

# CREATING AN INNOVATION ECONOMY



## Organizational Profile

**01** Leadership

**03** Planning

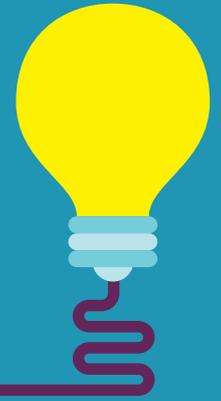
**05** Information

**08** People

**10** Processes

**16** Customers' and Results

Appendix



# ORGANIZATIONAL PROFILE



As 2 of the world's top proponents of scientific endeavour, the UK and Singapore celebrate 10 years of close cooperation in pioneering cutting-edge research innovation for global markets. Many leading British companies such as GSK, Lloyd's Register and **Rolls-Royce have collaborated with A\*STAR, jointly developing R&D capabilities to drive innovation and achieve growth in Asia.** This new partnership symbolised in the Joint Lab has the potential to catalyse our countries' reputations as international maritime hubs, translating to a wealth of economic opportunities in Asia Pacific and beyond.

**Rt Hon David Willetts MP**  
UK Minister for Universities and Science



We are proud to be teaming up with A\*STAR, a world leading research organisation based in Singapore. We will channel the power of Big Data Analytics to faster develop incremental innovations for our market leading aircraft and services - and with greater agility. **Using the very latest developments in this exciting new technology field, we expect to be able to offer our customers new ways to reduce their fuel consumption through speedier, more effective analysis of their operational data.**



**Mr Axel Krein**  
Airbus SVP Research & Technology



Agency for  
Science, Technology  
and Research

**CREATING AN INNOVATION ECONOMY**

# Biopolis helps turn biomedical sector into a powerhouse

President Tan lauds research hub's achievements on its 10th anniversary

By CHIA YAN MIN

IT'S been going for only 10 years but the Biopolis research hub has become a prized national asset, as President Tony Tan Keng Yam acknowledged last night.

powerhouse.

Last year, biomedical manufacturing was the largest contributor to total manufacturing value-add and contributed 5 per cent to gross domestic product.

Located in one-north, Biopolis

put in the biomedical sciences industry has increased nearly five-fold, from \$6 billion in 2000 to \$29.4 billion last year.

Employment has also more than doubled, from 6,000 to 15,700 in the same period.

Last year, manufacturing value-add from the biomedical sciences industry came in at \$15.3 billion, or about a quarter of total manufacturing value-add - mak-



Corp chairman Loo Choon Yong, President Board chairman Leo Yip unveiled 10th anniversary yesterday. ST PHOTO: S...

# A\*Star's research capabilities expand to new industries

By ANNA TEO

anna@sph.com.sg

SINGAPORE'S research capabilities are being employed in a growing number of industries.

"We are increasingly working with new industry clusters," Lim Chuan Poh, chairman of the Agency for Science, Technology and Research (A\*Star), told BT, citing finance services, marine and offshore and put-

## A high value pillar

Snapshot of Spore's BMS (biomedical sciences) journey

	SHARE OF MANUFACTURING OUTPUT		SHARE OF MANUFACTURING VALUE-ADD	
	2000 (%)	2012 (%)	2000 (%)	2012 (%)
BMS	4	10	10	26
Electronics	51	28	44	25
Transport	5	10	7	16
Precision engineering	11	11	15	15
Chemicals	20	34	12	8

	PHASE 1 2006-2005	PHASE 2 2006-2010	PHASE 3 2011-2015
Build basic research infrastructure and capabilities	\$51.3b		
Develop translational and clinical research		\$53.3b	
Deliver health and wealth			\$53.7b

- 10 research institutes and consortia
- As at Oct 1, 2013, 68 companies have committed \$130m for 155 research projects with research institutes
- Some 3,000 PhD scientists, half of whom come from more than 60

## Singapour eldorado scientifique

LE MONDE SCIENCE ET TECHNO | 07.02.2013 à 15h10 • Mis à jour le 13.02.2013 à 09h28

Par David Larousse - à Singapour

Abonnez-vous à partir de 1 € Réagir Classer Partager

Recommander Partager 256 personnes recommandent ça. Soyez le premier parmi vos amis.



"Mes collègues de Londres ne comprenaient pas pourquoi rester. Maintenant que je suis ici, à Singapour, la question est: ironise Barry Halliwell, biochimiste et vice-président de Singapour (NUS) en charge de la recherche et de la technol..."

# S'pore-made H1N1 flu vaccine being tested on humans

Researchers hope to test at least 60 people in Phase 1

By MELISSA LIM

SINGAPORE'S first H1N1 flu vaccine is being tested on humans for the first time.

The Agency for Science, Technology and Research (A\*Star) and Switzer-land's Cyton Biotechnology AG announced yesterday that the first healthy volunteer has been dosed with their vaccine in a Phase 1 clinical trial.

They hope to test it on at least 60 people during this first phase.

Previously, the vaccine was tested on mice and ferrets. The clinical trial will find out how well and how safely it can protect humans from the H1N1 influenza infection.

Researchers are taking a different approach, which they believe is faster, cheaper and safer compared to conventional methods, in the development



A\*Star's Professor Alex Maitland oversees progress of the vaccine project.

year. Of those who fall ill, three million to five million become severely ill, 500,000 of them die.

As Singapore does not make its flu vaccines, it has to wait in line to them from other countries.

In the case of the outbreak of a new strain of H1N1 influenza in 2009, we claimed about 30 lives in Singapore, wait could have had potentially dire consequences, Singapore ordered one million vaccine doses in September, when they arrived three months later, the worst of the outbreak was over.

As the current clinical trial is still in the early stages, the agency is unable to estimate if and when the vaccine will be commercialised. Should it be made available on market, A\*Star subsidiaries will be entitled to the vaccine for Singapore and other Asian countries and earn royalties from worldwide sales.



Biopolis: Singapore in 1999 was a "nobody" in the world of biomedical research. But now, when Biopolis celebrates its 10th anniversary, Singapore is recognized as a global powerhouse. Competitiveness and global influence of biomedical research require that researchers and funders work together in a coordinated manner. It means

# Building a research powerhouse in 14 yrs

The formula is simple: speed, decisiveness, hard work and a committed leadership



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CREATING AN INNOVATION ECONOMY



# ORGANIZATIONAL PROFILE

## ORGANIZATIONAL ENVIRONMENT

*Nature of main products and services and the delivery mechanisms to provide the products and services to customers*

*Organization's purpose, vision and values*

### AN INNOVATION ECONOMY FOR SINGAPORE

Today, A\*STAR plays a key role in Singapore's R&D landscape, capitalizing on advancements in science to enrich the economy. A commitment to grow the economy through R&D is a hallmark of the organization whose goal is to create an innovation economy for Singapore.

Driving this resolve is A\*STAR's Vision and Mission for Singapore to be among the most research intensive, innovative and entrepreneurial economies in the world in order to create high value jobs and prosperity for Singaporeans. A\*STAR's commitment to its vision and mission is distinguished in its efforts and capabilities to produce novelties in science, drive R&D collaborations and translating them to benefit the public, companies and the economy at large.

Our vision and mission statements as follows:



Fig A: Vision & Mission

Underlining A\*STAR's Vision & Mission are A\*STAR's core values which forms the basis for how we do things in the organization.



Fig B: Core Values

To complement A\*STAR's purpose, vision and values, three strategic thrusts are driven to further strengthen efforts towards A\*STAR's vision.

A\*STAR's strategic thrusts underpins its efforts in creating a promising future based on innovation and it acts as the guiding principle for us to stay committed and focus on our vision and mission.

A\*STAR's key strategic thrusts:

- **Talent Thrust** – A\*STAR plays a key role in the development of R&D manpower. It stays committed to attraction and development of scientific talents to meet the needs of Singapore's industry and public sector research institutions. Through these developments, high-value jobs are also created
- **Intellectual & Innovation Thrust** – Deepen technological capabilities and investing in basic science and knowledge to seed the intellectual capital that forms the basis for future innovations
- **Enterprise Thrust** – Focusing a greater proportion of R&D on economic outcomes. Encourage more private sector R&D and strengthen linkage between R&D and business

### INTENSIFYING INNOVATION FOR ENTERPRISES

A\*STAR provides a range of products and services to corporations. Our customers are the Multinational Corporations (MNCs), Globally Competitive Companies (GCCs), Promising Local Companies (PLCs) and Small and Medium Enterprises (SMEs). Over the past two years, A\*STAR has intensified its efforts on innovation and enterprise, bolstering, reinforcing and realizing the potential of innovation in industry development. The following are A\*STAR's main products and services:

**Industry Projects** – A\*STAR formulated four key project types to cater to the R&D needs and goals of organizations. Companies can tap on A\*STAR in various collaborative schemes of partnerships:

1. Many to one - This allows companies to tap on a wide array of R&D expertise by opening access to A\*STAR's research entities
2. One to one - Allowing focused development on a targeted research area
3. Many to Many – Providing a platform for public and private sectors to collaborate
4. One to Many – Leveraging on a research institute to bring companies together to collaborate on common research areas

**Provision of Scientific Talents** – The Growing Enterprises with Technology Upgrade (GET-Up) programme reaches out to local companies and matches them with suitable and affordable research manpower. This will drive outcome-oriented R&D work for SMEs to increase their business competitiveness.

**Ready-to-go Technology Platforms** – Launched in July 2013, the Technology Adoption Programme (TAP) is poised to help local SMEs gain access to technology, enable growth and play a role in our larger economic

transformation. Through this programme, A\*STAR will help to link technology needs of companies to solution providers, provide consultation and explore the use of technology to enhance their productivity and innovation.

**Technology Transfer** – As A\*STAR's technology transfer office, , Exploit Technologies Pte Ltd (ETPL) promotes and facilitates the transfer of A\*STAR's innovations to industry and society. ETPL does this through Licensing, Spin-off services and Collaborations. In working with ETPL, companies can access the breadth of A\*STAR's technologies, the benefits of Gap Funding, business networks and a variety of collaboration modes.

### Core Competencies of the organization

#### PLACING SINGAPORE ON THE WORLD MAP

A\*STAR's competencies have enabled Singapore to be a formidable force in the field of innovation and garnered global acclaim. This is seen recently, when A\*STAR's patent power scorecard was ranked second by IEEE spectrum among international government agencies, ahead of agencies like NASA and the US Department of Energy.

A\*STAR's core competencies are also aligned with its key strategic thrusts:

- Strategic planning for Singapore's economic R&D agenda
- Bridging the gap between commerce and technology with industry projects partnering major customer groups (MNCs, GCCs, PLCs and SMEs)
- Producing excellent science and innovations with high market relevance to facilitate technology transfer to the marketplace
- Research grant administration, IP management and protection
- Managing and operating a wide array of research institutes spanning from biomedical sciences to technology and engineering to provide scientific and support services
- Nurturing a talent pool of scholars, A\*STAR has strong capabilities in planning and administering scholarship programs to PhD level

Our core competencies have opened doors to new windows of growth and opportunities for enterprises and Singaporeans, pushing the frontiers of business and creating value jobs. This led us to the forefront of establishing Singapore's own unique proposition of translating innovation to the economy, strengthening the linkage between the two and moving the nation forward to an innovation economy.

### Major equipment, facilities and technologies used

#### STATE-OF-THE-ART RESEARCH FACILITIES

Research infrastructures and institutes are key requirements in meeting A\*STAR's R&D agenda. They

form the home base to equip our research talents and scientists with state-of-art tools and facilities to conduct high quality and innovative research.

Biopolis and Fusionopolis are also strategically located in the one-north R&D district. Biopolis is established as a hub for biomedical research while Fusionopolis targets science and engineering research. The close proximity between A\*STAR's research entities brings together the capabilities and talent to foster cross-disciplinary research collaborations within A\*STAR and between its public and private sector partners.

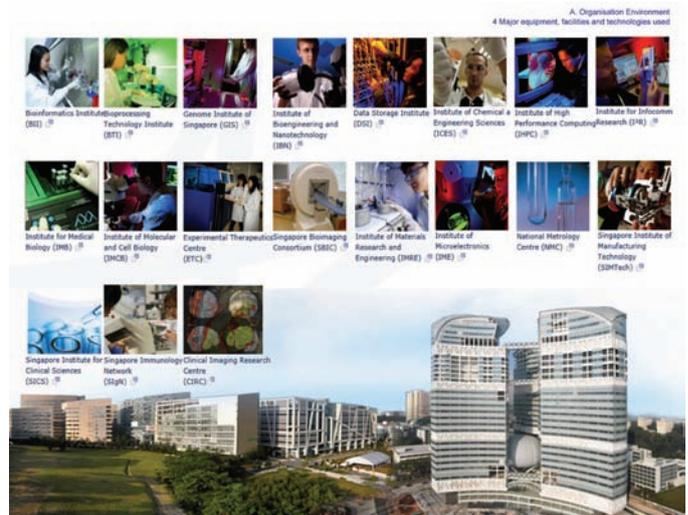


Fig C A\*STAR's Research Institutes and Centres

**Regulatory environment within which the organization operates, including occupational health and safety regulations; accreditation, certification, or registration requirements; relevant industry standards; and environmental, financial and product regulations**

#### A HEALTHY REGULATORY FRAMEWORK

A\*STAR complies with all mandatory policies and regulations of Government. This involves meticulous compliance with a regulatory network of government entities namely, MTI, MOF, MOM, MOH, WSH, BCA, AGO, NEA, and PSD. These instructions are issued in the form of circulars and circular minutes, and Government Instruction Manuals (IMs).

We also comply with the quality framework imposed by the ISO 9001:2008 standard as we have been ISO certified since 10 December 2007.

