Institution: University of Kent

Unit of Assessment: 8

a. Context

Chemistry at Kent is situated within the multi-disciplinary School of Physical Sciences (SPS), a dynamic research-focused School with 32 full-time academic staff. The School's research is arranged into four main groups of which the Functional Materials Group (FMG) is the largest, with 17 research-active staff across materials chemistry and physics. The School's other groups are: Applied Optics, Astrophysics and Planetary Science and Forensic Imaging.

The School's is structured to encourage interdisciplinary working and recognizes that the greatest opportunities for impact lie in tackling problems synergistically.

The impact of the Functional Materials Group, which constitutes this Chemistry submission, is focused on three main user groups:

1. **Businesses** directly involved with materials (as producers or users) where there is a need to understand material properties from a fundamental science base. The impacts are clustered around commerce, material production, and health science (see Crystals for National Security and Nanoparticles for Biomedical Applications case studies).
2. **Non-industrial organisations** where there is a need for specific project-based expertise in an aspect of materials chemistry (see Mary Rose case study).
3. **Education**: schools and the public through an extensive, proactive outreach programme and public engagement.

The group draws on the University's central services to support development of its impact, including the Kent Innovation and Enterprise unit (KIE).

b. Approach to impact

Stakeholder Engagement

The FMG's approach to impact has been to focus on the three user groups described above. A central plank of this approach is the Schools membership of the South East Physics network (SEPnet-2), which includes chemists alongside physicists, and enables Kent to share good practice in outreach and employer engagement across the region (see Crystals for National Security case study). We meet with SEPnet's industrial advisory panel biannually where we receive advice on building industrial partnerships and gain an improved understanding of maximizing the impact of industrial collaborations. The School's outreach activity is supported by a full-time staff member who works on SEPnet-2 and a half-time post whose role includes the promotion of the School's research and expertise within the UK.

School Support for Impact

The School expects all of its researchers not only to see impact as a result of their research, but as an embedded activity. The School's Workload Allocation Model (WAM) includes a generous time allocation for industrial partnerships, industrial contracts, and knowledge-transfer activity (typically 10 to 60 hours per annum dependent upon type and size of contract/activity). Time provision is also made in the WAM for the direct supervision of students and PDRAs (150 hours for a PhD and 50 hours for a PDRA per annum) associated with industrial and organisational grants outside of the research councils. Research leave for academic staff, which may be from a few weeks up to a year, enables staff to develop research, enterprise or foster the impact of their work. Individuals who have benefitted from this since 2008 include Strange and Holder. In academic year 2012-2013, 295 hours were allocated to six academics within FMG for the preparation of industrially collaborative proposals. In addition the Head of School has discretionary funding to act responsively and take advantage of opportunities as they arise. In 2008 the School appointed an outreach officer who combines a recruitment role with promoting and engaging with industrial partners.

University Support for Impact

The University provides significant support to assist FMG in achieving impact, including:

- Patents: the University provides the administrative assistance necessary to enable researchers to obtain patents for inventions that have development and marketable potential.
- Investment: the University provides support through direct investment in impact-driven research. For example, FMG was recently awarded additional funding of £75k to develop research into metal-free battery technologies [Alfredsson]. The University also provides investment in spin-out companies.
- Media: the University has a dedicated media office and science results of potential public interest are widely disseminated through the local and national media. Many SPS members provide national and international media interviews and information. (e.g. Strange on BBC's The One Show, May 2013.
- Innovation Vouchers: Funding is available (via KIE) to support smaller project collaborations between SMEs and the University with Kent providing a 50% contribution towards the cost. This stimulates collaborations and provides opportunities for fostering longer term partnerships.
- KIE staff provide support by proactively searching for research partners introducing academics and potential business partners, and disseminating calls for expertise and assistance from companies and organisations. Examples include the recent MAST-STC and AFSOR calls for defence-related research; the latter including a full day meeting between FMG members and a representative of Air Force Office of Scientific Research (May 2013).

