Research Assessment Exercise 2020
Impact Overview Statement

University: City University of Hong Kong
Unit of Assessment (UoA): 9 (Chemistry)
Total number of eligible staff of the university in the UoA: 23

(1) Context

The UoA9 in the University lies within the Department of Chemistry (the Department). There are 23 eligible academic staff in this UoA. The Department was retitled from "Biology and Chemistry" to Chemistry in July 2017. Due to the Department's unique history, this UoA's research aims to address fundamental science challenges in chemistry, biology and environmental science. Our research has environmental, public policy and societal impact. (Figure 1). These impacts include: the environmental benefits resulting from the risk management of per- and polyfluoroalkyl substances in aquatic systems; the promotion of a global conservation profile for the horseshoe crab; international policy and legislative changes that have emerged from the creation of sensitive methods of analytical detection of aquatic fluoroalkyl substances; the creation of a standard test model for environmental impact assessment, using the medaka marine fish model; public outreach benefits arising from educating secondary school students, notably via forensic science training programmes and hands-on involvement in horseshoe crab rearing.

(2) Approach to impact

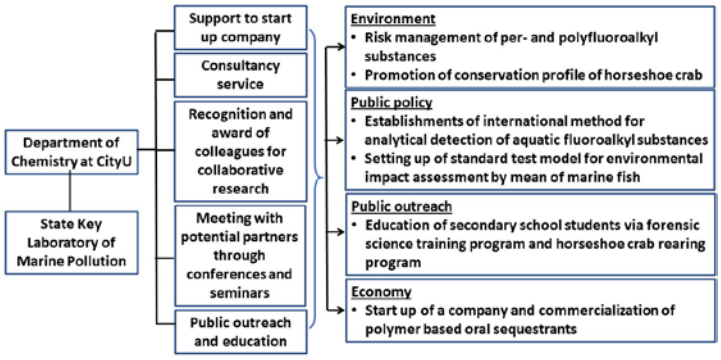

Figure 1 : Impact structure at CityU Chemistry

The Department has synergistic collaborations with the State Key Laboratory of Marine Pollution (SKLMP), and aims to promote interdisciplinary research activities and leverage resource. The SKLMP was jointly established by CityU and the Chinese Ministry of Science and Technology in 2010, in partnership with the State Key Laboratory of Marine Environmental Science at Xiamen University. The SKLMP is dedicated to the development of innovative chemical, biological and engineering technologies for the early detection, assessment, prediction and control of pollution impacting the marine environment. Two impact cases: (i) risks management of per- and polyfluoroalkyl substances (Paul Lam) and (ii) Marine medaka fish and horseshoe crab as models for environmental and ecosystem health (Richard Kong and SG Cheung) have been nurtured and developed with the combined support of the Department and SKLMP.

(3) Strategy and plans

We encourage colleagues to apply for collaborative research grants by providing financial support to the research proposals that have been shortlisted for final submission. As an example of an interdisciplinary collaboration that is resulting in commercial impact, a major polymer based oral sequestrants project has been supported involving colleague Vincent Ko with Sunny Hei Wong (a clinician-scientist at Chinese University of Hong Kong), working together with Claves Life Sciences Ltd. (Hong Kong; a member of the Aptorum group). This project has developed non-absorbable polymers and used them as orally administered sequestrants for targeted microbiota metabolites in the intestinal tract, leading to reduced systemic absorption through the intestinal epithelium and increased excretion in stool. The team has secured a start-up contract research grant (total approved amount in HKD, same below: $0.98m, 2017) and an Innovation and Technology Fund ($6.4m, 2019). The invention has been filed for a patent application (US pat appl. number 62/527,833, 2017). With the support from Department, the team plans to commence the scale-up of production, develop good laboratory practice toxicology tests, and start GMP Production after the initial project completion.

