Interview: Dr. Benjamin Seet â?? Executive Director, A*STAR BMRC, Singapore

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*The executive director of A*STARâ??s Biomedical Research Council, Dr. Benjamin Seet highlights several remarkable milestones that the organization has been able to achieve since its inception, while underscoring how cultivating deep levels of expertise will carry Singaporeâ??s biomedical sciences sector into its next phase of development.*

In a few words, can you please describe the scope of the Biomedical Research Councilâ??s function in Singapore?

The Biomedical Research Council (BMRC) is a part of the Agency for Science Technology and Research (A*STAR). We see ourselves as filling the space between academic research in the universities and the corporate research that takes place in industry. What we do covers an entire spectrum from basic sciences all the way down to process manufacturing and engineering. The key point is relevance to the economy and relevance to the development of industry in Singapore. Itâ??s a bit broad, but if you look at our indicators of success, they are measured in terms of private R&D investments in Singaporeâ??both from multinational and local companiesâ??the competitiveness of local companies from an innovation perspective, and the number of R&D job opportunities created.

Why exactly has the biomedical sciences sector been such a key priority for the State?

This goes back to the Asian financial crisis of the late 1990s where the government realized that it was too dependent on the countryâ??s three economic pillars at the time: engineering, chemicals, and electronics. So, there was a need to diversify. That was also at a time when biotech was doing

extremely well in the Americas and Europe. Right from the start, the concept of the Biopolis was anchored to economic development, with the aim to grow an entire biomedical industry.

If you trace it historically, in the early 2000s there were barely any research activities here; so most of the investments in phase I (2000 â?? 2005) of the Biomedical Sciences (B.M.S.) Initiative had initially focused on building the capabilities, attracting talent, and initiating research in areas where very little had existed. As we moved to phase II in 2006, the focus shifted to translational and clinical sciences. In the most recent phaseâ??2011 to 2015â??we targeted our efforts on bringing that research out of the labs, out of the hospitals, and closer with industry. In addition, there was a diversification into new sectors including medical technology and devices, food and nutrition, and consumer care. So it has certainly been an evolution: starting from creation, transition to clinical, and establishing relevance with industry.

From 2016 to 2020, our work will be defined very much by enterprise. It will be about creating competitive companies in Singapore, as well as continuing to attract multinationals to invest in R&D and innovation in Singapore.

[Featured_in]

How successful has the organization been in accomplishing the objectives that it initially set out to achieve these past 16 years?

When we started out, there was a singular focus to grow activities of major pharmaceutical companies inSingapore, not only manufacturing and supply chain management, but R&D as well.

In terms of manufacturing, we currently have close to 30 pharmaceutical and biotechnology manufacturing plants, with approximately 20 of these plants dedicated to small molecule, API, and excipient production, and the rest in biologics manufacturing. Collectively, these manufacturing facilities contribute about 20 percent to the manufacturing value-add of the whole economyâ??approximately 4 percent of the nationâ??s GDP.

R&D is a different story because thatâ??s dependent on global factors rather than just the conditions in Singapore. When you look at major pharma R&D over the past 5 years there has been a lot of turbulence: mergers, acquisitions, closure of R&D facilities, re-shoring back to home countries, as well as a lot of open innovation. Similarly, weâ??ve also faced ups and downs in Singapore. There are companies that have left, but there are also companies that have relocated major R&D operations to the country.

One of the largest investments will probably have been Chugai Pharmaceuticals. Interestingly enough, this was actually their second R&D investment in Singapore. The newly created Chugai Pharmabody brought their biologics antibody development into Singapore, and theyâ??ve since made a commitment of approximately half a billion dollars over the next seven yearsâ??a substantial R&D investment by any standard measure.

What have been the most fundamental support mechanism that have helped facilitate this degree of success in your opinion?

If I were to list a few they would include first and foremost, government support in terms of funding, resources, and infrastructure. Sustained government support over the course of 20 years since the decision was made to develop the biomedical sciences sector has been pivotal. The commitment has never wavered, though the strategy that went along in supporting this initiative has definitely continued to evolve.

The second pillar revolves around people. The workforce has to be at the right level of education and training to be able to support the growth of new industries. If we have a biologics manufacturing industry, for example, the workforce has to be fairly specialized.

The third is that Singaporeâ??s geographic limitation has become one of its strengths. If you donâ??t have enough space, you have to concentrate buildings, people, and facilities. Comparing Biopolis to science parks of larger countries, you find that everything here is much more interconnected. The Biopolis itself has approximately 5,500 people, while one-north, which includes both Biopolis and Fusionopolis, encompasses roughly 16,000 peopleâ??researchers, scientists, engineers, as well as administrators collectively advancing innovation within a relatively small piece of real estate.

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The predictability of funding has also been another factor of success. The fact that today in 2016 I know how much funding Iâ??m going to get until 2020 gives me the ability to effectively plan over a 5-year period, compared to yearly budget determinations faced by other prominent research institutes around the world.

With many countries in the region now looking to Singapore as model for development, do you believe the Biopolis and accompanying ecosystem can be replicated?

The answer is yes and no. Itâ??s certainly not easy to recreate what we have here. It may be possible in city-states or large cities which exhibit similar levels of proximity and concentration of resources, people, and activities, but every model is unique, with differing political and financial systems. Also, such an initiative is resource intensive, so it would require a country with the right level of GDP and workforce development and the ability to plan fairly long-term. It has taken us 16 years to date, but we have yet to fully reap the returns on investments for the B.M.S. Initiative. It takes a sustained and committed effort to continually support an endeavor like this; weâ??ll probably only truly start reaping the benefits of Biopolis in a few more years.

