

Research Assessment Exercise 2020

Impact Overview Statement

University: The Hong Kong Polytechnic University

Unit of Assessment (UoA): 9 Chemistry

Total number of eligible staff of the university in the UoA: 15

(1) Context

We understand that research activities have greater value when they benefit the society that surrounds us and that we grow within. Cohabiting with another UoA (Biology) under one Department, focusing on 3 developed research themes (Materials and Sustainable Chemistry, Medicinal Chemistry and Chemical Biology, and Food Safety and Technology), we create impactful research via active collaborations with biologists, industry, and government. By proactively publicizing our research achievements, providing the general public with broad and practical information, and targeting our research direction in coordination with government and industry needs, we have been exploiting our unit's knowledge and expertise to serve a wide variety of beneficiaries, ranging from the general public (over 5.5M viewers/listeners of TV/radio programs), to secondary students (about 3,000 students from over 20 schools), to over 10 food and pharmaceutical companies (e.g. *New Beta Innovation*), to Hong Kong government departments (e.g. Food and Environmental Hygiene Department).

(2) Approach to impact

Industry and Government – we use several mechanisms to support our staff to seek and develop partnerships with relevant companies and government departments. **1) Our *Drug Development Platform* and *Food Safety & Technology Research Center (FSTRC)*** enable us to support impactful research projects and postgraduate studentships with departmental and university funding (*Departmental Research Fund, Dean's Reserve funding, Projects Of Strategic Importance* funding by the University etc.), which leverage further large scale donations and additional government funding (from both Hong Kong and Mainland China) as well as consultancy work with international companies (e.g. *Xianhong Science Ltd.* and *New Beta Innovation*); **2) Our staff receive *entrepreneurship training, support for patents, licensing* and *seed funding* through PolyU's *Institute of Enterprise (IfE)* and the *Innovation and Technology Development Office (ITDO)*; **3) Our performance in *international invention competitions*** generates publicity and local industry interest, e.g. *K.F. Yung's* biofuel project, which won Grand Prize and Gold Medal Awards at the *43rd International Exhibition of Invention of Geneva* in 2015, has stimulated a collaborative project with local company; **4) We proactively partner with industry and government agencies to *secure collaborative funding*** such as *Innovation & Technology* funds, e.g. *L.Y.S. Lee* collaborated with *Fraunhofer* (Germany) and the *Nano and Advanced Material Institute Ltd.* on Li ion battery lifetime prediction and enhancement methods developed with industrial partner *Golden Peak Industries Ltd*; **5) We *develop relationships with new user organizations through student placements***, which can lead to collaborative research, e.g. *The Food Testing Lab of Guangdong Inspection and Quarantine Technology Centre* has been providing our students with intensive training and practical experience regarding food testing approaches and procedures. We have developed this interaction into a research project led by *M.K. Wong* on developing fluorescent formaldehyde detection probes; **6) We *actively engage with government departments*** for whom our research is of interest. Since September 2017, *Z. Yao's* research on 'used oil' has provided robust and specific guidance for the Hong Kong government's *Food and Environmental Hygiene Department*, and his new "Guidelines on good practice of using frying oil" are expected to be in effect from the end of 2019.**

Media, public, and schools –In collaboration with the Communication and Public Affairs Office, our unit has actively publicized research achievements directly impacting public interests. During this

assessment period, 5 PIs' research works with broad implications were reported by local news media, in more than 50 articles (*South China Morning Post*, *Apple Daily*, *Oriental Daily News*, *HK Economic Times*, etc.) and over 40 radio and TV interviews (*RTHK*, *TVB*, *HK Cable TV*, and *DBC HK*), together covering more than 80% of Hong Kong's 7 million population as well as the Guangdong area of China. In 2015, *Z. Yao*'s research on 'used oil' explaining better frying practices for minimizing potential health issues was published in multiple newspapers. In radio interviews, we presented our nanochemistry research's relevance for health products, such as masks and medicines. Since 2017, our unit has organized annual 1-day "Chemistry, Works!" workshops for more than 60 distinguished F5 students from local secondary schools. This workshop teaches students about the social impacts of our research and aims to inspire them to follow chemistry careers. We also organize annual Summer Camps for secondary students (80 students on average) and visits for over 10 secondary schools engaging over 450 participants. In the past 6 years, we have hosted 14 mini lectures for local secondary students (with nearly 1000 participants) and 3 Nobel Laureate Lectures for the general public (engaging around 950 participants).

(3) Strategy and plans

We continue our strategy to support basic and applied research generating societal impacts through publicity, consultations, and licensing. Our Department's unique structure allows continuous and intimate interactions between biology and chemistry leading to interdisciplinary and impactful projects through active collaborations. For example, the *FSTRC* established in the unit connects biologists and chemists in numerous research projects involving contemporary food research and traditional Chinese medicine development. This center also plays a key role in bridging our research to industry and society. Our Departmental Advisory Committee with 6 industry members and 2 HK government members also provides guidance on industrial and societal needs for further impactful research activities. Our strategy and plans to maximize and sustain impact for the next 6 years are to:

- Continue and expand our outreach activities engaging the general public and students, for example, Nobel Laureate Lectures and Mini Lecture Series.
- Develop further close industrial partnerships to ensure research activity relevance and to continue to address society needs and industry challenges through collaborative projects by engaging stakeholders early in the research process, e.g. through open-ended collaboration seminars, yearly workshops, and regular industrial site visits organized by various research centres.
- Align our research direction with 2 of the HK government's major initiatives - *Biotechnology* and *Smart City* - through collaboration among research groups in the unit. For example, bio-compatible functional nanomaterials are being developed for cancer treatment and bioimaging as a collaborative project between *Material and Sustainable Chemistry* and *Medicinal Chemistry and Chemical Biology* research themes.
- Identify relevant priorities of research impact via our *Annual Research Monitoring System (ARMS)* to provide institutional support for facilities (lab space, instruments, etc.). For example, in 2019, *T.W. Lo* was supported to buy instruments for investigating the local atomic structure of materials (X-ray scattering and diffraction instrument with pair distribution function) in recognition of its high importance in materials research, including smart energy storage and functional nanomaterials.
- Include research impact in the annual appraisal exercise and promotion of academic staff in order to cultivate a culture of research impact.

(4) Relationship to case studies

Our impact case study on nanoparticle-based ink technology to prevent counterfeiting and tampering provides clear evidence of our commitment to maintaining close industrial partnerships to ensure research activity relevancy. This is an example of how our efforts to understand industry needs and work closely with companies can lead to successful and meaningful change, in this case in the Chinese food and beverage market.