## Regulatory Environment



Fig D Regulatory Environment

## ORGANIZATIONAL RELATIONSHIPS

*Relationship with parent organization (if the organization is a subsidiary of a larger organization) if applicable*

A\*STAR is one of ten Statutory Boards under the Ministry of Trade and Industry (MTI). We work closely with the Economic Development Board (EDB) and SPRING Singapore (Standards, Productivity and Innovation Board) to (a) attract and retain high value-added corporate R&D investments to Singapore; and (b) help local small and medium enterprises (SMEs) with technologies and research talent.

MTI fully finances the activities of A\*STAR, and funds the Research Development Fund (RDF).

## National R&D Framework



Fig E National R&D Framework





# LEADERSHIP



**A team of highly motivated leaders with significant focus on shaping the future of Singapore**, that opens up to the outside world before locking in their strategies. Impressive!

**Dr Moncef Slaoui**  
Chairman, Research & Development, GlaxoSmithKline



**Through partnership with A\*STAR, we can leverage their strong research capability to develop new products and technologies for our global consumers;** as well as tap into their knowledge of Asian consumers to provide solutions for the dynamic and growing Asia/Pacific markets.



**Ms Nancy Quan**  
VP and Global R&D Officer  
Coca-Cola



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**CREATING AN INNOVATION ECONOMY**

ANALYSIS EXCLUSIVE



# A\*STAR TURN

Dr Raj Thampuran  
Managing Director, Agency for Science, Technology and Research, Singapore

16 INTERNATIONAL INNOVATION

## SINGAPOUR

# L'ARMÉE DE BIOPOLIS

Sous l'impulsion du militaire Chuan Poh Lim, la cité-Etat est à la pointe de l'innovation

**Ce patron de start-up est un général.** L'homme qui incarne l'aventure biotech de Singapour n'est pas un scientifique mais un jeune et brillant officier. Chuan Poh Lim (photo) a dirigé l'armée de son pays avant d'être bombardé, à 41 ans, Monsieur Recherche de la cité-Etat. C'est ici que les médicaments et les cosmétiques de demain sont inventés. L'archipel, où s'activent des milliers de chercheurs de toutes nationalités, est devenu, en quelques années, un hub mondial pour les technologies biomédicales, qui rivalise avec les plus grands.

« Nous avons commencé dans le biomédical à partir de zéro, explique ce militaire râblé, dans son bureau qui domine le quartier financier. Pour nous faire connaître des chercheurs recrutés: un Notabiliste réputé, le génome, l'oncologie, Philippe Kouri



## Managing Intellectual Property

The Global IP Resource

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INTERVIEW: SINGAPORE'S LICENSING LEADER

14 December 2011 | Peter Ollier, Hong Kong

Peter Ollier interviews Suresh Sachi, general counsel of A\*Star, Singapore's government research agency, about structuring an in-house team, the art of deal making and the city state's drive to become an IP hub

The Agency for Science, Technology and Research (A\*Star) was designed to foster research and development in Singapore and to commercialise that research. It oversees 14 biomedical sciences and physical sciences and engineering research institutes, and six consortia and centres.

How does the in-house group who initial process inventors and our outside simplification

## TALKING TO EXPLOIT TECHNOLOGIES CEO PHILIP LIM

### Turning patents into commercial winners

By GRACE CHING SENIOR CORRESPONDENT

SINGAPORE'S research laboratories have developed a wealth of technologies that could generate more than 5000 patents in commercial value for companies in the coming years.

That never-felt investment was evidenced in about 400 licenses signed with firms over the past 10 years, said Mr Philip Lim, chief executive of Applied Technologies.

These licenses stem from the 3,000 patents managed by Inphos, which handles technologies developed by Agency for Science, Technology and Research (A\*Star) institutes and researchers (ARCs) in Singapore.

Specifically, the company has entered into one local firm that has benefited last year. It entered a multimillion-dollar deal to make a bio-enzyme solution to make eco-friendly self-cleaning clothes.

This solution can ensure harmful



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## Lloyd's Register, A\*STAR Open Joint Lab On Energy & Marine Research

Tech & Pharma  
May 13, 2013

Lloyd's Register and A\*STAR have officially opened a joint laboratory to study the challenges faced by the marine, energy, and offshore sectors.



AsianScientist (May 13, 2013) – Lloyd's Register (LR) and Singapore's Institute of High Performance Computing (IHPC) have officially opened a joint laboratory in Singapore to study the challenges faced by the marine, energy, and offshore sectors.

The joint lab is part of LR's US\$35 million investment in its Global Technology Center (GTC) set up in Singapore in 2012. It is also pursued under LR's agreement with the Agency for Science, Technology and Research (A\*STAR) to collaborate on R&D projects as a key part of the center's activities.

## Stay out of the lab, get into the clinic

SAI MEDICAL OFFICER FOR 22 YEARS

Dr Tan Geok Leng, executive director of the Institute for Infocomm Research (I2R), will work closely with the Agency for Science, Technology and Research (A\*Star).

I2R is looking research in areas as diverse as signal computing, data analytics, signal processing, intelligent transport systems and biomedical technology.

Last year it tied up with China's search giant Baidu to focus on South-east Asian languages. Baidu users will be able to type Vietnamese, for instance, into a search box and results will come back in the same language.

Also last year, I2R licensed software technology to local firm Reachfield IT Solutions which allows a video content service provider to offer its content to be used on a PC, tablet, smartphone or any other device.

Dr Tan aims to increase the institute's collaborations with multinational corporations (MNCs) and small and medium-sized enterprises (SMEs).

"MNCs want cutting-edge technology. We can give them the raw technology we developed and their own development teams can commercialise it," he said.

But with SMEs, technologies need to be "tested three-quarters" by I2R as SMEs lack research and resources. "We've to give them technologies that are more or less ready to be commercialised. They just have to add their own special sauce and under-

## TALKING TO INSTITUTE FOR INFOCOMM RESEARCH EXECUTIVE DIRECTOR TAN GEOK LENG

### Next up – building robots that understand speech

By GRACE CHING SENIOR CORRESPONDENT

SCIENTISTS here are hoping to build robots able to respond to simple spoken instructions – opening up many exciting applications.

And they are developing ground-breaking technologies to take the analysis of satellite imagery to a more sophisticated level.

This is just some of the cutting edge work on the agenda at the Institute for Infocomm Research (I2R), a unit of the Agency for Science, Technology and Research (A\*Star).

I2R executive director Tan Geok Leng oversees more than 600 scientists and researchers at I2R, at one-stop. He is enthusiastic about robotics and the possible applications if robots could understand speech.

"I want to take robotics to the next level, make them more friendly, for years, we've been developing speech capability and we hope to make them understand simple spoken instructions so that they can be used in homes especially to care for the elderly."

Another focus is technologies in areas such as audio and video compression and analytics. They will be further developed to analyse satellite images, for example. "We're the know-how to preserve the quality of the information in the photos transmitted from space to earth. The photos would be clearer which allows researchers to get more accurate information from them. This would be useful for example, to identify areas of pollution or where vegetation has been lost over time."

The institute, founded in 2002, will work closely with the Science and Engineering Research Council, of which Dr Tan was recently appointed executive director.

Dr Tan, 55, joined the I2R 14 months ago. Before that, he was chief technology officer of the Infocomm Development Authority of Singapore.

I2R is looking research in areas as diverse as signal computing, data analytics, signal processing, intelligent transport systems and biomedical technology.

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"MNCs want cutting-edge technology. We can give them the raw technology we developed and their own development teams can commercialise it," he said.

But with SMEs, technologies need to be "tested three-quarters" by I2R as SMEs lack research and resources. "We've to give them technologies that are more or less ready to be commercialised. They just have to add their own special sauce and under-

standing to turn the technology into products they can sell."

The institute will also play a major role in the IAP (Innovation Adoption Programme) announced in the Budget earlier this year. In an effort to raise productivity, local IT firms can license I2R's technologies to create solutions to sell to other SMEs. From July, the programme will be piloted in the sectors: construction, food manufacturing, precision engineering, marine, aerospace and retail.

Dr Tan also hopes to work more with large local companies such as SingTel and Singapore Airlines.

For example, for SP AusNet, it developed sensors for its electricity and gas network in Australia to identify problems that could lead to service disruption. SP AusNet, a wholly-owned unit of Singapore Power, manages a multi-million-dollar electricity and gas network in south-east Australia.

This year, Dr Tan wants to reach out to tech start-ups as it may be able to offer technologies to boost the start-up's initiatives. Start-ups and more established firms will be invited to showcase I2R technologies on May 16.

"I want to challenge their imagination. Tell me what you can do with the technology and we'll see how we can help you."

grace.ching@sp.gov.sg




Agency for Science, Technology and Research

CREATING AN INNOVATION ECONOMY



# 1 – LEADERSHIP

## 1.1 SENIOR LEADERSHIP

### 1. Senior executives develop organization's values that focus on innovation

#### ORGANIZATION VALUES DRIVEN BY INNOVATION

Recognizing the role of innovation in the knowledge economy, A\*STAR leadership develop values that leverages on its people and considers its talents as key to innovation.

These values are translated into setting directions and creating opportunities that are vital to creating an innovation economy.

Commitment to uphold A\*STAR's Values are what binds us together into a cohesive team to fulfil our mission. They form the basis for how we do things in the organization.

Together they form our value system - "A\*STAR & I".

**ACTION:** We are action-oriented and strive to excel in what we do. This requires staff to take the initiative and be enterprising. It demands that we anchor plans and actions in practical consideration, and focus on excellent execution once a decision is taken.

**SPEED:** We work swiftly and conscientiously to ensure no momentum is lost. This means to work with a sense of competitive urgency in seizing and exploiting opportunities. It requires us to seek to achieve goals fast without compromising quality, and to question and abandon bureaucratic practices.

**TEAMWORK:** We build on each other's strengths so that all can win. We are expected to build on each other's abilities and to stay focused on team gains and not individual advantage. We are expected to be generous with our expertise and resources and to share.

**AGILITY:** We innovate and adapt our plans and actions to take into account changes. This requires staff to be aware of the changing competitive landscape, to challenge and review assumptions, and to be prepared to change strategies and tactics to achieve our mission and vision. We need a mindset that strives for continuous improvement and must be prepared to learn, unlearn and re-learn.

**RESOLVE:** We are dedicated and determined to achieve our mission. This demands that we be committed and persistent in what we do, to learn from failures and to try again until we achieve the end goal in mind.

**INTEGRITY:** We will carry out our responsibilities in an honest and trustworthy manner. We are expected to uphold a high standard of conduct, to have integrity in our thoughts and actions, and to be open in admitting our mistakes and learning from them. We honor staff who exhibit such values by rewarding them with the highest A\*STAR accolade - the STAR Employee Award. We look for people who uphold high standards of integrity and who are committed to working as a team, across organizational boundaries and in a multi-disciplinary and integrated manner to build success. We place a premium on staff with a bias for action, who are able to work with agility of

mind and steady resolve to achieving our mission.

#### OUR CODE OF CONDUCT

In 2013, A\*STAR introduced the Code of Conduct (apply to all staff of A\*STAR HQ and its Entities) to complement and reinforce A\*STAR Values. The Code of Conduct is intended as a compass for all employees and embodies the ethos of the whole of A\*STAR. Through consistent commitment to uphold the code of conduct, we are able to steadfastly move towards our organizational goals:

##### Ethics & Integrity

Ethics and Integrity shape the "mind" of our organization. We should conduct ourselves ethically and with integrity, and uphold the name and reputation of A\*STAR at all times.

- Act in good faith and in the best interests of A\*STAR and avoid situations where personal and organizational interests conflict
- Be impartial in carrying out our duties and responsibilities
- Display trustworthiness, honesty and accountability in our words and deeds
- Properly manage and steward public funds, resources, assets and information entrusted to us

##### Excellence & Standards

Excellence and Standards reflect the "spirit" of our organization. We should pursue excellence and adopt the highest standards, while maintaining the highest levels of humility. We should also observe the highest levels of safety at all times.

- Conduct ourselves with the highest level of professionalism, including in our interactions with the public
- Benchmark ourselves against the best and constantly improve our practices, processes and systems, striving to become the benchmark for others
- Recognise and leverage on our attributes and advantages
- Adopt an innovative mindset and learn continuously

##### Empathy & Respect

Empathy and Respect nurture the "heart" of our organization. We are a rich and diverse community with a common mission. We should display mutual respect and appreciate the thoughts and feelings of one another to foster a cohesive and inclusive environment.

- Be fair in our actions and conscious of their effect on others
- Be mindful of religious, social and cultural differences and sensitivities
- Encourage a culture of mentorship at all levels
- Respect the intellectual property of A\*STAR and others

To further nurture innovation excellence, we consistently benchmark and push ourselves to improve, leveraging on our attributes and advantages to improve efficiency. We also adopt the "must do" spirit by having the commitment and courage to persist despite dire circumstances so as to continually improve ourselves and innovate.

## 1.2 ORGANIZATIONAL CULTURE

2. Organization translates its values into desired behaviours that encourage and support innovation

3. Organization adopts innovation-focused policies and practices that support values

A\*STAR integrates the value system into the daily work of our staff using a variety of channels.



A\*STAR's Code of Conduct embodies A\*STAR's Values and bridges A\*STAR's Values and Operational Policies

Fig 1.1 Alignment of A\*STAR Values and Code of Conduct

A\*STAR translates its values into behaviours and policies that supports innovation. This is done by integrating the value system and Code of Conduct (Fig 1.1) into the daily work of our staff to foster good practices, policies and behaviors relating to innovation.

4. Organization has programmes to promote innovation culture

A\*STAR has well-established systems to cultivate staff behaviour rooted to our organizational values. This ensures that our people are progressively nurtured to act out our mission which is rooted on innovation. The key building blocks are namely; Foundation, Awareness, Operationalise, Internalise and finally translated to Behaviour. This is fostered in a progressive manner shown in Fig 1.2.



