

The Federation of Asian Chemical Societies: Forty years on

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In the 1970s UNESCO and many national aid agencies understood the important role that the application of chemistry had in developing the social, economic and environmental wellbeing of nations. UNESCO also understood the vital role that professional societies play in fostering chemical capability and helped organise the formation of the Federation of Asian Chemical Societies (FACS).

In 1980 our region contributed only 19% of world chemistry papers. The task of the FACS was, through networks, working groups and collaboration, to foster the development of chemistry in the region. This was highly successful. In 2018 our region contributed nearly 60% of all the world's chemistry papers. We are the epicentre of world chemistry. However, chemical capability is still low in many of our member countries. The FACS now has two tasks: catering for the high performing chemists in the region while still fostering the development of chemistry in those countries still developing.¹



Thomas H Spurling

Tom Spurling received his PhD in Physical Chemistry from the University of Western Australia in 1966. He joined CSIRO in 1969 and led its Chemistry research from 1989 to 1998. In 1999 he led the World Bank 'Management and Systems Strengthening-LIP1' project in Jakarta. He is now Professor of Innovation Studies at Swinburne University of Technology. Tom was President of the FACS from 1989 to 1991. He was made a Member of the Order of Australia in 2008 'For service to chemical science through contributions to national innovation policies, strategies and research, and to the development of professional scientific relationships within the Asian region.'



John M Webb

John Webb is a graduate in chemistry from the University of Sydney (B.Sc.) and from the California Institute of Technology (Ph.D.). He coordinated chemistry networks in Asia for many years for UNESCO, for the FACS and for the Australian government aid program. His subsequent diplomatic roles included UNESCO Paris and as Counsellor (Education, Science and Training) at the Australian High Commission in New Delhi with responsibilities that included Nepal and Pakistan. He now is Adjunct Professor at Swinburne University of Technology. In 1996 he was awarded the Medal of the Order of Australia for establishing collaborative research networks in Asia



Forty years on

We want to take your minds back to the late 1970s and early 1980s and recall the place that Asian chemistry had in comparison with the rest of the world. In those days, despite having more than 50% of the world's population the region contributed only 19% of the chemistry papers in the Web of Science database. Only three countries, Japan (12.7%), India (4.8%) and Australia (1.7%) contributed more than 1% to the world output (See Table 1).

At that time UNESCO and many national aid agencies were very conscious of the important role that the application of chemistry had in developing the social, economic and environmental wellbeing of nations. As we have noted elsewhere³, in 2015 the United Nations General Assembly Resolution 70/1 set 17 Sustainable Development Goals for

2030 and at least eight of these goals require chemistry capability for their achievement.

It was during the 1970s that the Chemistry section in UNESCO was developing from its school science origins to include higher education and research. It was fortunate for our region that the person in the UNESCO Headquarters in Paris responsible for this development was Dr John Kingston, an Irish-born chemist with degrees from Trinity College, Dublin and the University of New South Wales, Sydney.

Research and training were the central themes of the program with an emphasis on capacity building and the development of endogenous capabilities. UNESCO provided small grants for activities such as workshops and training courses as well as contacts in the region. Projects were to be local and the benefits of that research were to be locally based.

Australia	1.7	Nepal	<0.1
Bangladesh	<0.1	New Zealand	0.3
China Mainland	0.1	Philippines	<0.1
Hong Kong	0.1	Singapore	<0.1
India	4.8	South Korea	<0.1
Indonesia	<0.1	Sri Lanka	<0.1
Iraq	0.1	Taiwan	0.13
Japan	12.7	Thailand	<0.1
Malaysia	0.1		

Table 1. Chemistry research publications in 1980 (as % of global research publications) of FACS member countries; data from the Web of Science database.²

To achieve this, Kingston mobilised chemists in other countries as collaborators.⁴

His Australian experience led him to readily engage chemists in many countries in establishing and delivering programs through regional networks. The first such network, established in 1974, was the regional network for the chemistry of natural products in South East Asia. This research theme was an inspired choice, since the chemistry of extracts from plant species peculiar to a country's biodiversity provided unique opportunities for local chemists to select and control their research.

