Chemistry has a bright future for us and our economy

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Chemistry is the science of molecules: the basic building blocks of all known matter. In a way, this makes chemistry the science of everything.

Chemists have shown that all the substances around us – the Earth and indeed the universe as a whole – are composed of just 92 building blocks or elements (not including several we have made ourselves, which don't appear in nature).

In fact, just seven of these elements are responsible for more than 99% of the world around us.

In sharp contrast to other major science disciplines, such as physics, mathematics and biology, chemistry is the only fundamental science that has a specific industry attached to it.

Chemical civilisation

Chemistry as a discipline also has been, and remains, a significant contributor to the wealth, prosperity and health of humanity. Over the last 5,000 years, it is chemistry, more than any other discipline, that has made our global civilisation possible.

Early civilisations learned how to extract simple metals and to process them, which enabled military and eventually economic superiority. Likewise the civilisations that discovered gunpowder gained ascendancy in many areas of the globe.

Innovations, such as the development of specific cements, mortars and, later on, concrete, glass and plastic, allowed urbanisation on a massive scale.

The industrial revolution was enabled by the rapid improvements in understanding combustion and thermodynamics of fossil fuels. This led to global power shifts to those countries, which were able to implement these innovations on an industrial scale.

In 2014, the global chemicals industry contributed 4.9% of global GDP and the sector had gross revenues of US$5.2 trillion. That corresponds to US$800 for every man, woman and child on the planet.

We anticipate that chemistry will continue to define the directions of technological change during the 21st century. For example, chemical research and development will contribute to energy efficient LEDs, solar cells, electric vehicle batteries, water desalination, biodiagnostics, advanced materials for durable clothing, aerospace, defence, agriculture, nanotechnology, additive manufacturing as well as health and medicine.

Focal point

Chemistry is the largest scientific discipline, with 29 of Australia's universities having dedicated chemistry departments.

Contrary to popular belief, there is close to gender balance within chemistry, with 56% of all graduates in chemistry being male. Mean salaries are A$50,000 p.a., with a mean graduation age of 22.

Currently, around half of all chemists work in industry, one quarter in universities or teaching, and most of the remaining quarter are employed in government laboratories.

Chemicals and plastics supply 109 of Australia's 111 industries. There are more than 60,000 people employed in the chemical industry and it is our second largest manufacturing sector. The sector contributes A$11.6 billion dollars annually to Australian GDP.

These are impressive figures but to maintain this performance, long term strategies and national focus are required.

Rich opportunities

Today, February 19, the first Decadal Plan (DP) for Australian chemistry was launched by the President of the Australian Academy of Science, Professor Andrew Holmes, and the Chair of the Australian Research Council, Professor Aidan Byrne.

The decadal plan is a grass roots document, put together by a working group under the auspices of the National Committee for Chemistry. The key goals of such a bottom-up approach are to ensure that it is the chemistry community itself that sets the direction of the field and identifies the opportunities and challenges ahead.

Based on the findings of the DP process, chemistry in Australia remains a healthy but underperforming science. Chemistry is an attractive career choice and chemistry remains vital to many Australian industries including construction, mining and agriculture.

However, chemistry graduates are increasingly moving into areas such as biotechnology, environmental monitoring, forensic science, food science and green chemistry.

The biggest challenge identified by the DP working group is poor communication across the sector. While 40% of companies in many European countries have interactions with universities, only 4% of Australian companies report such links.

Australia can do much better in exploiting its strong research base. The chemistry community must work together more effectively to create a genuine "value-adding chain".

Profitable, chemistry-based companies create high quality jobs, which in turn attract students to stay in science. Better linkages between

universities and industry will ensure Australia can generate the products needed to maintain high living standards.

Governments need to support this value-adding chain by developing long-lasting, bipartisan policies that foster risk-taking and greater investment in manufacturing. We may have heard a lot of this before but now it is being said with one voice.

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