Fig 1.2 Building blocks to Innovation Culture and Behaviour

5. Organization reviews and closes gaps between current and desired innovation culture

Through internal and external feedback channels, A\*STAR continually reviews and reinvents ways to ensure its current culture building systems remain relevant to its organizational goals. The feedback channels will provide us greater insight to make well-informed decisions to close the gaps between current and desired culture. Our feedback channels are summarized below:

Feedback Channels for Culture	
Internal Feedback	External Feedback
<p><b>Dialogues</b></p> <ul style="list-style-type: none"> <li>MD Staff Engagement Sessions</li> <li>Induction Programme</li> <li>Insights Programme</li> <li>Compass Rounds</li> <li>HQ Townhall</li> <li>Departmental Retreats</li> <li>Chairman Lunch Meetings with RSEs and Scholars</li> </ul> <p><b>Surveys</b></p> <ul style="list-style-type: none"> <li>Employee Engagement Survey</li> <li>A*STAR Branding Committee Survey</li> </ul> <p><b>Performance</b></p> <ul style="list-style-type: none"> <li>Annual Staff Appraisal</li> </ul>	<p><b>Dialogues</b></p> <ul style="list-style-type: none"> <li>SERC and BMRC Industry Visits, Engagement and Meetings</li> <li>AGA Tea Sessions and Visits to Scholars</li> <li>Workplan Seminar (involves external stakeholders)</li> </ul> <p><b>Surveys/Audit</b></p> <ul style="list-style-type: none"> <li>AGO Annual Audit</li> <li>Customer Satisfaction Surveys</li> </ul> <p><b>Results</b></p> <ul style="list-style-type: none"> <li>Recognition, e.g. Frost &amp; Sullivan Award</li> <li>Benchmarking Studies and Learning Journeys</li> <li>Performance to RIE 2015 KPIs</li> </ul>

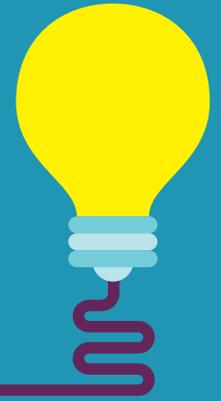
Fig 1.3 Feedback Channels

## INNOVATIVE ACTION ON FEEDBACK

Fig 1.3 shows the many channels that A\*STAR uses to review A\*STAR's efforts in developing an Innovative Culture. The Employee Engagement Survey (EES) is one of the mechanisms used to periodically review organization's culture from tranche to tranche. Action plans are then developed following the EES. The most recent EES 2013 saw a larger portion of favourable scores as benchmarked against EES 2008, including leadership and culture, as well as innovation on the rise. The EES provided an important platform for A\*STAR to solicit internal perspectives on organizational excellence, to guide the continual development of our plans so that we can innovate to remain relevant and competitive.

The most significant feedback comes from A\*STAR industry customers. A\*STAR's efforts in industry engagement provides us with the opportunity to develop the people, capabilities, infrastructure and programmes for A\*STAR in moving forward to help industry customers to:

- Upgrade and innovate to remain competitive
- Focus on increasing productivity and sustaining economic growth through tech adoption
- Create higher quality jobs and improve quality of life through innovation
- Look to R&D to spur innovation



## PLANNING



The **partnership with A\*STAR adds to the bilateral cooperations of ANR with international research funding agencies and meets the objective to extend the ANR's collaborations outside Europe.** The signature of such an agreement is also an opportunity to reinforce the relationships between France and Singapore, a country with a strong scientific and technological potential, on topics of common interest that are key for the research development: nanotechnologies, information communication science & technologies and biomedical sciences.

**Jacqueline Lecourtier**  
General Director, French National Research Agency



**A\*STAR has an unequalled record of building a research organisation** from relatively small beginnings into a potent centre for science and technology. It is recognised all over the world for this accomplishment.

**Dr Sydney Brenner**  
Nobel Laureate  
Scientific Advisor to A\*STAR Chairman  
Distinguished Professor, The Salk Institute for Biological Studies, USA  
2002 Winner of the Nobel Prize in Physiology or Medicine



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## 2 – PLANNING

### 2.1 STRATEGY DEVELOPMENT & DEPLOYMENT

6. Organization has strategies that focus on innovation

7. Organization's innovation strategies are aligned to the organization's objectives and goals

### SHAPING THE INNOVATION STRATEGY

A\*STAR follows a systematic and integrated strategic planning process. The plan is first formulated at the national level with A\*STAR playing a key role in shaping the contents. It is then cascaded into an A\*STAR corporate plan. Thereafter, the A\*STAR departments draw up their departmental plans incorporating information pertaining to national goals and aligning them with A\*STAR's organizational objectives. Fig 2.1 outlines the National R&D Framework.



Fig 2.1 National R&D Framework

In shaping its research focus areas and capability development plans, A\*STAR also undertakes a robust planning process in close consultation with partner economic agencies, relevant industry players, international scientific experts, and the wider research community. This ensures that the research is we do is highly industry relevant and will impact lives and the economy.

### PLANNING OUT THE RESEARCH PIPELINE

A\*STAR identifies key areas of research drawing from emerging drivers of growth, megatrends, national priorities and growth potential. The process is largely supported by engagements and discussions with international advisory groups (eg. Council Boards, and the Biomedical sciences International Advisory Council) to provide regular updates on industry and global direction, and provide independent validation of future scientific areas for A\*STAR to pursue. The discussions with these internationally eminent scientists and industry players allow A\*STAR to have a clearer sense of the prevailing scientific landscape, the competitive strengths of Singapore vis-à-vis other countries, and to prioritize resource allocation accordingly.

With that in mind, A\*STAR undertakes technology planning to help chart scientific direction and roadmap for the mid to long term in preparation for the next tranche. Fig 2.2 outlines the planning process of identifying opportunities for innovation. Fig 2.3 maps out A\*STAR's planning process leading up to its 5-year plan. Both expounds on A\*STAR's strategy in setting the direction to achieving its organizational goals and visions.

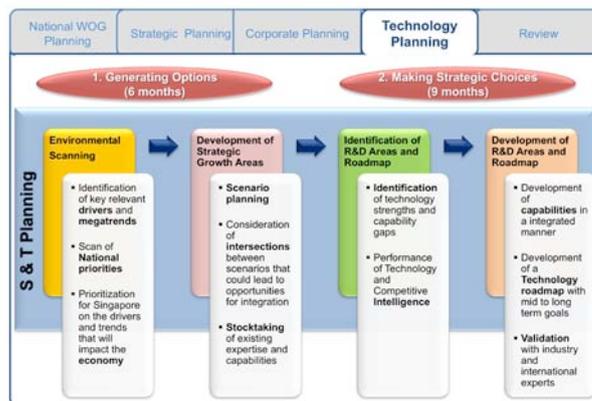


Fig 2.2 The S&T Planning Cycle

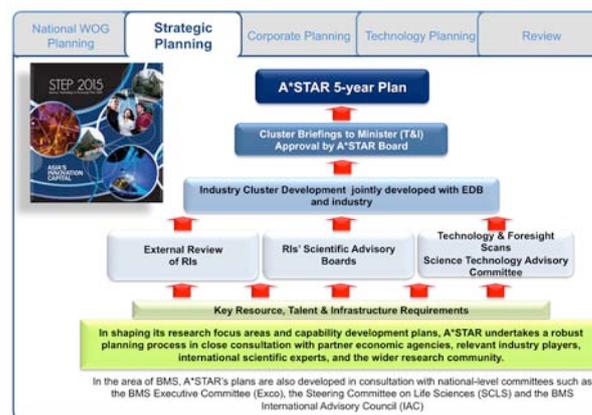


Fig 2.3 A\*STAR 5-year Plan

### 8. Organization establishes short-term and long term goals for innovation strategies

A\*STAR establishes short-term and long-term goals aligned with its key strategic thrusts. Formulated for the RIE 2015, the following are strategic objectives set out to fuel A\*STAR's innovation agenda:

- Develop and nurture scientific talent for Singapore that includes an indigenous core
- Strengthen and develop major economic clusters in Singapore through R&D
- Attract, anchor, and grow industry in Singapore

Expanding further on the broad objectives above, sub-objectives are also developed with specific KPIs tagged to them:

#### Talent

- Build a continual pipeline of highly trained talent
- Ensure an attractive and conducive environment to develop nurture and retain talent

## **Intellectual & innovation**

- Transfer knowledge and expertise to Industry
- Improve flow of IP to enterprises

## **Enterprise**

- Create partnerships with industry and clinical community
- Create value from industry partners

### ***9. Organization develops action plans aligned to innovation strategies and goals***

## **KEY THRUSTS TO DRIVE AN INNOVATION ECONOMY**

A\*STAR strategic thrusts are engineered to support A\*STAR's mission to build an innovation economy for Singapore. A\*STAR planning and policy department (PPD) maps out the action plans, desired outcomes and stretch goals under each thrust keeping in mind the organizational goals.

## **TALENT THRUST**

A\*STAR recognizes talent as a key ingredient to scientific advancement and technological progress. In this regard, the talent thrust is prized to develop and nurture scientific talents to ensure Singapore continues to be an attractive hub for research excellence.

The A\*STAR Graduate Academy (A\*GA) is instrumental for identifying and grooming Singapore's scientific talent and have funded more than 1000 scholars and fellows in the best universities in Singapore and abroad.

## **A\*STAR'S ACTION PLANS FOR ITS TALENT STRATEGY ARE:**

- Attract, develop, motivate & retain scientific talents
- Develop and nurture scientific talents for Singapore that includes an indigenous core

Apart from driving the talent pool within the organization, A\*STAR is also committed to support the building of science & technology talent pool for the industry. Through such private-public sector partnerships, new developments in businesses and R&D are constantly creating high value jobs and growth for Singapore and its economy.

## **INTELLECTUAL & INNOVATION THRUST**

The intellectual & innovation thrust is strategized to fuel the intellectual capital required to reinvent and innovate. This thrust positions A\*STAR to strengthen and develop major economic clusters in Singapore through R&D. This will enable us to develop mission-oriented action plans to develop intellectual capital by:

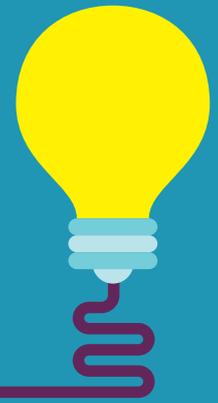
- Developing world class R&D capabilities with international and local partners
- Fostering technological transfer and adoption

This has benefitted private and public sectors alike and continues to strengthen A\*STAR's position to drive growth through innovation.

## **ENTERPRISE THRUST**

A\*STAR firmly believes that to translate R&D from mind to market and to create significant impact to economy, more efforts have to be driven to engage and stimulate the industry. A\*STAR continually revise and develop directions for its industry programmes. This includes putting in place action plans such as:

- Improving licensing, commercialisation of technology and patents
- Deepen industry engagement efforts, enhancing industry engagement for greater economic outcomes (MNCs/ SMEs)
- Preposition Research capabilities for future translation to industry
- Strategic thematic programmes aim to build capabilities to pre-position A\*STAR for new industrial impact, and involving starting up new suites of capabilities and talents



## INFORMATION



A\*STAR has made a major contribution to attracting international companies to ... Singapore. This is through **its unique ability to link basic research, applied research and development through its RIs and its close links with industry.**

**Lord Ronald Oxburgh**  
Former Chairman of Shell  
Member, House of Lords Select Committee on Science and Technology, UK



Fusionopolis is home to the science and engineering research community and the infocomm and media industry. It follows the establishment of Biopolis in 2003 for the biomedical sciences. **Fusionopolis and Biopolis are the anchors of the one-north development, which is designed as an entire integrated innovation ecosystem.** Here researchers can mingle and discuss and share knowledge and ideas, and scientists can fire their imaginations to dream up the next big thing.



**Lee Hsien Loong**  
Prime Minister, Singapore



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The Executive Seat is a new series that looks at human resource matters, corporate management and the business of hiring staff. In the second of this series, Rachel Boon speaks to A\*STAR's Dr Tan Guan Hong.

# Don't teach how to do it, share your experience

Business veteran believes training should come with a personal touch

DR TAN Guan Hong, 60, is programme director of the Agency for Science, Technology and Research's Institute for Information Research (IIR), a job that involves introducing technology, engineering support and productivity programmes for small and medium-sized enterprises and older...



strong, but their mind is... The firms should ask themselves how they want to grow the company. You can use machinery to supplement their physical strength in terms of technology, which has a lifespan. These days, you see a new mobile phone model every six months. For example, I recently visited Great Laundry, which is run by the second generation. They bought automated machines and wanted to run three shifts but it was difficult to find workers. There is an avenue for them to use older workers, but as the office is in Tian, it's a smarter problem regarding transport and, in turn, getting older workers to go there. There are many issues, and the companies have to address those one after another.

How much should firms invest in training older workers? For small and medium-sized enterprises, 10 per cent of the annual salary is a good place to start. You need to assign a proper budget for it to let people know there's a value to training. Training is an investment in an individual and he carries those skills for the rest of his life. But in our accounting system today, training is an expense, not an asset. I need to have long engagements with my accountants, so I asked her, if that's the case, why send your kids to school? In Philip Skerretson, who I worked from 1980 to 1993, I was brought up in that culture - that training is an investment - and in Philip, we also had job rotations.

Besides the Government encouraging firms to keep workers employed as they get older and do more than, what can employers do? The older person must have something to look forward to.

## SINGAPORE'S RESEARCH AGENCY WINS FUTUREGOV INFOSECURITY AWARD

By Kelly Ng | 28 October 2013 | Views: 1223

Agency for Science, Technology and Research (A\*STAR) in Singapore has won the 'Information Security' award in this year's FutureGov Awards, for its impressive ISO 27001-certified Information Security Management Systems.