Over time, the regional network approach was extended to other regions such as South Asia and other areas of chemistry such as inorganic and analytical chemistry and, in time, training courses for instrumentation.

The success of the network approach prompted the UNESCO Division of Scientific Education and Research to propose, in 1978, that a Federation of Asian Chemical Societies be established. The model was the already established Federation of European Chemical Societies, widely seen as being valuable in the construction of the post-World War II scientific environment within Europe. UNESCO thought of Asia as all those parts of the world that weren't Europe, Africa or the Americas! This definition included countries from Iran to New Zealand and from Australia to Japan. An information notice was sent to the national chemical societies of the region in February 1978 asking them to prepare to present their ideas at a meeting to be arranged later in the year. By October 1978 UNESCO had responses from Australia, Hong Kong, Indonesia, India, Iraq, Japan, Korea, New Zealand, Malaysia, Philippines, Singapore, Sri Lanka and Thailand. UNESCO arranged for a working group meeting to be held in Bangkok in December 1978, and this meeting agreed on draft statutes to be presented at an inaugural function in August

Number	Sustainable Development Goal
2	Zero Hunger
3	Good Health and Well-Being
6	Clean Water and Sanitation
7	Affordable and Clean Energy
9	Industry, Innovation and Infrastructure
13	Climate Action
14	Life Below Water
15	Life on Land

Table 2. Sustainable Development Goals requiring chemical capability

of 1979 at Mahidol University, Bangkok. A glittering ceremony, attended by Her Royal Highness Princess Chulabhorn of Thailand and other dignitaries, opened the inaugural meeting. The following eleven societies agreed to be founding members of the Federation of Asian Chemical Societies: Royal Australian Chemical Institute, Hong Kong Chemical Society, Indian Chemical Society, Iraqi Chemical Society, Korean Chemical Society, Malaysian Chemical Society, Integrated Chemists of the Philippines, Institute of Chemistry Ceylon, Singapore National Institute of Chemistry, Indonesian Chemical Society and the Chemistry Section, Science Society of Thailand (replaced by the Chemical Society of Thailand in 1981). Of the missing two of the original thirteen respondents to the UNESCO invitation, the Chemical Society of Japan and the New Zealand Institute of Chemistry joined the Federation in 1981.

The original statutes included many details and qualifications needed to persuade the foundation members that the new Federation was not going to threaten their autonomy. The objectives were:

1. *The Federation is a voluntary association, the object of which is to promote co-operation in Asia, Australia and New Zealand between non-profit-making learned societies in the field of chemistry whose membership consists of individual qualified chemists. With a view to promote the advancement of chemistry. It seeks to cooperate with regional and international organisations, and to act as a channel of communication for such organisations and to avoid overlap with them on projects initiated by itself or by them.*
2. *A fundamental principle governing the work of the Federation is that nothing done by or in the name of the Federation shall detract from the autonomy of any of the participating societies.*

This was replaced in 1991 by a simpler statement:

The general objective of the Federation is to promote the advancement of chemistry and the interests of professional chemists in the Asia Pacific region in a way which does not detract from the autonomy of any of the member societies.

And in 2019

The general objective of the Federation is to promote the advancement and appreciation of chemistry and the interests of professional chemists in the Asia Pacific.

The FACS web site⁶ lists 31 member societies in late 2019, with member societies covering most of east and south-east Asia but less across west Asia. The chemical societies of central Asia as well as Iran are not yet members of FACS. Some of the listed member societies are mostly inactive in FACS matters such as those from Iraq and Mongolia. There is clearly some way to go to achieve a fully inclusive FACS that extends across Asia.

An examination of Table 1 of the situation in 1980 indicates that in these early days there was considerable scope for the 'advancement of chemistry'. Many member society countries accounted for less than 0.1% of the global production of research papers in the chemical sciences. But much was to change.

