and the Karlsruhe Institute of Technology.

Our total facilities in-kind income reported by HEFCE for the period is £9.97m. This incorporates CAR's regular use of the ground-based facilities operated by the European Southern Observatory (ESO),as well as Herschel, the Hubble Space Telescope and XMM, in space. For CAIR, NERC funding has provided access to HECToR computing services for atmospheric-process modelling. The table below shows *additional* in-kind income estimated at £7.58m, which results from (i) CAR-led public surveys, awarded competitively, that are not captured by STFC in the usual way and reported to HEFCE; (ii) principal investigator time allocations awarded competitively on facilities funded by other nations without a UK contribution.

Time	Facility	Estimated value
1718 hours	ESO public surveys: VMC, VIDEO (to 9/12) and VPHAS+	£1,800k
384 hours	JCMT legacy survey, SASSy	£540k
660 ksec	NASA's Chandra X-ray Telescope	£4,400k
114 hours	VLA, EVLA radio telescope allocations	£195k
397 hours	Mopra, ATCA radio telescope allocations	£238k
11 nights	Subaru (Japan), SALT (S Africa) optical telescope time	£410k
	TOTAL	**£7,583k**

Infrastructure and facilities

Over the past five years, Physics research has benefited from significant financial investment in specialist laboratories and enhanced research equipment provision.

Source of funding	Purpose	Investment
HEFCE SRIF3[1]	Commissioning Polarimetry Research Laboratory	£1,100k
HEFCE UCIF[2]	Computer cluster and temp. controlled environment	£280k
HEFCE UCIF	Atmospheric Analysis Research Laboratory	£390k
HEFCE UCIF+QR[3]	Remote Sensing Laboratory, Bayfordbury	£265k
HEFCE QR[3]	Laser Scattering Research Laboratory upgrade	£60k
UH Small Grants[4]	Various items of specialist research equipment	£102k
	TOTAL	**£2,237k**

[1] *HEFCE Science Research Investment Fund 2006–8.*
[2] *HEFCE University Capital Investment Fund 2008–11.*
[3] *UH policy is for the majority of QR income to be returned to the research areas that generated it, for use in infrastructure improvements, graduate studentships, etc.*
[4] *In 2011, UH introduced a small grants scheme under which pump-priming support (up to £25k) could be provided for research equipment, infrastructure improvements, etc., to enhance the research base. CAR and CAIR researchers were successful in six such bids.*

As a result of the investment outlined above, CAR and CAIR's ~400 sq.m. of dedicated research laboratories have been equipped to the highest standards for experimental research and instrumentation development. Facilities now include:

- A **high-performance computer cluster** supporting both astronomy and theoretical light scattering modelling research.
- A **Polarimetry Research Laboratory** with class-leading optical and optoelectronic technology, including facilities for femto-second laser spectroscopy; two **Laser Scattering Research Laboratories** with state-of-the-art instrumentation for light scattering research and particle optical characterisation; and two **Instrumentation Research Laboratories** equipped with precision machining and fabrication facilities (used primarily by CAIR Particle Instruments Research group).
- A **JOEL scanning electron microscope** suite with Energy-dispersive X-ray Spectroscopy.
- **Stratasys 'Dimension Elite'** and **'Objet 30' high-resolution 3D-printers** for rapid functional prototyping of precision plastic parts used in experimental research and instrument/sensor development.
- The **Bayfordbury Astronomy Observatory**, which is both a teaching and a research facility centred on seven domed optical telescopes (up to 40cm dia), a single-dish radio telescope and a three-element radio interferometer, and an outreach showpiece attracting group visits as well as up to 400 members of the public to each of six open evenings every year. Five telescopes are now automated and support queue observing enabling, e.g. follow-up time-series optical photometry programmes, aiding aspects of CAR's research goals.

- The **Bayfordbury Remote Sensing Observatory** (http://strc.herts.ac.uk/cair/bayford.html), a NASA AERONET site equipped with micropulse lidar, robotic sun photometer, an all-sky camera, and two polarimeters (an infra-red spectropolarimeter and an ultra-sensitive sun polarimeter). The latter is a portable version of the PlanetPol polarimeter (previously used in the detection of the alignment of atmospheric dust), capable of measuring fractional polarisation down to one part per million.
- An **Atmospheric Research Analysis Laboratory** equipped with Energy Dispersive X-Ray Fluorescence for multi-elemental analysis, Gas Chromatography with Mass Spectrometer, Ion Chromatography, Inductively Coupled Plasma Spectrometry and number of traceable air quality sampling instruments.