As the lead agency for fostering world-class scientific research and talent for a vibrant knowledge-based and innovation-driven Singapore, large amount of information moves through its digital space regularly.

With rising global competition and growing external threats, A\*STAR wanted to provide assurance to users and researchers on the integrity and availability of data and information services.

In late 2011, the agency started on a journey to certify its A\*STAR Data Centre (Matrix) Infrastructure Services and Biopolis Campus Network Services to be 'ISO 27001 - Information Security Management Systems'.

The team laid out several key performance indicators (KPIs):

PHOTO 8



View photos

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  - Singapore's Defence Scientist supports cyber security promotion
  - Singapore Polytechnic opens first Cyber Security Academy
  - Singapore's border control agency to enhance its self-service facility

**TECHNASIA**

STARTUPS, MENDES, SOCIAL, E-COMMERCE, OPENIN, ASIA, TRAVEL

### Want to build a startup on selected technologies by research institute A\*STAR?

The Singapore Government, including Production (STP) and Digital Technology, are jointly launching a Call for Proposals to look for some of the most innovative technology start-ups. Selected proposals may receive up to S\$200,000 (US\$100,000) in funding and incubation under STP 22 (Singapore) to implement their ideas.

**Requirements:**

- Proposals must include usage of several A\*STAR technologies as listed here

**A\*STAR Technology Offerings:**

- 1. Applied/Team-based value of at least 1 billion Singapore dollars with at least 200 jobs in the Singapore region
- 2. Good track record (at least 1 year) in commercialisation
- 3. Applied/Team-based commercialisation government grants

**Bidding Details:**

When: Monday 28th April 2013  
Time: 10am - 11:30am

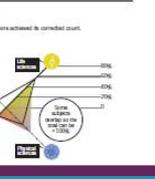
ASIA-PACIFIC NPI

ARTICLES: 116  
CORRECTED COUNT: 4152

## Singapore

Singapore is boosted as 3.7% GDP increase in 2013 - and its science output grew too. The island nation's 2013 NPI research output was almost double that of the previous year.

A small, resource-poor nation, Singapore relies on its acumen to support the country's high standard of living. In this respect it resembles Switzerland, both countries consistently rank in the top ten of the Global Innovation Index of the World Intellectual Property Organisation and Cornell University. The World Economic Forum ranks Singapore second to Switzerland in its 2013 list of the world's most competitive economies. Hong Kong and Japan are the other Asian representatives in the top ten.

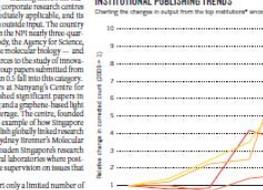


### MATURING RESEARCH

As Singapore's research enterprise matures - training more PhD students, establishing institutes and attracting corporate research centres - its scope is widening beyond the immediately applicable, and its researchers are becoming less dependent on outside inputs. The country has long been a centre for biotechnology - in the NPI nearly three-quarters of papers from the national research body, the Agency for Science, Technology and Research (A\*STAR) involve molecular biology - and now Singapore is drawing significant resources to the study of innovative new materials. Eight of the 13 Nature group papers submitted from the NPI with a corrected count of more than 15 fall into this category. In its first year of operation researchers at Nanyang Centre for Disruptive Photonic Technologies published significant papers in Nature Communications on optical clocking and a graphene-based light sensor that received widespread global coverage. The centre, founded and headed by Vahidaly Chaharsa, is a good example of how Singapore has attracted international expertise to establish globally leading research units. Another instance is Nanyang Institute of Biomedical Engineering Laboratory at A\*STAR, to headlead Singapore research horizon former has now established several laboratories where post-doctoral researchers can work without close supervision on issues that interest them.

Singapore's small population can support only a limited number of institutions that contribute to the NPI: about 20 in total. Of these, only three carry real weight: NUS, Nanyang and A\*STAR. All three are all in the top 20 of the Asia-Pacific region and significant players on the world stage, looking their own against counterparts in much larger countries. In the Asia-Pacific region, NUS ranks higher than Australia's top institution, the University of Melbourne. Both NUS and Nanyang score higher than South Korea number one, the Korea Advanced Institute of Science and Technology (KAIST) and Nanyang (N7) are nudging up the global top 100 - Nanyang up 146 places from 2011.

### INSTITUTIONAL PUBLISHING TRENDS



RANK	INSTITUTION	2013	2012	2011	2010	2009	2008	2007	2006	2005
1	Nanyang Technological University (NTU)	10,200	9,800	9,500	9,200	8,800	8,500	8,200	7,800	7,500
2	National University of Singapore (NUS)	8,500	8,200	7,800	7,500	7,200	6,800	6,500	6,200	5,800
3	Agency for Science, Technology and Research (A*STAR)	7,800	7,500	7,200	6,800	6,500	6,200	5,800	5,500	5,200
4	Singapore University of Technology and Design (SUTD)	6,500	6,200	5,800	5,500	5,200	4,800	4,500	4,200	3,800
5	Nanyang Technological Education Institute (NTEI)	5,200	4,800	4,500	4,200	3,800	3,500	3,200	2,800	2,500
6	Nanyang Technological University (NTU)	4,800	4,500	4,200	3,800	3,500	3,200	2,800	2,500	2,200
7	Nanyang Technological University (NTU)	4,500	4,200	3,800	3,500	3,200	2,800	2,500	2,200	1,800
8	Nanyang Technological University (NTU)	4,200	3,800	3,500	3,200	2,800	2,500	2,200	1,800	1,500
9	Nanyang Technological University (NTU)	3,800	3,500	3,200	2,800	2,500	2,200	1,800	1,500	1,200
10	Nanyang Technological University (NTU)	3,500	3,200	2,800	2,500	2,200	1,800	1,500	1,200	900



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### 3 – INFORMATION

#### 3.1 MANAGEMENT OF INFORMATION AND KNOWLEDGE

##### 10. Organization selects, collects and captures information related to innovation

#### SHAPING THE INNOVATION STRATEGY

A\*STAR has a systematic process to collect, manage and disseminate information to support the organization’s key strategic thrusts and operational processes. Sources of information are derived from external stakeholders such as:

- Government: MTI, ministries, NRF, government agencies (SPRING, EDB, etc.)
- Partners: R&D partners, industry partners, educational institutions
- Customers: Industry projects, licensing, SMEs (GET-Up/TAP)
- Internal: Corporate HQ, Councils, A\*GA, RIs and staff external environmental scanning as well as a comprehensive internal knowledge portal.



Fig 3.1 Information Collection Process

Fig 3.1 show how key information (RIE 2015 and A\*STAR Management Report Indicators) are collected, monitored, reviewed and disseminated across A\*STAR for action. These information are analyzed and actions plans are developed to reinforce existing innovation strategies in view of the R&D challenges ahead. Examples of how such information are being utilized are covered in the following chapters.

##### 11. Organization shares information to encourage innovation and learning

A\*STAR has a knowledge management system coined as the Knowledge Universe (KU) for sharing of information within the A\*STAR family. Intra- and inter-department knowledge repositories are found in the KU, facilitating collaboration for enhancing knowledge across the board and improving operational efficiency.

To encourage cross disciplinary research collaborations,

JCO organizes and supports interaction platforms aimed at bringing researchers from both Councils together to foster a more collaborative environment and achieve greater synergies between different scientific disciplines. Examples includes Joint Council workshops, special interest groups for researchers, and the annual A\*STAR Scientific Conference.



#### Keynote Speakers

	<b>Irene Ng</b> Professor Marketing and Service Systems University of Warwick Director International Institute of Product and Service Innovation "New Business & Economic Models in the Connected Digital Economy: Implications for Research"		<b>Frank Burnet</b> Professor Science Communication Unit University of West of England "Why and how to communicate your research"
	<b>Sheng Ding</b> Professor Gladstone Institute of Cardiovascular Disease Department of Pharmaceutical Chemistry University of California San Francisco "A Chemical Approach to Controlling Cell Fate"		<b>Khek-Yu (Lawrence) Ho</b> Professor of Medicine Chair, University Medicine Cluster Head, Department of Medicine National University Health System, Singapore "Innovation Efficiency: Blind men and an elephant"
	<b>Peter Schwartz</b> Senior Vice President Global Government Relations and Strategic Planning Salesforce.com "The Next Scientific and Technological Revolutions"		<b>Freddy Boey</b> Professor Deputy President and Provost Nanyang Technological University "From Research to Innovation to Start Ups – Perspectives from a Singapore Inventor"

Fig 3.2 A\*STAR Scientific Conference (ASC)

In addition, the A\*STAR Research Publication launched in 2009 showcases the cutting edge research and technologies from across the Research Institutes (RIs) for sharing within the A\*STAR research community, as well as with external parties such as the universities and business community.

International Science and Technology (S&T) partnerships continue to play a crucial role in enabling A\*STAR access to top scientists in leading research institutions from around the world, and fostering exchange of scientific expertise critical for knowledge creation and innovation. Through interactions with the international S&T community, A\*STAR is also able to tap on best practices and share success stories. Furthermore, A\*STAR represents Singapore as the national S&T agency in international S&T bodies, such as the ASEAN Committee on Science and Technology (COST), and the Asia-Pacific Industrial Science and Technology Working Group (ISTWG).



<http://www.a-star.edu.sg/People/Our-Research-Community/Visiting-Scientists/Distinguished-Visitor-Programme.aspx>



Fig 3.3 The Visiting Investigatorship (VIP) and Distinguished Visitor Programme (DVP)

Fig 3.3 The BMRC Distinguished Visitor Programme (DVP) is an initiative aimed at fostering stronger ties between the local scientific community and internationally renowned scientists, as well as prominent personalities in the global Biomedical Sciences scene. It also strives to bring greater awareness of Singapore's Biomedical Sciences initiative to the international community. The BMRC Distinguished Visitor is invited to Singapore to participate in a one-week visit programme, customised to best suit his/her specific research interests and promote interaction with the local research community.

The Visiting Investigator Programmes (VIP) is another initiative aimed at tapping and attracting world-renowned experts as visiting investigators to enhance A\*STAR's capabilities in key strategic areas. These VIPs will also groom local talents in areas identified as capability gaps by the RIs. The programme allows A\*STAR to tap on the deep expertise and international networks of these eminent scientists. These VIPs will spend a significant amount of time in Singapore, and each VIP may be funded up to \$5 million for a period of three years.

## 12. Organization analyses and uses information from various sources related to innovation

A\*STAR sources of information include various systems highlighted earlier in Fig 3.1. Information sources are reviewed regularly by process owners (Councils, A\*GA, Corporate HQ, etc.)

At Councils, information is analyzed to help make better decisions in areas of:

- Enhancing and deepen industry engagement efforts for better economic outcomes
- Reinforce the relevance and attractiveness of research to industry and to foster research collaborations between Councils entities and industry partners
- Strengthen suite of mission-oriented capabilities and generate economic impact through Integration
- Focusing on Mission-Oriented Programmes with High Growth Potential
- Leveraging Seamless Integration and Translation as Key Competitive Advantages
- Bridging capability gaps to pre-position A\*STAR for new industrial impact

At ETPL, information relating to IP are monitored and reviewed to improve licensing through closer collaboration with MNCs and tighter integration with SMEs. Such efforts improve the commercialisation of A\*STAR's scientific discoveries through gap funding (Commercialisation of Technology (COT) and Flagship).

The strategic use of IP-related information also allows ETPL to drive technology disclosures into licensable intellectual properties (IPs), as well as improve the patent usability rate with more rigorous assessments

## 13. Organization retains knowledge to support innovation

A combination of print and digital information framework is used to manage knowledge to support and foster innovation at A\*STAR.

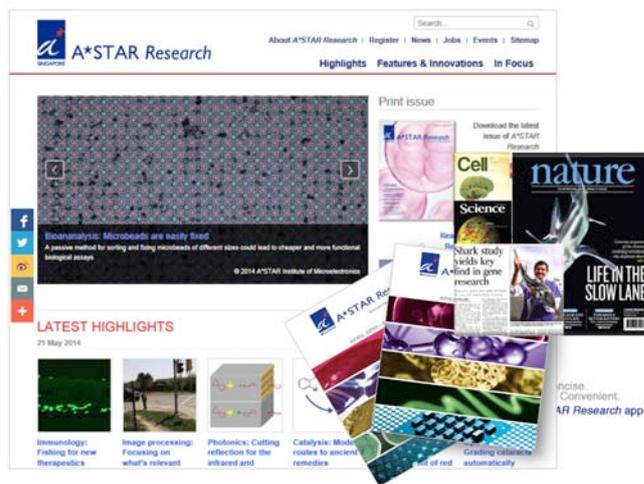


Fig 3.4 A\*STAR Research

Fig 3.4 A\*STAR Research is an online and print publication highlighting some of the best research and technological developments across research institutes of A\*STAR. A\*STAR Research publishes regular research highlights, in-depth features and coverage of the latest innovations in science and engineering at A\*STAR in a format that can be appreciated by both experts and the laymen alike. Some interesting features about A\*STAR Research and website:

- A\*STAR has published in over 6,900 journals since 2011; recently making the cover of Nature – one of the most prestigious scientific journals globally
- More than 3500 registered users receive the bi-weekly email updates
- Over 1000 twitter followers on R&D updates

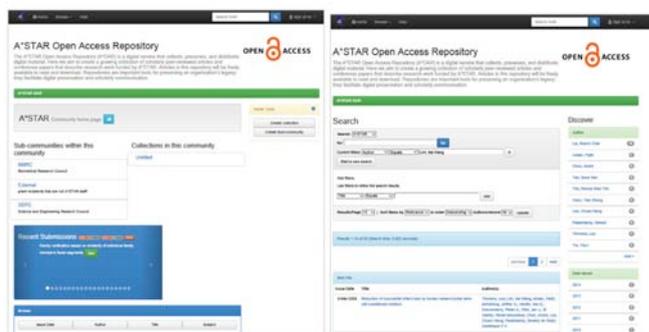


Fig 3.5 A\*STAR Open Access Repository

Fig 3.5 The A\*STAR Open Access Repository (A\*OAR) is a digital service that collects, preserves, and distributes digital material. Here, we aim to create a growing collection of scholarly peer-reviewed articles and conference papers that describe research work funded by A\*STAR.