During the past 40 years, the economies of many, but not all, countries in Asia

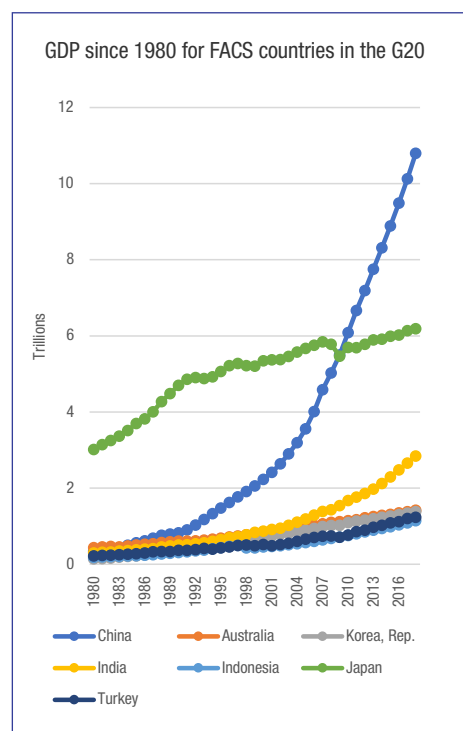


Figure 1. GDP since 1980 for FACS countries in the G20

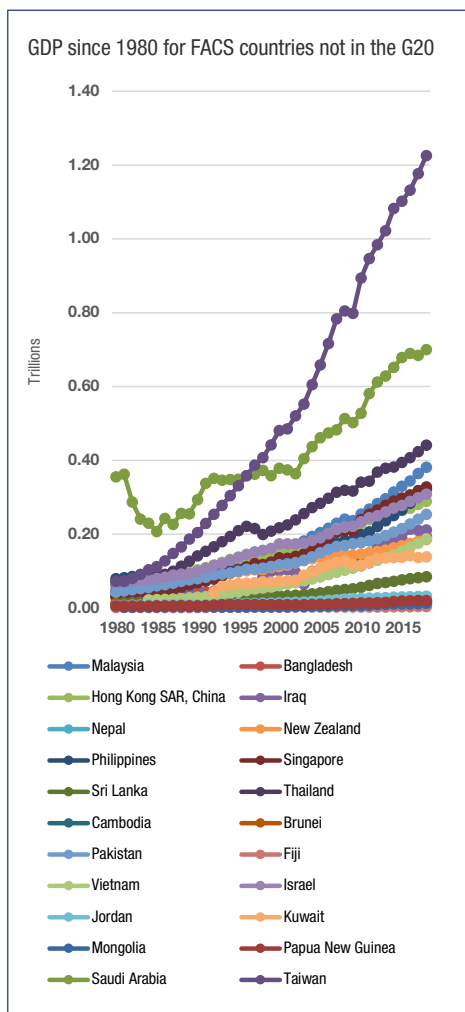


Figure 2. GDP since 1980 for FACS countries not in the G20

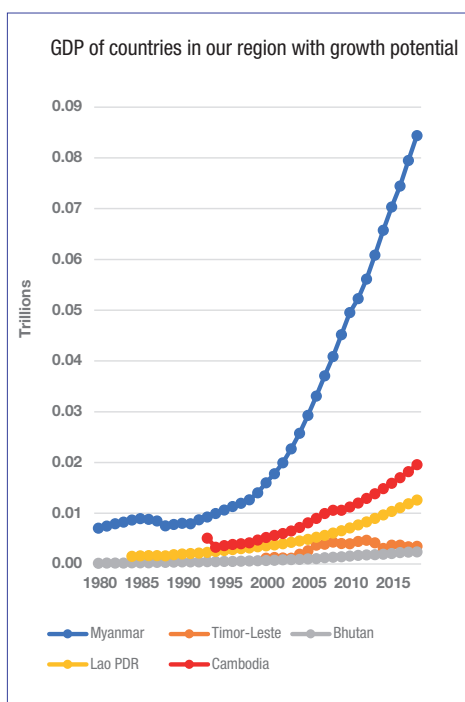


Figure 3. GDP of countries in our region with growth potential

have grown strongly. When the FACS commenced in 1980 only Japan and Australia were in the top 20 economies of the world. In 2018 China, Japan, India, Korea, Australia, Indonesia and Turkey are all in the top twenty countries by nominal GDP with Taiwan just outside the top 20 economies. We have illustrated this in the following figures⁷. In these figures we have used data from the World Bank and have expressed the figures as constant 2010 US dollars. We would have preferred to use purchasing power parity to compare national GDPs but that World Bank series for many countries only goes back to 1990.