This supportive environment has allowed FMG to maximize the impact of its work beyond the HE sector, as our case studies demonstrate. Other examples include:

Industrial CASE studentship with Merck Chemicals. Holder was approached following a 2006 paper (Polymer 2006, vol 47, p5701) by Merck which had an interest in developing and exploiting the materials described for their application in electrophoretic displays. This led to CASE studentship for the period 2010-2014 which has already resulted in a joint Kent-Merck patent application ('Particles for Electrophoretic Displays' files with the European Patent Office, April 2013). The development of the patent application was supported by the University through KIE.

Innovation Voucher with Megger Instruments Ltd. Electronics company Megger was unable to solve a problem in the application of new electronic components. FMG devised a research programme assisted by KIE and supported by the University's Innovation Voucher Scheme (50% cost contribution). Megger's Project Manager, Daniel Hammett, said "We followed your recommendations and went for highly filled resins… which worked very well. So, in short, we are very happy that you were able to fill a knowledge gap that allowed us to ask the right questions of our suppliers and get ourselves on a successful track."

c. Strategy and plans

The University of Kent's Strategic Plan has 'enabling and valuing innovation, enterprise and creativity', as one of its six key goals. The School of Physical Sciences has responded to this with a strong emphasis on impact across all elements of its research and planning. In the four years to 2013 the School's contribution to the University's total Innovation and Enterprise income has risen from 4% to 15%. In 2012 the School appointed a Director of Innovation and Enterprise (DoIE) to build on this success, to catalyse innovation and to draw on the peer network across the University to develop further the School's impact work. The DoIE is responsible for monitoring and evaluating the impact of FMG's work, as well as for identifying new opportunities.

The School's impact strategy is overseen by its Research and Enterprise Committee. Each

member of staff is interviewed by the chairman of the committee and Head of School on an annual basis to discuss their research performance and plans and the impact of their work. For socially, commercially or culturally relevant research, impact is measured by the number and size of contracts (spanning a range from broad fundamental research to specific issue research and development consultancies), patents and feedback from companies or organisations.

The FMG's strategy for developing impact further includes three objectives:

To seek new industrial partnerships: A number of FMG academics are included a new partnership with DSTL Materials and Structures Science and Technology Centre (see REF5). An immediate consequence of the partnership has been the allocation of an industrial CASE studentship from DSTL with Alfredsson (on new battery technologies) and a joint submission from Holder with the School of Engineering and Digital Arts (Kent) for CDE funding (on materials for RFID sensors). We will seek to maintain and build on this existing partnership and to seek new collaborations with industry during 2013-2018.

To further develop our consultancy services: The School's new Analytical Suite provides an ideal platform for consultancy services. Recent consultancies within FMG to industrial users utilising the analytical suite have included Cadbury's/Kraft Foods (Reading and USA), Alchimica Chemicals (Athens, Greece) and Ametek, Inc. (New York, USA). We will continue to publically advertise and expand on this service during 2013-2018.

To achieve impact internationally: The School – including FMG - plans to achieve impact beyond the UK. As the UK's European university, Kent is proud of its international outlook and actively seeks collaboration with European partners (see Nanoparticles for Biomedical Applications case study). A key strategic plan is to more closely involve and integrate energy materials research in FMG into the European industrial research community through the EU Network of Excellence ALISTORE (see REF 5, section d, Sustainability). ALISTORE consists of 20 leading laboratories (both academic and industrial) across Europe working on lithium ion batteries. Key members in the past have been Alfredsson, Chadwick, and Mountjoy**,** but membership has recently been expanded to include staff and Arnold, Holder and Sayle.

d. Relationship to case studies

Crystals for National Security and Biomedical Diagnostics: This is a knowledge-transfer activity and an example of how FMG benefitted from the support available to maximize the impact of its work. The introduction came from the University's Innovation and Enterprise unit; the School's facilities were used as the location for the crystal research; and SEPnet was a vehicle for promotion of the research beyond the academic audience.

Nanoparticles for Biomedical Applications: An industrial collaboration, with a health application, the case study also exemplifies the School's European-looking approach.

Mary Rose : Protecting our Heritage through Chemistry: FMG has been involved in supplying scientific expertise and research for the preservation of the Mary Rose since 2007. This case study demonstrates how full access to all the School's facilities, and project support via a studentship (Aaron Berko) helped FMG achieve impact with non-industrial organizations.