

Fostering Physics and Physics Education in ASEAN: Report on the ASEAN Federation of Physics Association Workshop (23 March 2017, Nanyang Executive Centre, NTU)



If anything could be said about how physics, as a field, has been evolving in Southeast Asia, it would be about its gradual maturing in a late-blooming region. The varying imperial/postcolonial legacies (with the exception of Thailand), governmental science and technology policies, and uneven rates of socio-economic development among the ASEAN states created uneven conditions for the development of regional physics research, collaborative enterprise, and physics education. Nonetheless, however lacklustre the beginnings, physics has since blossomed and even begun to thrive in the region.

The overall emphasis among the ASEAN countries since their entry into modern science and technology had been on expediency, with resources concentrated into scientific R&D considered as immediately deployable to an everyday technological problem at hand. One might blame this on the conditions surrounding the early developments of science departments in ASEAN, especially in the funding allocation for the administration and support of these departments. ASEAN countries with less resources for pushing forward the agenda of fundamental physics research find themselves trapped in a vicious circle of never catching up with the more scientifically advanced nations; the former's inability to accommodate their returning physicists who had trained abroad led to a continuous brain-drain which continuously stymied the growth of these states. While the less developed ASEAN states were able to participate in scholarship schemes that

contributed to the development of their pool of physics expertise, the beneficiaries of such schemes would find themselves unable to continue their work should they choose to return to their native countries.

To commemorate the fifty years since the establishment of ASEAN, 22 senior physicists from nine ASEAN states (excluding Myanmar) congregated at the Institute of Advanced Studies (IAS) at Nanyang Technological University (NTU), Singapore on 23 March 2017 to discuss strategies for developing sustainable and more organic collaborations, as well as sharing resources, through the formation of a regional association that could serve as a point of collaborative and communicational convergence. One of the crucial concerns was on how to ensure the legitimacy of such an association in representing the interests and needs of all member states. The other was on how to deal with the problem of ASEAN countries caught in 'middle-income trap' that kept them from advancing further into more cutting-edge R&D in science and technology. The event was supported by the Ministry of Foreign Affairs, Singapore.



All ASEAN delegates revved up to begin the first session of the meeting

The workshop opened with a welcome address by Prof Kok Khoo Phua (Founding Director, IAS NTU), who informed the delegates of IAS NTU's commitment at increasing the level of engagement and involvement of ASEAN scientists and students in the various multidisciplinary activities that it hosts, including the winter programmes for working high-energy particle physicists and graduate students that are co-organized with CERN.



Prof Kok Khoo Phua (IAS NTU) kicked off the meeting with his opening address to mark the historic occasion

The address was then followed by a keynote by Mr Chee King Tan, Deputy Director of the ASEAN Socio-Cultural Community at Singapore's Ministry of Foreign Affairs. He spoke of the establishment of the first ad-hoc ASEAN Committee on Science and Technology (COST) in Jakarta in 1970 as segue-way to talking about the most recent ASEAN COST subcommittees (nine of them) that have been formed for the period between 2016 and 2025. There were at least four subcommittees that directly address the physical sciences: meteorology and geophysics; materials science and technology; sustainable energy research; and space technology and applications. These subcommittees are representative of important areas of scientific research for ASEAN; materials science and sustainable energy, for instance, are among the earliest areas of research that the ASEAN states had ventured into, given the close connections of both to infrastructural and socio-economic developments.



Mr Chee King Tan (Ministry of Foreign Affairs, Singapore) explaining the role of the ASEAN Committee on Science and Technology (COST) and what more has to be done

The subcommittee on Science and Technology Infrastructure and Resources Development could potentially be a platform for improving STEM literacy and physics education in the region, especially for inculcating historical awareness into STEM education. One of the questions from the floor

concerns the slow pace of ASEAN COST, which Mr Tan concedes is the result of how ASEAN was set up – which is to operate at the rate of its slowest member state. Much still has to be done at the ASEAN ministerial level to ensure better coherence and continuation between regional and national needs. Although a number of regional physics and physical science societies were previously set up to facilitate co-operation among the Asian physics community, most have failed to function adequately in pushing forward, a regional scientific agenda. Hence, ASEAN states that were able to do so would form bi-lateral scientific collaborations with other more advanced states, which do not necessary contribute to the overall scientific developments of ASEAN as a whole.

The realities of physics R&D and education in ASEAN are mostly stark, as could be seen from the presentations of the workshop delegates. Among the common problems faced are insufficient infrastructural and resource support, and the marginalization of research in theoretical physics due to continuous emphasis on industrial application. Certain ASEAN countries such as Singapore, Vietnam, Thailand, Malaysia, the Philippines, and Indonesia are doing better than others – these are also the countries with more established physical societies and physics departments for maintaining the visibility of physics in their respective national science and technology agenda. Some, such as Brunei, has only one university with a physics department, and a small number of students.

Most of the presentations, except for Malaysia, discussed the education system of their respective countries; one would find that only a small number of students chose to major in physics. Employment prospects within their area of studies, other than in teaching, are not abundant for many of the ASEAN states. Certain states, such as Cambodia, has only one research laboratory (the Laboratory of Applied Nanomaterials), which means insufficient equipment and instruments for laboratory instruction. Laos focuses on how physics could be employed in energy technology while attending to environmental degradation and the subsistence needs of certain segments of its population. Malaysia presented on collaborative scientific networks and publication outcomes, the taxonomy of national theoretical physics development, and the potential for developing an ASEAN history of physics as part of physics education as well as the systematic curation of archives to chart ASEAN's physics development.