In Figure 1 we have displayed the GDP of the seven countries of the FACS who are members of the G20 group of nations. Note the growth of China and the emergence of India.

In Figure 2 we have displayed the GDPs of the FACS countries that are not in the G20 group of nations. The GDP data for Taiwan is from a different source from the other countries⁸. Taiwan has a GDP which is marginally lower than the 20th of the G20 nations. When comparing this Figure 2 with Figure 1, note the different scale on the y-axis.

While we can all marvel at the extraordinary economic growth in our region in the past 40 years, we should not forget that some of the countries represented in our Federation have not yet participated in this growth. This is illustrated in both Figure 2 and in Figure 3. In Figure 3 we have included Myanmar, Lao and Bhutan, countries that are not yet members of the FACS. Timor-Leste is our newest member.

As noted earlier, in 1980 the region covered by the Federation contributed only 19% of the world's output of chemistry

Australia	2.1	Nepal	< 0.1
Bangladesh	0.1	New Zealand	0.2
China Mainland	32.9	Philippines	< 0.1
Hong Kong	0.7	Singapore	0.9
India	7.0	South Korea	4.0
Indonesia	0.1	Sri Lanka	< 0.1
Iraq	0.1	Taiwan	1.4
Israel	0.6	Thailand	0.5
Japan	5.7	Turkey	1.2
Malaysia	0.7	Vietnam	0.3

Table 3. Chemistry research publications in 2018 (as % of global research publications) of FACS member countries; data from the Web of Science database.¹⁰

Country	% of world population
China	18.5
India	17.7
Indonesia	3.5
Pakistan	2.8
Bangladesh	2.1
Japan	1.6
Philippines	1.4
Vietnam	1.25
Turkey	1.07
Thailand	0.9
South Korea	0.66
Iraq	0.51
Malaysia	0.41
Nepal	0.36
Australia	0.32
Taiwan	0.31
Sri Lanka	0.27
Israel	0.11
Hong Kong	0.095
Singapore	0.075
New Zealand	0.062
Total	54.00

Table 4. Percent of world population of FACS countries.

papers. The situation in 2019 is quite different from that of 40 years ago. Our region now produces about 56% of the world output. (see Table 3) Curiously, this is about the same as the percent of the world who live in this region!⁹ (see Table 4) The global scientific output in chemistry has continued to grow across this period but the contributing countries have changed appreciably. Some key examples are shown in Figure 4: in 2018 China contributed close to 35% of world chemistry literature in the data base; the USA has dropped down to around 15%. Such data are sometimes contested in terms of the relative importance of these publications. Citation data, however, confirm that much of the chemistry research literature from Asia is well cited. In Table 5 we have listed the Category Normalized Citation Impact (CNCI) for the chemistry papers from selected countries (see Table 5).