With effect from 1st August 2013, A\*STAR had

implemented an Open Access mandate. This means that all peer-reviewed articles and conference papers published on or after 1 August 2013, arising from A\*STAR funded projects (both assured and non-assured funding) will be made publicly available on A\*STAR Open Access Repository or any other institutional / subject Open Access Repository no later than 12 months after the official date of publication.

### 3.2 COMPARISON & BENCHMARKING

#### 14. Organization selects, collects and captures information related to innovation

A\*STAR is in the business of R&D and our Strategic Thrusts are centred on Talent, Intellect & Innovation and Enterprise. We have identified KPIs that allow us to track and review how we are faring in each key business area.

For selected critical areas, we have identified benchmark organizations to compare ourselves against. These organizations are selected because they are generally considered to be leaders in their fields.

Fig 3.6 shows how do we select our Focus Areas

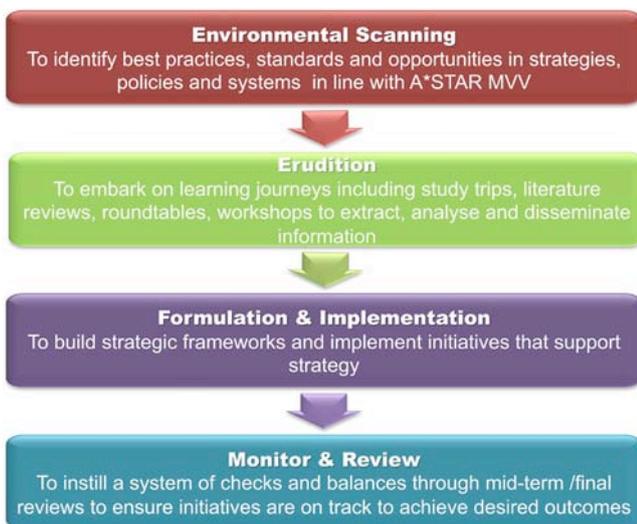
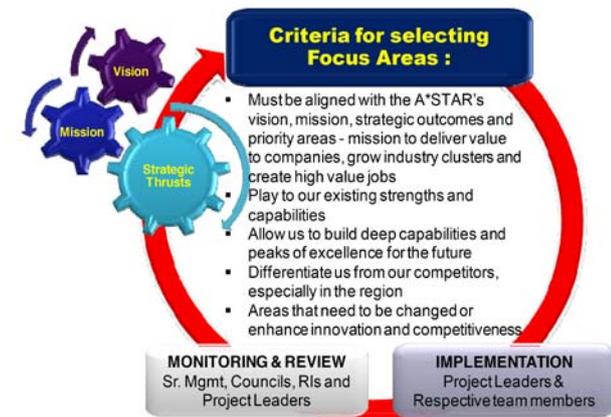


Fig 3.6 Criteria for selecting focus areas

### 15. Organization analyses and uses information from various sources related to innovation

#### ADOPTING BEST PRACTICES THROUGH COMPARISONS AND BENCHMARKING

A\*STAR has been conducting benchmarking studies to seek breakthrough improvements in line with its Strategic Thrusts.

Strategic Thrust	Talent Thrust	Intellectual & Innovation Thrust	Enterprise Thrust
Benchmarking Projects	<b>AGA</b> <ul style="list-style-type: none"> <li>Competitiveness and relevance of A*STAR scholarships</li> </ul>	<b>BMRC:</b> <ul style="list-style-type: none"> <li>Skin Research Institute Singapore (SRIS)</li> <li>Singapore Centre for Nutritional Sciences, Metabolic Diseases, and Human Development (SiNMeD)</li> </ul> <b>SERC</b> <ul style="list-style-type: none"> <li>Marine &amp; Offshore Strategic Research Programme</li> <li>Urban Systems</li> </ul> <b>SERC &amp; BMRC</b> <ul style="list-style-type: none"> <li>A*STAR MedTech Initiatives</li> </ul> <b>ETPL:</b> <ul style="list-style-type: none"> <li>Diagnostic Development Hub</li> </ul>	

Fig 3.7 Benchmarking and comparative information chart

Fig 3.7 The benchmarking and comparative information have allowed A\*STAR to be consistently aware of its position in the R&D landscape and forms the basis for strategic planning ahead to drive innovative practices and venture into promising areas of R&D.





## PEOPLE



The fact that some of the best have chosen to come to Singapore and to **invest the prime years of their scientific careers with A\*STAR** speaks volumes of the **attractiveness of the research** opportunities at the Biopolis. I commend A\*STAR for its far-sighted efforts to help shape and nurture the scientific leaders of tomorrow.

**Dr Tadataka Yamada**  
**Tadataka (Tachi) Yamada**  
Executive Vice President, Chief Medical and Scientific Officer  
Takeda Pharmaceuticals  
Formerly president of the Bill and Melinda Gates Foundation's  
Global Health Program



Singapore recognises the industry's need to train and develop multidisciplinary teams who can translate novel ideas into viable healthcare solutions. **We are delighted to be collaborating with Stanford University and A\*STAR to address this demand and nurture talent** who will become well acquainted with the Medtech innovation process, while being attuned to Asian clinical needs.



**Dr Beh Swan Gin**  
Permanent Secretary  
Ministry of Law  
Formerly Managing Director  
Singapore Economic Development Board



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**CREATING AN INNOVATION ECONOMY**

[ I'M A SCIENTIST: JACKIE YING ]

# No fast track in research – it's a lifelong journey

It's the learning and growing that will keep you going, even when the going's rough

progressing. I try to be home by 6.30pm. I get some exercise by running up and down the stairs, then I help my 12-year-old daughter Hai-Min with her Chinese homework. After dinner it's back to work till midnight. Many processes, I feel the system here has become too rigid. It's killing their curiosity and creativity.

Q: With so many accolades and world firsts, what has been your proudest moment?



JACKIE YING

Professor, Executive Institute and National Institute of Education, Agency for Science, Technology and Research. Jackie Ying is a chemical engineer and a materials scientist. She has worked in the private sector and academia. She is currently a professor at the National Institute of Education. She has received several awards and accolades for her work in research and education.

makes sense to me. It was also a very personal choice to wear the tudou (headscarf) after I went on the umrah (minor pilgrimage)

## A beautiful mind

Do You See Lin's girl moved the PM to the bar as an inspiration in his National Day Rally speech

$P(x, y) = 0$ , where  $P$  and  $Q$  are two lines. For example, if  $P = (a, b)$ ,  $Q = (c, d)$ ,  $a_1 \neq a_2$ , we can do  $a_1(x - b) - a_2(x - d)$ .  $P$  and  $Q$  will be zeros of the line  $y - b = -(x - a)$ . We find zero (say  $R$ ) of  $l(x, y)$ .  $c(x - d) = (c - d) \in E$ .  $d(x - c) = (R) + (R') - 2(O)$ .  $x(y - c) = D - (R') + (O)$ . Linearly equivalent to  $(R)$ .



"So many people in my life have helped me along - my teachers, peers and even past students. I want to give it on by helping others."

## 137 get A\*Star scholarships for science studies

Agency hopes grants will help to develop strong core of local scientists

By DAVID EE

Agency for Science, Technology and Research (A\*STAR) has announced that 137 students have been awarded A\*Star scholarships for science studies. The grants are intended to support the development of a strong core of local scientists. The recipients will receive financial support for their studies and research. The agency hopes that these grants will help to develop a strong core of local scientists.



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## Google and A\*Star are top choice employers for fresh grads



AsiaOne Wednesday, Jul 10, 2013

while A\*STAR secured the top spot

g Technological University, National ent University, took part in Universum's

## THE A\*STAR ROLL OF HONOUR 2013

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A\*STAR Roll of Honour 2013. The next generation of trailblazers in science. A\*STAR scholars who have consistently excelled in their undergraduate journey. DATE: Thursday, 5 Dec 2013. TIME: 2.30pm - 5.00pm. VENUE: 20 Marina Square, Marina Bay Sands. REGISTER NOW at [www.a-star.gov.sg](http://www.a-star.gov.sg)

**hrm** COVER STORY

**Timothy Sebastian**  
Group Director, HR,  
Agency for Science, Technology and Research

Member of parliament for the East Region.

He has 20 years of work experience both locally and internationally. Timothy has three years of work experience in the public sector. He has worked for the Singapore Economic Development Board (SEDB) and the Agency for Science, Technology and Research (A\*STAR).

What HR can do better:  
HR departments and HR managers should focus more on the strategic value of the organization.

## 'I made that in my lab'

A\*Star scholar Dr Loh Xian Jun wants to point out products in the supermarket that are manufactured in his laboratory

By Douglas Chow

ALTHOUGH he had the opportunity to study abroad, Dr Loh Xian Jun, 31, decided to stay in Singapore to work for his PhD degree in applied chemistry, for which he received his first class honours and first-class honours award from the National University of Singapore (NUS) in 2008. He is currently a research scientist at A\*STAR.

Dr Loh had been interested in materials science since his junior college days and had spent more than two years at the National Institute of Education as an industrial student studying polymers and self-assembly of materials. He was a merit prize during the National Science Talent Search, which came with an Agency for Science, Technology and Research (A\*STAR) scholarship that sponsored his undergraduate independent research project, including his fellowship at Cambridge University.

Now a research scientist at A\*STAR's Institute of Materials Research and Engineering (IMRE), Dr Loh has the freedom to explore diverse fields in science. "Whether it's pure chemistry, physics or biology or a little bit of everything, I can always give my support to try new things and push new frontiers in science."

Dr Loh's research direction crystallized during his postdoctoral attachment at IMRE, where he has researched a hydrophobic or water-resistant polymer film in a water-soluble or poly-ionic. He explains that the polymer film which would normally be impervious to the hydrophilic liquid, what can be used in the delivery of drugs or as a scaffold for living cells.

His work is related to the research in the synthesis of translating basic science to tangible innovations. "It is an opportunity to create something which can end up in a supermarket shelf. One of those days, I hope to point out some of these products and say 'I made that in my lab'."

"Finally in a new day and I seek to push myself to understand my science, to make my science social and to eventually make my science accessible to all. Science should be used to benefit the people."

A firm believer that science should play a role in people's lives, Dr Loh is an A\*STAR programme manager of the personal care programme.

His research work has led to the development of several consumer products, the underwear and polyurethane to build Singapore's research capabilities in the field of materials research and development.

"I'm confident to push the boundaries which have set with my PhD, I've realized that I have to surpass what I have achieved and do better than my predecessors," he says.

Besides research, Dr Loh is a keen advocate of educating the younger generation to build up a local talent pool. He gives good pointers here working with students.

He has supervised final-year projects of NUS undergraduates as well as postgraduate students at A\*STAR. A number of them later won an A\*STAR scholarship to do their PhD at A\*STAR.

"Each of their successes has been remarkable to me. To see their own offspring of the work of scientist and his daily life is rewarding in itself."

Humblety is a key attribute for those wishing to be academics, says the scholar.

"We are in the business of generating knowledge and this is a major challenge. The key is to be humble. We should be able to accept that we do not know or understand everything. Once we realize that we do not know or understand everything, we can start to learn."

He adds that science must remain open, where there must be shared and open-minded. "It's not just about the science itself, it's about the people who are doing it. The science can only lead to the progress of science if it is open."

His advice to those applying for A\*STAR scholarships: "The whole process is a long one. It's not just about the science itself, it's about the people who are doing it. The science can only lead to the progress of science if it is open. Being book smart is no longer sufficient these days. You have to be relevant to the ecosystem you are in."

Dr Loh is an A\*STAR research scientist at the Institute of Materials Research and Engineering.

## SERC TALENT TIMES

Vol.02 / 2013

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## 4 – PEOPLE

### 4.1 HUMAN RESOURCE PLANNING

#### 16. Organization has human resource plans based on the Organization's innovation strategies

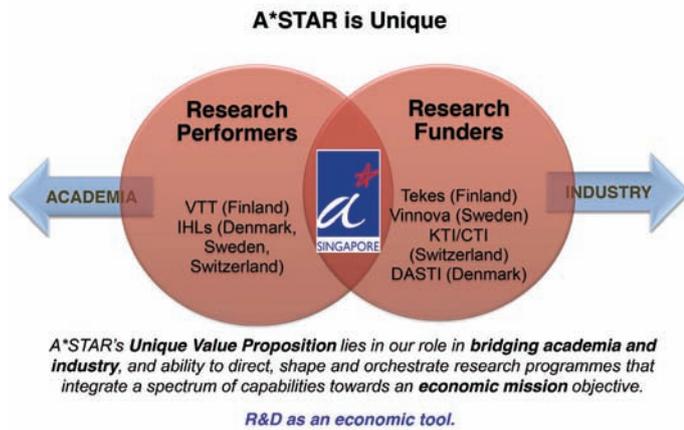


Fig 4.1 A\*STAR's Unique Position - bridging academia and industry

A\*STAR's innovation strategy straddles 2 spheres – R&D and partnerships. A\*STAR aims to create greater economic returns through its investments in research by (i) harnessing its capabilities, talent, infrastructure to break into new areas of R&D; and (ii) continuously developing win-win public-private partnerships to attract foreign investments and anchor R&D activities in Singapore.

Fig 4.1 shows A\*STAR's unique value proposition through our role in bridging academia and industry, and ability to direct, shape and orchestrate research programmes that integrate a spectrum of capabilities towards an economic mission objective.