They will subsequently file an Investigational New Drug application by the end of 2020, seek to gain support for clinical trials (phase 1 to 3), and eventually to commercialize the invention. An income sharing agreement for each phase of the commercialization between Claves Life Sciences Limited and City University of Hong Kong was signed in 2018. The commercial impact of this case is developing and will be reported in the next RAE. The effort of establishing collaborative research work and conducting consultancy service are rewarded by the University's Performance-based Pay Review scheme, in which academic staff's annual pay rise is adjusted in accordance with success in securing a collaborative research grant or the completion of commercial consultancy service. The criteria and standard in the scheme, consented from all academic staff, are reviewed annually by Departmental Performance Assessment Committee chaired by Head. To facilitate meetings between colleagues and potential partners, the Department has invited over 200 speakers giving seminars and supported to organize 7 international conferences/symposia at CityU in the RAE period.

Commercial Impact: The University's Knowledge Transfer Office (KTO) is also in charge of knowledge transfer development and ensures that the knowledge, including technology, know-how, expertise and skills, are effectively translated and judiciously transmitted to society. The office aims to ensure that each outcome, whether commercially or non-commercially oriented, serves to enhance the societal or economic wellbeing of the community both in Hong Kong and internationally. Research projects with potential commercial impact are exemplified by those funded under the Innovation and Technology Fund (ITF) scheme (totalling $24.33m), examples include (i) Rapid, Reliable and Convenient Nitrate Detection Method for Aquaponic System Water Testing (Alex Wong, $1.7m, 2016); (ii) Development of Printable Electrodes for Simultaneous Monitoring Five Targeted Metal Ions in Water (Vincent Ko, $1.5m, 2016); (iii) Preclinical In vivo Evaluation of a Water-Soluble and Potent Platinum-Based Anticancer Prodrug (Guangyu Zhu, $2m, 2016); (iv) Preparation of Self-assembled Nanodrugs by an Ice template Assisted Method (CS Lee, $1.4m, 2016); (v) Development of Solid, Packaging-free, 2-in-1 Shampoo & Conditioner Bars with a Novel Formulation (Alex Wong, $0.8m, 2019), etc.

Consultancy Service and Intellectual Property: The Department currently has active research links with 6 companies and NGOs, including: Claves Life Sci. Ltd., Cheyenne Asset Management Ltd., Ming Fai Enterprise International Co. Ltd., Grant Vision Chemical Ltd., Ocean Park Conservation Foundation, V.ABC Group Limited and Bioanalyser Company Limited. The University's KTO oversees, handles and supports all the copyright and patents application of intellectual property, the Department has secured many intellectual property rights since 2013: 10 US granted (TC Lau, CS Lee, Ken Lo, Istvan T Horváth, ZT Xu, GY Zhu) and 13 US filed patents; 1 granted (CS Lee) and 7 filed mainland china patents.

Public Outreach: Educational outreach impact through engagement with Hong Kong youngsters is exemplified by the forensic science training program (Michael Lam) and horseshoe crab rearing program in which SG Cheung organized the programme to deliver the importance and consequences of horseshoe crab conservation to over 2,700 secondary students, in partnership with Ocean Park Conservation Foundation. The schoolchildren were provided with juvenile horseshoe crabs from SG Cheung's laboratory and were taught how to take care of them for half a year, followed by a controlled group release to the wild. Michael Lam has conducted 10-day training camps on forensic science for over 500 Hong Kong secondary school students from 2013 to 2015. (Supporting information of forensic science training program can be found at https://bit.ly/2Ov3WIt and horseshoe crab rearing program is found at https://bit.ly/2KGlKiI)

(4) Relationship to case studies

The two impact cases were nurtured and developed through the combined efforts of the Department and SKLMP. With her Director (Paul Lam) and several faculty members of the Department as members, the SKLMP is one important pillar supporting researches in the Department. Both of the impact case studies went through the processes outlined in Figure 1. The oral sequestrants project by Vincent Ko and the forensic science training program by Michael Lam have also been developed within and supported by the Department.