Singapore, Vietnam, and Thailand spoke about the development of their national R&D in physics, government support, and activities for public outreach. Vietnam and Indonesia particularly gave detailed reports on the activities of their respective physical societies, including the publications output and the international conferences organized. Singapore shared details on the international physics competitions their students had participated in, as well as on the programmes of competition training they have developed over the years.

Among the ASEAN states involved in particle physics research, with connections to the CMS and ALICE collaborations at CERN, are Singapore, Thailand, Malaysia, the Philippines, and Indonesia. There was a skype session with Prof Emmanuel Tsesmalis, Head of Associate Member and Non-Member State Relations, CERN International Relations. He spoke of how to get ASEAN states more involved with the LHC collaborations and how best to provide opportunities for advancing ASEAN's participation.

The last item on the workshop's agenda involved the historical formation of the ASEAN Federation of Physical Societies (AFPS), a milestone for both NTU and ASEAN. AFPS is the preferred name for the proposed ASEAN Federation physics organization that won in a landslide of ten out of fourteen votes against three other contending names. The delegates concurred on the necessity of having a secretariat office to provide administrative support to AFPS's work, which can be stationed in Singapore for the first two years, and be rotated amongst the ASEAN nations subsequently. The steering committee meeting of AFPS will take place in two months' time to firm up the formation of ASEAN Federation of Physics Association. It will be incorporated with the Registrar of Societies or the Registrar of Companies.

Among the activities and responsibilities of AFPS are to: organize training sessions and workshops for young researchers in ASEAN through online broadcast or physical participation so as to encourage a flow of scientists and students within the region for research and education in physics; aid in the formation of a physical society in Brunei, Cambodia, Myanmar and Laos; collaborate with CERN in areas such as particle physics, computational physics, as well as medical research and imaging; work with the International Centre for Theoretical Physics (ICTP) on the physics education of the region; collaborate with the Asia-Pacific Physical Societies (AAPPS), European Physical Societies, American Physical Societies, and Institute of Physics, UK on

the promotion of physics; encourage exchange and circulation among professional physicists and students in the region.

The meeting also recognized the importance of funding, agreeing that AFPS should come up with a list of prominent personalities qualifying to be its Patron. The possible Patrons include Princess Maha Chakri Sirindhorn (Thailand) and Aung San Suu Kyi (Myanmar).



A light moment in an otherwise serious meeting

After the workshop wrapped, some of the delegates were taken on a tour of the three laboratories located at the Division of Physics and Applied Physics at NTU's School of Physical and Mathematical Sciences. The laboratories visited were one of the experimental laboratories of the Centre for Quantum Technologies, the Centre for Disruptive Photonic Technologies, and the Centre for High Resolution Instruments for Science. The visitors were given an explanation by NTU physicists acting as docents of the laboratory tour on the inter-connected roles played by each laboratory in interfacing, supporting, and contributing to the ecosystem of fundamental and applied physics research at NTU specifically, and Singapore more generally. The laboratories are also showcases of the important role of science and technology policies in determining what gets funded in physics research. The evening ended with a dinner at Bumbu Restaurant, an Indonesian Straits Chinese restaurant.

Participating ASEAN Delegates

- Jimmy Lim (Director, Centre for Advanced Material & Energy Sciences, Universiti Brunei Darussalam)
- Mohd Khairul Zarifi bin Hj Masri (Universiti Brunei Darussalam)
- Chan Oeurn Chey (Royal University of Phnom Penh, Cambodia)

- L.T. Handoko (Deputy Chairman for Engineering Sciences, Indonesian Institute of Sciences)
- Monika Raharti (Director, Center For Young Scientists , Indonesia)
- Khamphouth Phommason (Director, School for Gifted and Ethnic Students, National University of Laos)
- Kurunathan Ratnavelu (President, Malaysian Institute of Physics)
- Hishamuddin Zainuddin (Deputy Director, Institute for Mathematical Research, Malaysia)
- Clarissa Lee (Institute of Malaysia and International Studies, University Kebangsaan Malaysia)
- Giovanni Tapang (Second Vice-President, Samahang Pisika ng Pilipinas (Physics Society of the Philippines)
- Jose Perico Esguerra (University of the Philippines Diliman, National Institute of Physics)
- Rajdeep Rawat (President, Institute of Physics Singapore)
- Kok-Khoo Phua (Founding Director, Institute of Advanced Studies, NTU, Singapore)
- Leong-Chuan Kwek, (IAS NTU and NUS, Singapore)
- Tanakorn Osothchan (Secretary General, Thai Physical Society, Thailand)
- Burin Asavapibhop (Chulalongkorn University, Thailand)
- Phongpichit Channuie (Walailak University, Thailand)
- Norraphat Srimanobhas (Chulalongkorn University and CERN, Thailand)
- Nguyen Quang Liem (Director General, Institute of Materials Science, VAST, and Vice-President, Vietnam Physical Society)
- Nguyen Mau Chung (Hanoi University of Science, Vietnam)
- Nguyen Thi Hong Van (Institute of Physics, VAST, Vietnam)
- Nguyen Van Hieu (VNU-Ho Chi Minh City University of Science, Vietnam)



Report by Dr Clarissa Ai Ling Lee. She is a visiting fellow with the Institute of Malaysia and International Studies at the Universiti Kebangsaan of Malaysia (National University of Malaysia), and a fellow at the Jeffrey Sachs Centre on Sustainable Development at Sunway University, Malaysia. She works at the intersection of science, technology, and innovation, with particular interest in the physical sciences. She was part of the Malaysian delegation that had attended the meeting.