Fig 4.2 A\*STAR's 8 Schemes of Service

To achieve this, there is a need for a variety of staff specialising in different areas such as industry development, R&D and corporate services. A\*STAR is therefore a multifaceted and multinational organization with over 5200 staff from 60 countries, in 8 different schemes of service as shown in Fig 4.2.

Concerted efforts are made to attract and develop a diversity of talent along the research, innovation and enterprise value chain, with career paths developed for the scientists, engineers and entrepreneurs.

Our HR Planning is aligned towards the goal of maintaining and strengthening A\*STAR's positioning of an employer of choice, by attracting, developing and retaining the best

talents to help A\*STAR achieve its goal of creating an Innovation Economy.

A\*STAR plays a key role in managing and developing our people as key ingredient of our success. The HR department works closely with Chairman and MD as a reflection of top leadership's commitment to ensuring that human resource gets top level attention and scrutiny. For example, Chairman chairs the Career Development Committee (CDC) and MD chairs the interview panel for all Senior Officer (SO) hires. Chairman and MD are also jointly leading the establishment of A\*STAR's center of Leadership Excellence.

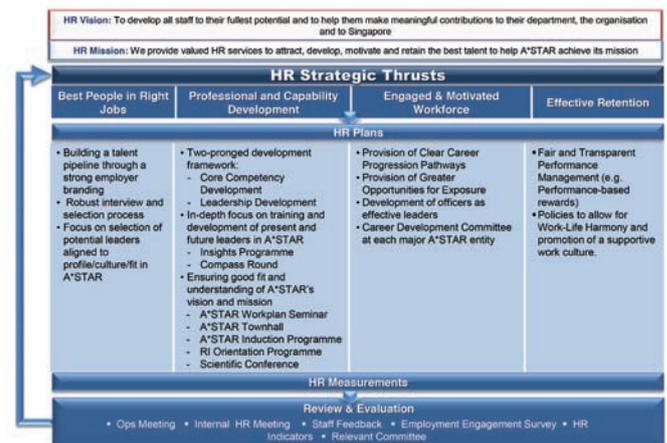


Fig 4.3 A\*STAR's Human Resource Framework

In addition to continuous interactions with top management, HR strategies and plans are derived from directions set during the A\*STAR Leadership Advance which highlight the priority areas for the coming year. The meetings are held biennially in July and September. If HR support is needed to ensure that programs and activities can be carried out, the resources and capabilities will be committed accordingly.

We recognize that human capital is a strategic and competitive asset. We believe in recruiting people with a track record of excellence, whether in their academic results and their employment history.

We expect our people to be fully dedicated and determined to achieve A\*STAR's mission. We place a premium on staff with a bias for action, who are able to work with agility of mind and steady resolve.

We look for people who uphold high standards of integrity.

In return, we commit to invest in our people, to remunerate them fairly, and to provide them a challenging environment to reach their full potential.

### 4.2 EMPLOYEE ENGAGEMENT

#### 17. Organization develops mechanisms to involve employees in innovation

There are different engagement platforms available for staff, such as MD's roundtable sessions, MD and GD (HR)'s engagement sessions, focus groups and taskforces.

We believe that in order for staff to feel committed to

A\*STAR and to be actively engaged in shaping its direction, they first need to understand the HR framework, how they fit into the organization, how management values them as individual contributors, and how their drive, enterprise and efforts are recognized and rewarded.

Hence, it is very important for HR to communicate plans and policies plainly and clearly through both open and confidential channels of communication.

An example is MD A\*STAR speaking directly with staff on a one-on-one or small group basis. Following the Employee Engagement Survey in Nov 2013, MD met with Division Heads and all A\*STAR staff in small groups to explain our HR framework holistically and to answer queries directly. Annual Townhalls (chaired by MD with representation from senior management), and a Workplan Seminar (by Chairman) also allow the accurate dissemination of information while concerns and questions were addressed.

A\*STAR also leverages on the formation of small groups to lead and spearhead innovation, improvements and changes. Task forces and focus groups helmed by different level of staff, cross divisions allow staff performing a variety of roles and different background to come together to critique current problems, processes and propose innovative solutions to improve and to resolve bottlenecks.

To instill a sense of ownership, we developed a framework to foster commitment and involvement while improving performance. There are A\*STAR-wide awards which recognize our staff's contributions to innovation, such as the A\*STAR Star Innovation Team Award.

**A\*STAR's performance appraisal philosophy hinges on the following:**

**A. Open Feedback**

During the target-setting process, staff and their supervisors will come to an agreement on the year's deliverables. Open feedback between a staff and his direct reporting officers (ROs) and counter-signing officers (CSOs) is carried out on the job and throughout the year, and not just during the annual appraisal exercise. The open dialogue promotes good understanding of mutual expectation.

For staff in A\*STAR HQ, in particular, the appraisal quality 'Innovation', that is part of Personal Attributes, seeks to assess staff's preparedness to question assumptions and established practices, receptiveness towards new ideas, readiness to take calculated risk to try new approaches and whether staff have proposed new ways to secure better outcome in their work.

**B. Performance and Development**

With the innovation goals of (i) developing groundbreaking R&D and (ii) building public-private partnerships through bridging industry and research, one of the ways in which A\*STAR appraises organizational and individual performance is through the achievement of KPIs. These targets are set and driven by the Biomedical and Science and Engineering Research Councils. Staff will be appraised on the achievement of their

individual KPIs, which could include the number of patents filed, papers published, partnerships established, industry dollars received, and industry projects embarked on. They will then be rewarded based on their performance as indicated by their ratings (provided by their ROs and CSOs), reviewed and endorsed by the CDC (for A\*STAR Corporate Staff Members) and the RI Executive Directors (for staff members in the RIs and Entities). This is in line with A\*STAR's pay-for-performance philosophy.

The CDC and appropriate approving panels in the RIs/Entities would also provide endorsements for staff, in the Corporate functions and RIs/Entities, respectively, who meet the criteria for promotion to the next higher job level.

The appraisal exercise also seeks to identify new competency areas to meet the staff's job requirements and the output of the discussion will be used to guide scheduling of the staff for training and developmental opportunities to help the staff increase his competency levels and to grow professionally.

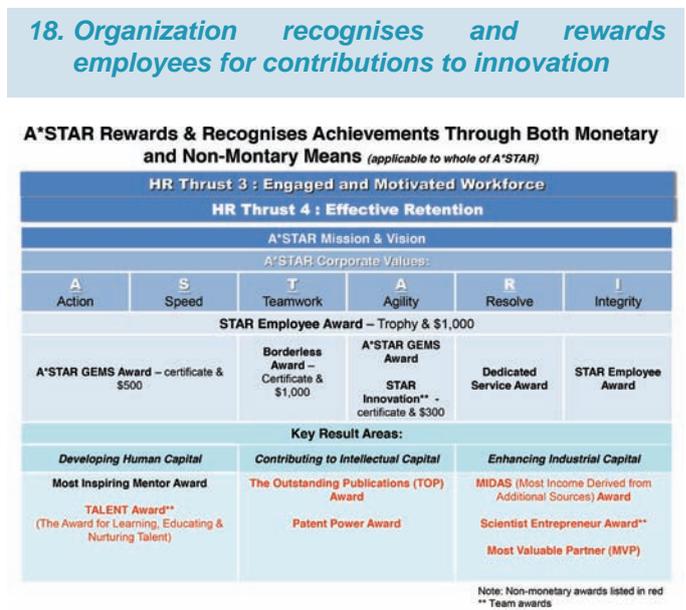
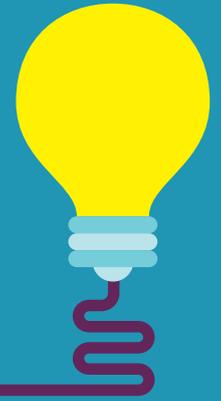


Fig 4.4 A\*STAR A\*STAR Rewards & Recognises

Fig 4.4 shows how A\*STAR rewards and recognize staff.

The A\*STAR Awards, introduced in 2007, recognises staff for their contributions and celebrates their achievements. The intention is to build a positive and encouraging climate to incentivise staff to exhibit the A\*STAR values. The awards celebrates individuals and teams in the A\*STAR community who live up to our corporate values, are exemplary role models, as well as those who have contributed to A\*STAR's strategic thrusts.

In the context of Innovation, the Star Innovation Award recognises individuals of teams whose ideas resulted in sizable cost-savings for A\*STAR, and the Scientist-Entrepreneur Award recognises current and former staff who have successfully commercialised or spun-off research to industry. The Outstanding Publications award recognises Research Institutes with the highest number of quality publications in high impact journals.



## PROCESSES



**Prof. Don Nutbeam**  
Vice-Chancellor, University of Southampton

The Southampton Marine and Maritime Institute is a world-leading hub for international collaboration which really has no parallel in terms of its scale and ambition. With Singapore being home to the world's leading maritime economy and supporting major strengths in marine and maritime engineering we are very pleased and excited for the SMMI to be working in **collaboration with A\*STAR here to deliver a number of projects to develop safer, improved and more efficient** offshore and marine structures and ships to deliver real and tangible economic and environmental benefits for the future.



We are proud to play a part in advancing medical technology in Singapore. Licensing these sophisticated assays from **A\*STAR gave us a springboard into the highly competitive market of Molecular Diagnostics.** We are now able to provide a comprehensive suite of diagnostic services for a range of infectious diseases to the research, healthcare and biomedical industries in Singapore and Asia. SMEs can stay competitive by working with A\*STAR to deliver products with direct societal benefits.



**Alex Thian**  
Founder and CEO of AITbiotech



Agency for  
Science, Technology  
and Research

**CREATING AN INNOVATION ECONOMY**

# P&G ties up with A\*Star on 5-year research plan

Accord covers over 25 local partnerships with up to \$60m in funding provided

By NISHA RAMCHANDANI  
nisha@sp.com.sg

IN one of Procter & Gamble's biggest public-sector research tie-ups, the consumer goods giant and the Agency for Science, Technology and Research (A\*Star) have inked a five-year master research collaboration agreement (MRCA) to cover research partnerships with over 25 local research, medical and educational institutions.

The agreement, which extends and expands an earlier 2010 MRCA between the two parties, provides scope for up to \$60 million in funding, A\*Star said in a press release yesterday.

The collaboration, which will focus on both upstream and downstream innovation, will leverage on P&G's consumer knowledge and A\*Star's research and development capabilities.

"Expanding our partnership allows P&G to more fully leverage the unique innovation capabilities at A\*Star and its network of research institutions," said Laura Becker, head of P&G's Consumer-Develop programs.

Under the new agreement, P&G will have access to research services and facilities at Biopolis and the Biopolis, in addition to resources from local universities and hospitals. The new partnership will also provide avenues for talent development through PhD programmes and post-doctoral fellowships.



Creating new products: An artist's impression of the Singapore Innovation Centre, which spans a green field of about 32,000 sq m, making Procter & Gamble the largest private sector tenant at Biopolis.

"It is important that we harness synergistically the full range of capabilities that are available in the public sector to sustain our competitive value proposition as an innovation hub," said Lim Chin Poh, chairman of A\*Star, pointing to the new Skin Research Institute of Singapore which brings together talent from A\*Star, the National Skin Centre and Nanyang Technological University.

"It demonstrates clearly that meaningful public-private partnerships create platforms that can greatly enhance our public-private partnerships under the Open Innovation Framework."

P&G will also soon be launching its Singapore Innovation Centre at the Biopolis, which celebrates its 10th anniversary this year. The Biopolis already houses other established names such as Novartis and GlaxoSmithKline.

The consumer goods firm's Singapore Innovation Centre is one of just two in Asia and spans some 32,000 square metres. P&G had said previously the \$250 million centre was on creating products for its beauty and personal care, and chemical businesses.

# GSK partners A\*Star to develop drugs

By NISHA RAMCHANDANI

PHARMACEUTICAL firm GlaxoSmithKline (GSK) and A\*Star's Institute of Chemical and Engineering Sciences (ICES) have inked a five-year agreement to develop medicines for emerging countries, which are expected to account for a sizeable proportion of the global market in the coming years.

GSK and ICES will focus on developing new evidence-based formulations (EBFs), or improved versions of existing drugs which can offer greater patient benefits. EBFs are also known as value-added formulations, or incrementally modified drugs.

"Collaborating with GSK provides an opportunity for

per cent of the global pharmaceutical market by 2016.

GSK's vice-president, Emerging Markets & Asia Pacific R&D, Duncan McKay said: "Within GSK's portfolio of off-patent products, EBFs are an important part of our growth strategy, and our hope is that together with ICES we will create a sustainable, scalable model to meet both specific market conditions and patient requirements."

The tie-up is expected to help position Singapore as a regional centre for drug development for the emerging markets as well as develop local talent in specialised formulation here.

The collaboration will allow ICES to enhance

## BUSINESS

# More than 500 companies benefit from GET-Up programme

By Wong Siew Ying

POSTED: 07 May 2013 8:49 PM

Ten years after its introduction, the GET-Up programme, an initiative to help small- and medium-sized firms upgrade their technology and enhance their competitiveness, has benefited over 500 companies.

## PHOTOS



File photo: The Singapore skyline. (AFP/File - Simin Wang)

By CHIA YAN MIN

SMALLER companies keen to invest in technology and research and development now have more resources to tap on.

A new scheme will give small and medium-sized enterprises (SMEs) that work with the Agency for Science, Technology and Research (A\*Star) 18 months of royalty-free and exclusive licences for intellectual property that stems from the collaboration.

The Headstart programme, as the scheme is called, was unveiled and launched yesterday during the Committee of Supply debate.

It is aimed at SMEs that need time to translate technology and intellectual property into commercial products and services.

More than 700 such companies have undertaken about 2,200 projects with A\*Star

over the past five years. A\*Star will also expand its Technology Adoption Programme (TAP) to cover more

sectors, Second Minister for Trade and Industry S. Iswaran said.