CAR has led the university's £125,000 buy-in to the 'Goonhilly Earth Station' redevelopment of the iconic Goonhilly site in Cornwall, where a 30m dish will be refurbished for astronomy research. This is being overseen by the Consortium of Universities for Goonhilly Astronomy (CUGA), which represents the founder-member HEIs of Hertfordshire, Oxford, Leeds and Manchester.

As well as occupying dedicated research laboratories and office accommodation, CAR and CAIR share a 'Discussion Room' (68 sq.m) equipped with easy chairs and projection facilities. This is used daily for impromptu seminars, presentations and 'coffee chats', and regular weekly events such as journal clubs. A video-conferencing room is also shared.

Through some of their international collaborations, CAR astronomers access a range of world-class facilities beyond those supported by STFC or ESO/ESA subscriptions. These include LAMOST in China, and time on the full range of Chile's major telescopes (exo-planets, via Shanghai Astronomical Observatory and Universidad de Chile); the MMT in Arizona (Galactic Plane science, via Harvard-Smithsonian Center for Astrophysics); and the VLA in New Mexico (nearby galaxy surveys, via NRAO, the National Radio Astronomy Observatory). CAIR's external facility access, made possible by NERC and EU funding, has included the Facility for Airborne Atmospheric Measurements (FAAM); the LACIS cloud chamber, Institute for Tropospheric Research, Leipzig; and the AIDA cloud chamber, Karlsruhe Institute of Technology.

e. Collaboration or contribution to the discipline or research base

Staff linked to the unit report the following activities 2008–13:

(Numbers in brackets distinguish the international component of the total number cited.)

Invited conference talks	104 (80)
Invited seminars	125 (54)
Committee/panel memberships	83 (49)
Science organising committees	58 (38)

Conferences hosted and/or organised:

- In September 2008, the 11th International Electromagnetic and Light Scattering Conference (http://www.els-xi-08.org/) came to UH, jointly convened by **Hough** (CAR) and **Kaye** (CAIR).
- The 2009 National Astronomy Meeting, held jointly with a European JENAM, was hosted by CAR. This 'European Week of Astronomy & Space Science' (EWASS) was an unprecedented success, attracting 1,300 participants, a figure as yet unsurpassed.
- CAR hosted the STFC Introductory School for new astronomy PhD students in September 2008.
- CAIR organised and ran the first ever Urban Air Quality conference at UH in 1996 (chaired by **Sokhi**) and has organised eight subsequent biennial conferences at locations throughout Europe (http://www.urbanairquality.org). The latest (Athens 2012) attracted over 250 delegates and is a leading research forum for air quality, climate and health.

CAR principal investigators of major science collaborations are:

Cioni	VISTA Magellanic Clouds Survey (VMC) – a NIR photometric public survey for ESO.
Drew	INT/WFC Photometric Hα Survey of Northern Galactic Plane (IPHAS). VST Photometric Hα Survey of Southern Galactic Plane (VPHAS+) – an optical public survey for ESO.
Lucas	UKIDSS Galactic Plane Survey (GPS)
Pinfield	EU FP7 Network 'Rocky Planets Around Cool Stars' (RoPACS), 2009–12 Co-PI: UKIRT Wide Field Camera Transit Survey (WTS)
Thompson	SCUBA-2 All-Sky Survey (SASSy)

Apart from RoPACS, all of the above are ongoing long-term international observing programmes.

Highlights of other collaborations:

The **exoplanets and brown dwarf** group is engaged in a number of highly productive collaborations: **Lucas** is a member of the Kepler consortium and **Jones** is involved in the acquisition and exploitation of multiple radial velocity sets (AAT, HARPS, Keck, Magellan, TNG) enabling the detection of habitable-zone planets around nearby stars. Part of the activities in this area are funded by an EU exchange programme, IPERCOOL (2010–14), which provides for staff and student exchanges with the Shanghai Astronomical Observatory, Brazil's Observatory Nacional and INAF's Astronomical Observatory of Torino.

In **high energy and extragalactic astronomy**, our staff have played a very active role in the Herschel-ATLAS consortium, taking the lead in 8 of the 36 science demonstration papers and 4 out of 23 Phase 1 papers. **Brinks** continues his prominent role in the THINGS/LITTLE-THINGS consortium that has made significant use of the Very Large Array for the study of nearby star-forming galaxies. **Hardcastle** is the LOFAR UK deputy project scientist, and is active in the international teams responsible for the surveys and transients key science projects. He is also the UH representative on the consortium developing the Cerenkov Telescope Array.