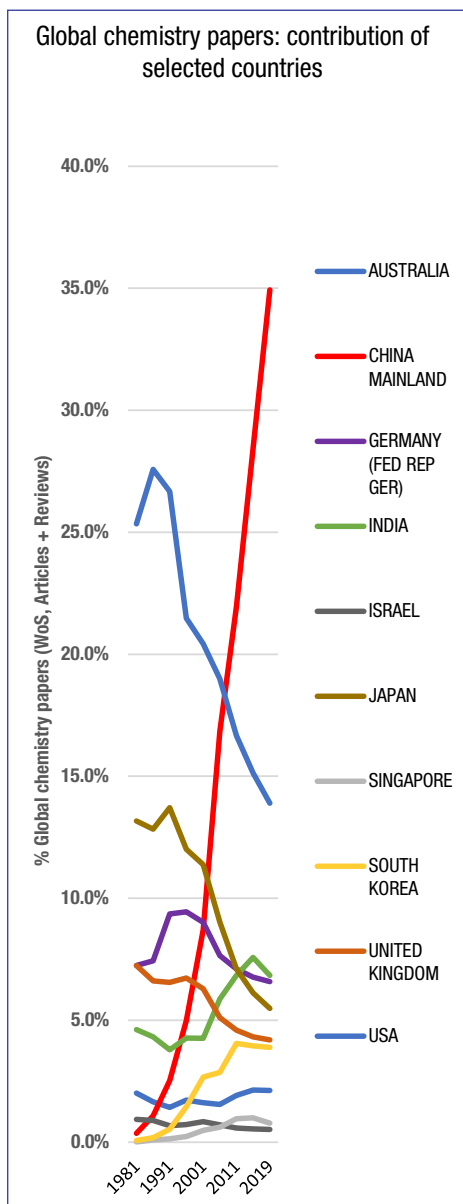


Figure 4. Global chemistry papers: contribution of selected countries.

Category normalised citation impact 2018	
Australia	1.26
China	1.28
Germany	1.1
India	.85
Israel	1.01
Japan	0.8
Singapore	1.89
South Korea	0.97
Taiwan	0.87
UK	1.17
USA	1.26

Table 5. Impact measure of chemistry papers from selected countries.

The CNCI of a document is calculated by dividing the actual count of citing items by the expected citation rate for documents with the same document type, year of publication and subject area.

In the 40 years of the Federation's life our region has become the epicentre of world chemistry! In this new global configuration of chemistry, the Federation has a unique opportunity. This has some implications for the program of the FACS.

In this new global chemical milieu, the Federation has to cater for the needs of the high performing countries. This means:

- Conferences such as the ACC
- Attracting more IUPAC specialist conferences to our countries
- Promoting one or more high impact journals
- Consider sponsoring its own specialist conferences

The Federation also needs to foster chemistry in the countries that have not yet reached their potential. Here, we refer to countries in the Federation such as Cambodia, Mongolia, Papua New Guinea and Timor-Leste as well as those not yet in the Federation. We have noted above the skewed geographic distribution of member countries and recognise the need to consider expanding the Federation to include other potential member countries within Asia such as Iran, Uzbekistan, Kazakhstan, Myanmar, Bhutan and Laos. We show in Figure 5 the GDP data for the countries in West Asia who are not members of the FACS. They have a lot to offer!

Finally, we recall the important role of the Federation in stimulating regional cooperation to assist countries to develop their capacity in chemistry and chemical education. The chemical society of the newest country in Asia, Timor-Leste, has applied to be a member of the Federation. The authors of this paper are familiar with the situation regarding chemical education and chemical research in Timor-Leste. The secondary school system has a modern curriculum

based on the Portuguese curriculum but the schools, both public and private) lack even the most basic laboratory facilities and equipment. The same is true of the only public university in Timor-Leste, the National University of Timor-Leste (UNTL) in Dili.

We should remember that in the 1970s and 1980s various country's aid programs contributed significantly to the building of chemical capacity in the region. UNTL urgently needs a general-purpose science laboratory with equipment to enable them to teach chemistry, physics and biology. Can the FACS be an agent to develop an aid program to achieve this?

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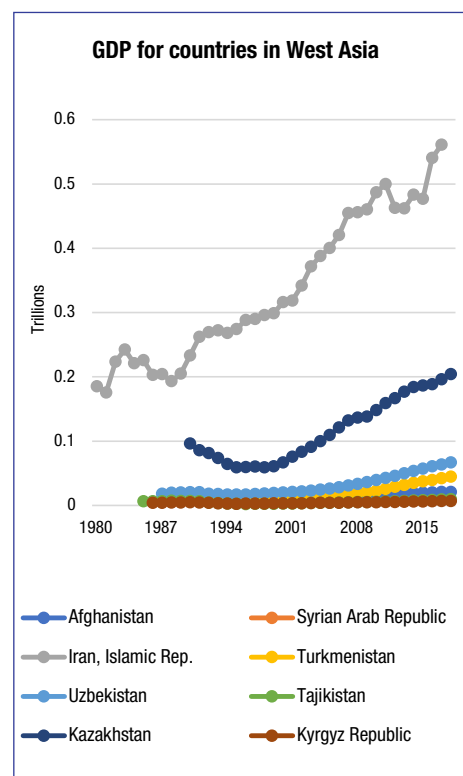


Figure 5. GDP for countries in West Asia

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