TAP was introduced last July, and aims to help companies adopt technology by connecting them to appropriate vendors in both the public and private sectors.

It began covering the construction, food manufacturing, precision engineering, marine, aerospace and retail sectors, but will be extended to the food services, health care, logistics and information media sectors.

Almost 200 companies from these initial industries have adopted new technologies as part of the programme.

The number of A\*Star technology licences going to SMEs has tripled in the past five years, Mr Philip Lim, chief executive of A\*Star's technology transfer arm Exploit Technologies, said in a statement yesterday.

## MINISTRY OF TRADE AND INDUSTRY

# SMEs to get Headstart help from A\*Star

Scheme will offer royalty-free, exclusive IP licences

"In the drive for productivity improvements and quality growth, research and development and innovation are key differentiators for our SMEs," he said.

Each licence for Snap2Sell costs around \$10,000. Griffin Kinetic managing director Gerry Tan said: "The system could mean taking a picture of a crate, for instance, and getting all the shipping information in your hands. This could cut our manpower needs and reduce room for error, raising overall productivity by 10 per cent, if not more."

Another innovation is the "tele-presence robot", which can monitor individuals in group settings by combining voice detection and facial recognition. This can be used in video-conferencing or as a surveillance tool in places such as nursing homes.

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# High-tech, low-cost ideas for SMEs

A\*Star unit offers easy, affordable solutions to improve productivity

By HOE PEI SHAN

FROM robots which remotely monitor the elderly to a sensor which can track multiple carpark

comm Research (ICER), which organises the annual exhibition. He said that while SMEs should look at technological solutions to boost productivity, their ability to



(above) shows how the carpark sensor system (right), lets users create mobile apps that can take a picture of it. ST PHOTOS; NG SOR LINA



network which helps detect the availability of multiple parking spots indoors and in open areas, giving parking management companies a more efficient and cheaper alternative to installing sensors above every space.

The goal, said Dr Tan, is to get around 100 SMEs to take up technological solutions each year and increase their productivity by 30 to 50 per cent.

Griffin Kinetic, a 50-man firm which provides logistics services in shipping and health care, is already keen to adopt ICER's new mobile image recognition technology.

The system, called Snap2Sell, allows users to easily create mobile applications that can bring up digital information on an object by taking a picture of it.

Each licence for Snap2Sell costs around \$10,000. Griffin Kinetic managing director Gerry Tan said: "The system could mean taking a picture of a crate, for instance, and getting all the shipping information in your hands. This could cut our manpower needs and reduce room for error, raising overall productivity by 10 per cent, if not more."

# Sofshell: Nothing soft about this start-up

Its patented ID Flex Technology protects by dissipating force. By VICTOR KATHEYAS

YOU may not think Sofshell is that hard. But it is. The Singapore start-up has a unique technology that, contrary to what you think, can protect your eggs from being crushed. It's called ID Flex Technology, and it's the result of a five-year research project by Sofshell's founder, Victor Katheyas.

The idea of ID Flex Technology was born in 2008, when Katheyas was working at a multinational corporation. He noticed that his colleagues were always complaining about their eggs being crushed. He decided to do something about it.



Agency for Science, Technology and Research

CREATING AN INNOVATION ECONOMY

## 5 – PROCESSES

### 5.1 INNOVATION PROCESS

#### 19. Organization generates, gathers and screens creative ideas from all sources.

The spirit of innovation is key to A\*STAR as a knowledge organization. It is embodied in A\*STAR's values and accentuated particularly in "Agility" where we continuously innovate and adapt our plans and actions to keep ahead of a fast-changing competitive landscape.

A\*STAR's Innovation Management Framework involves below illustrates the mechanisms:



Fig 5.1 Innovation Management Framework

### SETTING OF DIRECTIONS

In A\*STAR, the R&D directions are set out broadly by the current 5-year Science & technology Masterplan (Research, Innovation & Enterprise Plan 2015). Senior management will take reference from the existing S&T masterplan (RIE 2015) and determine the strategies needed to achieve expected outcomes.

### GENERATING A RESERVOIR OF IDEAS

Nothing is left to chance, and ground work has been done over the years to establish multiple platforms and sources of ideas. These ideas are then analysed and deliberated amongst staff and experts on how best to capitalize on such ideas, which in turn may require the ideas to be amended and/or adapted to drive innovation outcomes.

**Ideas are generated from various sources for example:**

- Collaborations & Connections with International Educational and Academic Institutions
- A\*STAR Advisory Boards & Panels (Top-Down)
- Within A\*STAR 19 RIs (Bottom-up)
- Oversea Visits, Conferences & Publications
- Industry / Customer Feedback / RCAs
- Public & Private Partners

### INCENTIVES FOR IDEAS

Staff are recognized for their contribution to Innovation. The A\*STAR Award has many categories that recognizes individuals and team contribution innovation (details in Cat 4). In 2011, as part of the drive to achieve RIE 2015 outcomes and to incentivize staff to innovate and be entrepreneurial inventors, A\*STAR management review and amended IP Policy No. 2. Under the new scheme, the first \$100,000 of licensing revenue derived from the commercialization of the intellectual property, after the 15% deduction, will be distributed to the inventors. The remaining revenue will be subjected to usual deductions and distributed in accordance with one-third rule to inventors, the RI and A\*STAR as per existing policy.

A\*STAR encourages and support staff to vie for prestigious international and national awards such as: MIT Technology Review TR35, President Science & Technology Awards, etc. A detail list of A\*STAR's award winners (both individual and team) can be found in Appendix 1 and 2.

### VEHICLE DEVELOPMENT

The next step after Idea Generation is the "R&D Process". A detailed description of this process will be found in the next section.

### CULTIVATING AN ENVIRONMENT TO SUPPORT INNOVATION

Senior Management sets leadership examples in championing the importance of innovation across the various RIs and HQ departments. They encourage and provide platforms for staff to attend training programs to develop their capabilities and expose them to new areas of science to encourage collaboration across councils and institutions. Examples of such programs are: A\*STAR Scientific Conferences, Distinguished Visitor Programme (DVP), Visiting Investigatorship Programme (VIP) etc.

The importance of innovation at A\*STAR is further reinforced through the appraisal system. To be considered as an "Excellent" performer at A\*STAR, an officer must demonstrate that he has made innovative contributions that resulted in meaningful and measurable improvements to the work processes or systems in his RI, or to A\*STAR.

The individual also has to show a strong positive learning attitude, making constant efforts to expand his knowledge base, and to adapt and respond to the rapidly changing R&D landscape in Singapore and the world.

### REVIEW

Senior Management reviews the Innovation Management Framework regularly at during meetings and at the annual workplan. Reviews and modifications to the Framework and the R&D Process are discussed, with improvements made to ensure relevance and effectiveness.

20. Organization incorporates new developments and changing requirements into innovations

21. Organization involves employees and partners in the new product/service design and introduction process

22. Organization has a relationship with customers to identify and address innovation opportunities

23. Organization validates innovation projects.

24. Organization implements innovation to achieve business outcomes

25. Organization reviews the management of innovation projects

will be assigned to work with the research team throughout the project. Even though the project is in the preliminary stage, depending on the uniqueness of each research proposal, some will attract industry interest.

**Step 4: Initiate Research Process Refinement of Approach**

After much planning and preparation, researcher will kick-start the R&D process. Efforts are concentrated in achieving desired outcomes based upon agreed milestones. Meetings with other researchers (internal and external) and dialogue with industry project partners are frequent and intense.

**Step 5: Research & Execution**

There will be scheduled Technical & Mid-term review with the Councils, Advisory and Review/Oversight committees. Program Meetings attended by Cluster Heads and OIC. As research findings become tangible, a possible model or prototype will be developed for testing by researchers and collaborators. The researchers will proceed to craft a Technical Disclosure for ETPL to determining its commercial potential or business value, and a patent application. Once again, the projects may attract industry to initiate an industry project with the RI.

**Step 6: Research Completion Submit Research Report**

After intensive research and tests to achieve desired outcomes, the team will submit a report to the Council and Review Committee for evaluation and assessment. The knowledge and capability garnered from this project will be capture and documented by the researchers. The team will seek opportunities to publish their findings in prominent and reputable journals and present papers at relevant industry and science and engineering conferences.

Research Excellence is base on integrity and ethical conduct. Ethical practices must be upheld in the conduct of R&D to retain the trust of society in the research community. Upholding research integrity and ethics are individual and collective responsibilities, and must be firmly ingrained in what we do. The impact of misconduct is organization wide. It takes just one person to affect the credibility of the entire group.

Fig 5.3 shows the process for validation research papers to be published in journals and/or papers to be presented in conferences. The process is enforced stringently to ensure that A\*STAR's reputation in Research Excellence is maintained. The 2013 edition of the Nature Publishing Index (NPI) ranks A\*STAR at 17 among 757 institutions based in the Asia-Pacific region.

Over and above journals and conference, the team is expected to conduct workshops and sharing sessions within and outside A\*STAR. On another front, the IP of the project may be licensed to companies to manufacture and sell their products.



Fig 5.2 Research & Development Process

**A\*STAR'S RESEARCH & DEVELOPMENT PROCESS**

**Step 1: Concept: Scanning for ideas**

Ideas are gathered from Internal and External sources of ideas as shown in Fig 5.1. The RSE and/or project team will evaluate the appropriateness and relevance of the idea to what they have set out to do in their workplans.

**Step 2: Scoping and Crafting of Research Proposal**

In this stage, the researcher will define broad area of the project. Key consideration will cover capability buildup, desired industry alignment, soliciting assistance from another RIs or research institution for collaboration, potential risk, cost and resources needed to execute the project. With all these considerations, the researcher would then refine his research scope and proceed to draft a research proposal for consideration by supervisor, RI ED and evaluation committee.

**Step 3: Review and Approval of Research Proposal**

In addition to having the proposal reviewed by a supervisor and the RI ED, the researcher may also send his proposal to external validators to review the relevance and quality of the proposal. Upon refinement, the proposal will be submitted to relevant council (assured funding) and/or grant disbursement board (non-assured funding) for approval and funding based on agreed performance indicators, outcomes and timelines. A program manager

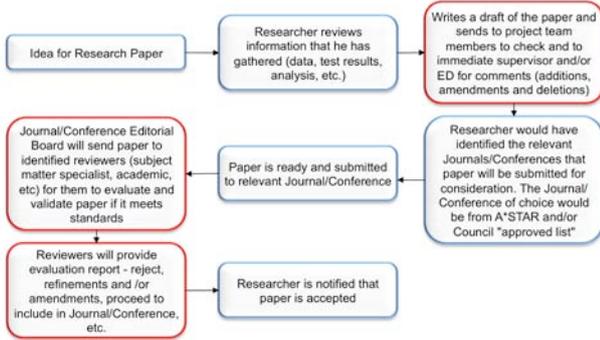


Fig 5.3 Validation Research Papers for Journals and Conferences

**Step 7: Commercialize – Rollout, Implementation and Spinoff**

This stage sees the full extent of benefits from innovations developed by the research team and/or industry. Details of Licensing, Industry Projects and Spin-off can be found in the next section.

**Step 8. Post Research Review for Improvements**

Though the project, as stipulated by the grant that it receives, is closing, new window of opportunities for innovation will open as the team debriefs and reviews the outcome of the project. Much work is anticipated as the research team follow-up on enquiries and develop further application in related and/or new areas which may lead up to new projects, and licensing opportunities.

(GET-Up/T-Up) and Technology Adoption Programme (TAP)

3. Technology Transfer – Licensing

**INDUSTRY PROJECTS**

The process for Customers (MNC and SMEs) in deciding to engage A\*STAR in Industry Projects involves many factors for consideration before an agreement is signed, such as:

- A\*STAR’s core capabilities, standing in R&D and track record in relevant scientific and technology areas
- The Resources (funds, IP, people, infrastructure, etc) needed to achieve the project outcome
- The working model for the project

Fig 5.5 shows the different models used by A\*STAR for Industry Projects:

- Many to One - Integrating scientific capabilities across disciplines for impact
- One to One - Building partnerships with companies in targeted research areas
- Many to Many - Creating effective platforms for both public and private sectors to collaborate
- One to Many - Leveraging an RI to bring companies together to collaborate on common research areas

**5.2 PROCESS MANAGEMENT & IMPROVEMENT**  
 26. Organization seeks breakthrough improvements in key business processes for value creation

**Industry Engagement**

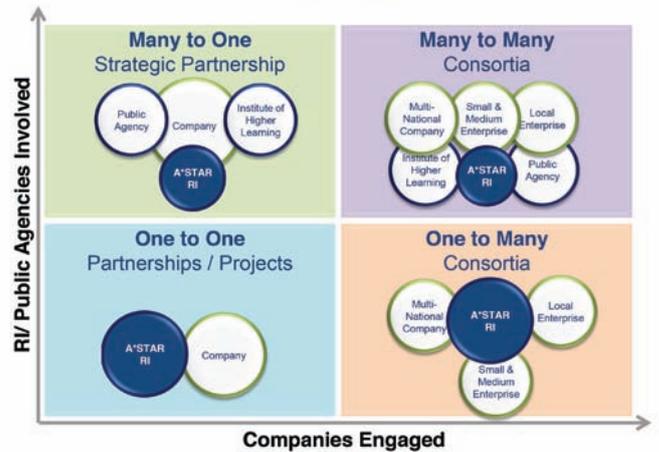


Fig 5.5 Types of Industry Projects

In 2013, A\*STAR undertook 1776 projects (34 projects a week or close to 7 projects per working day). Details success and value created in landmark Industry Projects can be found in Cat 6: Customers’ and Results.

**Growing Enterprises through Technology Upgrade (GET-Up)**

- **Technology for Enterprise Capability Upgrading (T-Up)**

SMEs are an integral part of our economy. They form 99% of our enterprises, employ 70% of our workforce and contribute nearly half of our GDP.