In CAIR, **Sokhi's Atmospheric Dynamics and Air Quality** group was the first to implement and adapt the complex model WRF/CMAQ for UK air quality research applications. Through collaboration with the USEPA, modelled predictions of regional air pollutants over Europe and North America are being analysed to improve future generations of modelling systems. With the Met Office (as part of the FP7 project MEGAPOLI), **Sokhi's** group also coupled WRF/CMAQ to the global climate model HADGEM–ES2 to assess the impact of climate change on future air quality over the UK. Sokhi is an established academic visitor with the Finnish and Danish Meteorological Institutes, and with TNO in the Netherlands.

Ulanowski's Light Scattering and Radiative Properties group has long-standing collaborations and two-way exchanges with atmospheric research groups at Karlsruhe Institute of Technology, ETH (Zurich) and the Institute of Tropospheric Research (Leipzig). Other collaborators include the University of Illinois, the University of New South Wales, Sydney (with whom we discovered the phenomenon of atmospheric aerosol alignment), and the Technical University of Lodz. One of the most fruitful collaborations is with the UK Met Office. Results obtained by **Ulanowski** and **Hesse** have been used to verify light scattering parameterisations for ice clouds implemented in the Met Office's Global Circulation Model.

Finally, CAIR's **Particle Instruments & Diagnostics** research group (led by **Kaye**) has established enduring international collaborations with leading atmospheric physics researchers who have adopted the group's specialist particle analysis research instruments – since 2008, more than forty journal publications and conference presentations have been produced by non-UH researchers in which our 'SID' (Small Ice Detector) aircraft probes or DSTL-funded 'WIBS' bioaerosol spectrometer instruments have been used. Indeed, the field success of WIBS has led to their commercial production being licensed to atmospheric instrumentation manufacturer DMT Inc., Boulder, USA (http://www.dropletmeasurement.com/).

Current editorial board membership and editorships:

Brinks	*SpringerPlus* (Physics and Astronomy section)
Drew	*Monthly Notices of Royal Astronomical Society* (*MNRAS*)
Hough	*Journal Quantitative Spectroscopy & Radiative Transfer* (*JQSRT*)
Napiwotzki	*Astronomy & Astrophysics* (*A&A*)
Sokhi	*Journal of Air and Waste Management Association* (USA)

Highlights of participation in committees, peer review and other community service:

Brinks	2008–9	Chair, ESO Observing Programme Committee
	2006–12	Secretary, European Astronomical Society
Chrysostomou	2008–12	Associate Director, James Clerk Maxwell Telescope
Drew	2009–10	Chair, ASTRONET review of Europe's mid-sized OIR telescopes (acronym: ETSRC)
	2009–11	Vice President, Royal Astronomical Society
	2013–15	Member Scientific Advisory Board, FINCA, Finland
Gledhill	2011–	Member of management committee of COST action MP114 ('Polarisation . . . Solar System and beyond')
Hough	2008–10	Chair, Isaac Newton Group International Board
Ryan	2009–	Member, Scientific Advisory Board for University of Heidelberg Zentrum fuer Astronomie
Sokhi	2009–	Honorary Research Director and Council Member of National Society for Clean Air (NSCA).
	2013–	Member DEFRA Air Quality Modelling Steering Group
Ulanowski	to 2010	Member, International Aerosol-Cloud Interactions Virtual Institute (Helmholtz-Gemeinschaft).

A majority of CAR staff regularly review STFC grant and fellowship applications, with some serving terms on its various peer-review bodies. For CAIR, **Chemel**, **Kaye**, **Sokhi** and **Ulanowski** have been members of the NERC and EPSRC Peer Review Colleges. Staff have reviewed for more than 40 refereed journals, including the following high-impact journals: *Science*, *Nature*, the top astronomy journals (*ApJ*, *MNRAS*, *A&A*, *AJ*), *Physics Review Letters*, *Atmospheric Chemistry & Physics*, *Optics Express*.

Prizes and fellowships awarded or held during the period 2008–13:

Coppin	L'Oreal (Canada) Women in Science Research Excellence Fellowship 2011–12
Geach	Royal Society University Research Fellow 2013–18
Hardcastle	Royal Society University Research Fellow 2002–10
Hesse	Most Valued Reviewer 2011, *J. Quantitative Spectroscopy & Radiative Transfer*
Hough	Herschel Medal of the Royal Astronomical Society, 2010
Kaviraj	Winton Capital Award of the Royal Astronomical Society, 2011
Mueller	Royal Society Wolfson Research Merit Award, from 2013; NASA Group Achievement Award, 2013 NASA Group Achievement Award – DIAL/HSRL Team, 2013
Sarzi	STFC Advanced Fellow 2008–13
Stevens; Lucas; Sarzi	Group Prize of the Royal Astronomical Society (SCUBA team 2009; UKIDSS 2012; SAURON 2013)
Wright	Royal Astronomical Society Postdoctoral Fellow 2012–15