What objectives will the next phase of development center on?

To answer this question I think itâ??s important to first look back over the last 5 years to see what have been some of the major achievements.

I mentioned that one of the key priorities was to bring ourselves closer to industry. A good measure of that is how much companies are prepared to invest in research activities with A*STAR. If you look at the previous trancheâ??2006 to 2010â??the total investments by private companies with institutes under the Biomedical Research Council was approximately SGD 18 million over 5 years. In the most recent phaseâ??2011 to 2015â??weâ??ve brought that figure to more than SGD 380 million, a substantial performance increase. That was a major achievement, largely enabled by both multinational and local companies that have increased their R&D activities here.

Furthermore, just like any portfolio manager, my job is to manage and diversify the portfolio of research activities. In the past, approximately 75% of our engagements were attributed to pharma and biotech. That 75% became 25% in the last 5 years. Thereâ??s been a massive change in the portfolio, part of which was in response to emerging opportunities, but at the same time, a deliberate diversification effort to find relevance in adjacent sectors. This took us into areas such as medical technologies and devices, food and nutrition, and personal care.

One of our biggest accomplishments was growing a food and nutrition innovation cluster here. Some of the worldâ??s largest nutrition companies now have an R&D lab in Biopolisâ??these include

global leaders like NestlÃ©, Danone, and Abbott Nutrition. But whatâ??s more interesting is that rather than solely working with these flagship companies, their suppliers are now operating here. Weâ??re talking about major companies that provide ingredients and chemicals such as Kerry Ingredients, Ingredion, Dupont, and Fujitsu who have come here because the major brand owners are engaging in R&D in Singapore. As a result of our engagement activities and research partnerships, weâ??ve grown an entire research ecosystem which now encompasses around 700 people across the entire food and nutrition innovation value chain.

Going ahead, we will focus our efforts on identifying the disruptors and trend setters for each of these industry sectors, determine what we can do thatâ??s differentiated, and then invest deeply to build a level of expertise thatâ??s competitive on a global scale.

With over SGD 19 billion exclusively earmarked for R&D under the RIE2020 plan, do you believe the amount of resources that Singapore is currently investing in â??differentiationâ?• will be enough to remain relevant in the long-term?

> Our future success will hinge on the ability to understand how science, technology, and innovation can help us to be competitive in the future economy.

I believe we have to reinvent ourselves every 5 years. Looking at how to be relevant is a continuous process that requires looking for and anticipating signals of change that will drive how consumers behave. We also seek these signals of change at an enterprise level, understanding the key driversâ??beyond costsâ??behind the types of products and services companies are developing and selling. Our future success will hinge on the ability to understand how science, technology, and innovation can help us to be competitive in the future economy.

What do you anticipate those signals of change to look like post-2020?

Taking the personal care sector as an example, , the use of animals for any form of testing is banned in Europe. If you sell a cosmetic product in Europe you have to show that no animal was used in the entire process, which means any efficacy and safety testing will have to depend on computational and in-vitro models and human trials. This is unlike drug development where animals remain the mainstay of efficacy and safety testing. This pushes the dependence on methods such as computational biology, predictive toxicology, and in-vitro testing before introducing to man. This is obviously a big gap for science and technology to fill, and a prime area where we plan to invest in.

The signals show that the food industry will increasingly move in this direction as well, especially when it comes to testing nutraceutical products. And weâ??ve already seen some food companies voluntarily claim that they donâ??t use animal testing in product development. Whether or not this will eventually impact pharma, I donâ??t think so,but over time, I think the number of animals used in drug testing will have to be rationalized and reduced.

What value will the pharmaceuticals and biotechnology segment continue to serve as the BMRCâ??s research portfolio develops further?

Pharma and biotech remain a fundamental part of our strategy, now and moving forward. The future of medicine will be determined by precision and the use of new technologies such as genomics, imaging, or digital monitoring. The task at hand now focuses on how weâ??re going to reinvent ourselves to introduce precision medicine into our health system and working with companies that provide the science and translation platform for these technologies.

This also entails looking at what could potentially disrupt healthcare. Digital innovation is a lateral space that we, together with the engineering and infocomms half of A*STAR, plan to invest heavily inâ??developing conceivable solutions for digital healthcare or smart health.

And at the same time weâ??re also constantly assessing how therapeutic frontiers are evolving, particularly in areas such as immunotherapies, gene therapies, and regenerative medicines. Itâ??s not about doing everything, but to do enough for us to be relevant for the future. Then we can perhaps pinpoint areas where we are doing very well and increase our investments accordingly.

The last part focuses on keeping manufacturing competitive. For this, weâ??re looking at the use of automation and data to optimize production lines and moving to the next generation of production plants. If you look at the biologics manufacturing plants in Singapore, Amgenâ??s facility is a next generation plant. Itâ??s the first plant to incorporate continuous manufacturing and disposable technologyâ??a substantial departure from the traditional biologics plants that are constructed with stainless steel vats. Facilities like this one will define the future of manufacturing.

Personally speaking, in what way will you benchmark your success as the councilâ??s executive director?

The challenge for any research organization is trying to draw a straight line from research activities, scientific publications, patents, licenses, and even engagements with companies to the macroeconomic objectives of GDP growth and creating new jobs. Itâ??s difficult to attribute the science that we do in research institutes and the partnerships that we have with companies to measures of economic growth. The terms knowledge-based economy and innovation-driven economy are loosely used in many parts of the world. But how do you actually translate these activities into economic outcomes? Quantitative performance metrics aside, perhaps the best measure of success will be the recognition of A*STARâ??s and BMRCâ??s unequivocal role in facilitating this translationâ??particularly in the biomedical sciences sector.

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