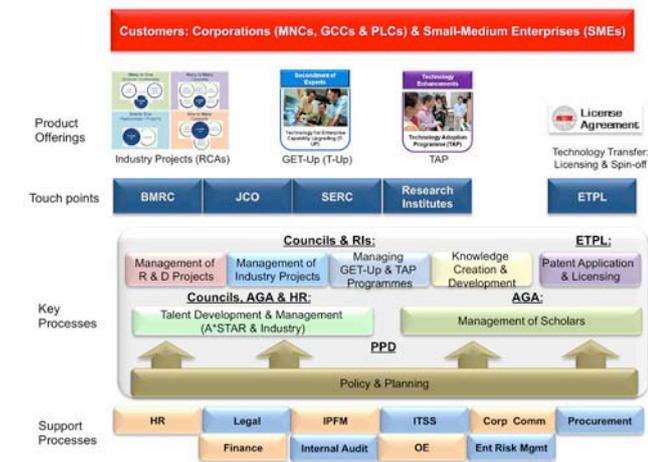


Fig 5.4 Key & Support Processes

**KEY BUSINESS PROCESS**

Fig 5.4 shows A\*STAR key offerings to customers (Multinational corporations, Local Promising Companies, Small and Medium Enterprises) are:

1. Industry Projects
2. Growing Enterprises through Technology Upgrade  
The Technology for Enterprise Capability Upgrading

GET-Up is an industry programme by A\*STAR that seeks to upgrade the technological capabilities of local Small- and Medium-sized Enterprises (SMEs) to enhance their global competitiveness.

GET-Up/T-Up scheme involves seconding Research Scientists and Engineers (RSEs) to local enterprises to enable them to access the pool of R&D talent in the A\*STAR Research Institutes (RIs). The RIs will endeavor to match suitable RSEs with the company based on the R&D project in mind. Partial funding will be provided to the eligible company for the salary of the RSEs up to a maximum of two years. Given A\*STAR's biomedical capabilities, from basic to translational research, GET-Up programmes were expanded to support the biomedical sciences cluster in 2012.

To date 441 Research Scientists and Engineers (RSEs) have been seconded to 255 local SMEs to assist them in developing new technical capabilities, products and services. Results of companies that participate in GET-Up (T-Up) scheme showed growth in sales revenue, increase in R&D spending and employment (lead indicator for innovation) in the past 3 years and expect to see the same in the next 3 years. About 70% of the T-Up recipients still using the technology introduced by the T-Up projects. Finally, more than 80% of the companies in the scheme will continue engaging T-Up support in the future.

#### **TECHNOLOGY ADOPTION PROGRAMME (TAP)**

TAP was a programme initiated by A\*STAR under the National Productivity and Continuing Education Council (NPCEC). Its key objective is to help local small and medium enterprises (SMEs) gain access to technology and use technology to enhance their productivity and innovation.

The A\*STAR TAP team will engage SMEs to understand their challenges and needs and will work with the company to identify technologies which can improve their productivity. TAP was launched in July 2013.

Within the last 3 quarters, TAP has close to 2,600 engagements, 302 adoptions and has convincingly signed 180 SMEs into adopting technology to enhance their productivity and innovation. The TAP team is targeting 9,000 engagements with 1,150 adoptions by 2015.

#### **TECHNOLOGY TRANSFER**

ETPL, the technology transfer arm of A\*STAR, manages the intellectual property portfolio of A\*STAR's research institutes and centres.

The Technology Transfer process begins with the R&D team submitting a Technology Disclosure (TD) to ETPL. The TD is meant to capture all forms of intellectual property for the purpose of determining commercial potential or business value, and an appropriate mode of IP protection. ETPL will assess proposed solutions or improvements for commercial potential and value, and determine appropriate modes of IP protection for the technology that supports or enhances its commercial potential and value. ETPL evaluates about 650 technology disclosures a year (3 TDs per working day).

After close and thorough evaluation, a decision will

be made to file a Priority Patent Application - The first patent application filed for a particular technology. This application is a costly and long process. When the Intellectual Property Office of Singapore (IPOS) or equivalent international body grants a patent, patent right is granted to the owner of an invention to prevent others from making, using, importing or selling the invention without the owner's permission. Once granted, the term of a patent is 20 years from the date of filing, subject to the payment of renewal fees. On an average ETPL files about 250 patents a year.

ETPL also actively commercialises A\*STAR's technologies through Licensing and spin-off activities which is common to all Technology Transfer Office.

Licensing refers to the permission to use IP granted by the owner of the IP (defined as the licensor) to the user, the licensee. Often the permission relates to the use of the IP rights, for example, manufacture and sale of products made through the use of the IP. The Licensor continues to retain ownership of the IP. ETPL commercialized about 150 licenses a year or 3 licenses a week.

Another form of commercialisation are the Spin-offs are new business venture, whereby at least one A\*STAR staff is a member to commercialise A\*STAR IP. The Investment & Spin-Off Management division works with the founding team to develop a technology roadmap that culminates into a business plan and to provide the necessary spin-off support. To date, there are 50 start-ups on record.

Finally, with Gap Funding, ETPL work with A\*STAR's research institutes and industry (in co-development efforts) to carry out technology development and refinement based on their inventions and proof-of-concept prototypes over a period of 3 to 12 months. Through Gap Funding, ETPL creates a pool of market-ready technologies for commercial applications, refinements for mass production and enhancements. Each year > 30 new Gap projects are launched.

#### **TECHNOLOGY TRANSFER**

In the area of Technology Transfer, improvements were made in the following areas:

- Improve licensing through closer collaboration with MNCs and tighter integration with SMEs
- Improve the commercialisation of A\*STAR's scientific discoveries through gap funding, which better translates technology disclosures into licensable intellectual properties (IPs); and into commercial applications
- Improve the patent usability rate with more rigorous assessments

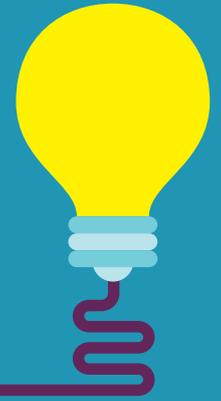
There is an increasing focus on SME start-ups as key to diversifying and spurring innovation in the economy.

Headstart is a new programme from A\*STAR that enables all local SMEs that enter into a Research Collaboration Agreement (RCA) with A\*STAR to enjoy royalty-free and exclusive IP licenses for the first 18 months. The exclusive use of the IP can be further extended at business-friendly terms through ETPL. SMEs need not participate in prolonged negotiations at this point as the terms will be fixed, based on industry sector.

This scheme is applicable to all SMEs engaged in Industry Projects with A\*STAR. Once there is any form of intellectual property generated from the Industry Project, SMEs will then be able to benefit from Headstart's favourable terms. All local SMEs, as defined by SPRING Singapore, can apply for Headstart.

ETPL recently published a handbook, "Innovation that Sells: The A\*STAR Researcher's Handbook from Mind to Market<sup>®</sup>" is a starting point to help researcher (A\*STAR or otherwise) to bring their inventions through the technology transfer process.

A*STAR PARTNER	A*STAR DEPT	PROGRAMMES	Platforms for Communication & Monitoring of Performance
<p>Ministry of Education, Local polytechnics, NUS, NTU and overseas partner universities</p> 	A*GA	<p><u>Undergraduate scholarships</u></p> <ul style="list-style-type: none"> <li>• A*STAR Undergraduate Scholarship (AUS)</li> <li>• National Science Scholarship (BS and MBBS-PhD)</li> </ul> <p><u>PhD Scholarship</u></p> <ul style="list-style-type: none"> <li>• National Science Scholarship (PhD and MD-PhD)</li> <li>• A*STAR Graduate Scholarship (Overseas)</li> <li>• A*STAR Graduate Scholarship (NTU/NUS)</li> </ul> <p><u>Postdoctoral Fellowships</u></p> <ul style="list-style-type: none"> <li>• A*STAR Graduate Scholarship (Post Doctoral Fellowship)</li> <li>• A*STAR International Fellowship</li> </ul> <p><u>Awards for International Students</u></p> <ul style="list-style-type: none"> <li>• Singapore International Pre-Graduate Award (SIPGA)</li> <li>• Singapore International Graduate Award (SINGA)</li> <li>• A*STAR Research Attachment Programme (ARAP)</li> </ul>	<ul style="list-style-type: none"> <li>• A*GA Meetings with Chairman</li> <li>• A*GA EXCO Meetings chaired by A*STAR Chairman and attended by NTU and NUS Provosts</li> <li>• Governing Board meetings with overseas partner universities</li> <li>• Discussions (meetings and emails) with CPDD and SPPD of MOE, as needed</li> <li>• A*GA meetings with Polytechnic Principals in 2012 when awards were first launched; discussions with polytechnic administrators (meetings and emails) as needed</li> </ul>
<p>Economic Development Board</p> 	SERC BMRC	IAF	<ul style="list-style-type: none"> <li>• A*STAR-EDB Joint Chairmen Meeting</li> </ul>
<p>Ministry of Health</p> 	BMRC	BMRC-OCF Joint Bench-to-Bedside Fund	BMS EXCO (PS MOH and Chairman A*STAR)
<p>SPRING Singapore</p> 	SERC - GET-UP	Get-Up and TAP	SPRING and A*STAR management (Chairman's level).
<p>JTC Corporation</p> 	IPFM	Infrastructural projects – Fusionpolis II	<p>MD A*STAR and CE JTC meetings</p> <p>FP2A Working Committee Meetings – chaired by MD A*STAR and ACE JTC</p> <p>Operating meetings A*STAR Director IPFM and Director JTC</p> <p>Working Level - IPFM DD and JTC Project &amp; Marketing Managers in charge of FP2A for Towers A/B &amp; C respectively.</p>



## CUSTOMERS' AND RESULTS



**Ms Deb Henretta**  
Group President - Asia, P&G

I am delighted that we are deepening our existing relationship with A\*STAR and expanding its scope. The MRCA marks an important milestone in P&G's journey to establish Singapore as a hub of innovation; I am confident that with this agreement, along with P&G's forthcoming Innovation Centre here, Singapore will indeed become home to innovation that touch and improve the lives of consumers across Asia and the world.



As Singapore's largest suburban shopping mall, we are constantly looking for new ways to help our tenants give our customers an innovative shopping experience. Through Jurong Point Shopping Centre's **collaboration with A\*STAR**, we will not only provide innovative marketing channels for our tenants to grow their business, but also enhance our customers' shopping experience further.



**Mr William Seet**  
CEO, Jurong Point Shopping Centre



Agency for  
Science, Technology  
and Research

**CREATING AN INNOVATION ECONOMY**

# Singapore scientist wins Hugo award for work on Asian cancers

By **AMANDA TAN**  
 A SCIENTIST from A\*Star's Genome Institute of Singapore (GIS) has won international recognition for his research in human genetics and genomics.  
 Patrick Tan, 43, whose research homes in on the genomic profiles of Asian cancers, is this year's winner of the Chen New Investigator Award presented by the International Human Genome Organisation (Hugo).  
 The award is specific-

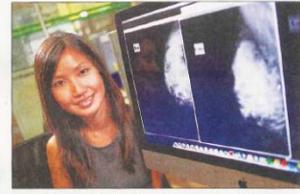


**Dr Tan:** His work involves grouping gastric cancer patients based on their

for developing therapeutic treatments tailored for each.  
 Dr Tan said he was deeply humbled and grateful: "We will redouble our efforts to translate our discoveries into applications that significantly improve health outcomes for patients in Singapore and the region."  
 Besides his appointment at GIS, the 1992 graduate of Harvard University and Stanford University School of Medicine (2000) holds other appointments.

# S'pore scientist wins top award

By **GRACE CHUA**



A YOUNG researcher from Singapore will soon have the chance to get her hands on a trove of data that may shed light on breast cancer risks, thanks to a prestigious international science fellowship.  
 Dr Li Jingmei, 31, received this year's Unesco-L'Oréal International For Women In Science Fellowship, one of 15 women scientists around the world to do so.  
 Dr Li is a post-doctoral re-

# Scientists develop chip that can identify 70,000 viruses

By **CHENG JINGJIE**

SCIENTISTS here have developed a new wonder chip that can identify 70,000 different viruses and bacteria in one go.  
 Currently, a typical test can detect fewer than 50 pathogens, and each kit tends to be specific to certain groups.  
 "Usually, tests for infectious diseases are done one test at a time. Each test will cost between \$20 and \$200. If they are all negative, you will have spent all the money and still don't know what you've got," said Dr Christopher Wong, one of the scientists leading the project.  
 But with the credit card-sized PathChip, a pathogen can be identified for \$450 in the laboratory and within 24 hours. This saves both money and the time it takes to diagnose a patient.  
 "So this chip is a change in paradigm because we hope doctors will be

confident of just running one test and then being able to decide what to do," added Dr Wong, a Singaporean.  
 PathChip is the brainchild of Dr Wong and his collaborators, Dr Martin Hibberd, a Briton, and Hong Kong's Dr Ken Sung. The three are directors of PathGen DX, a commercial offshoot of the Genome Institute of Singapore.  
 Currently, the chip, which took 10 years to develop, is only commercially available for research use. But it is expected to be available for diagnostic purposes in two years, with approval from the United States and Drug Administration and Singapore's Health Sciences Authority.  
 The idea for "a chip that does everything" was conceived in 2003 severe acute syndrome (Sars) outbreak. Dr Wong was surprised that the test available for the new



**Dr Christopher Wong (left) and collaborator Martin Hibberd with the PathChip, which can identify a pathogen for \$450 in the lab. PHOTO: DIOS VINCOY JR FOR THE STRAITS TIMES**



A demonstration of how a robotics system is used to polish the surface of a marine propeller. PHOTO: A\*STAR



**Applied Materials and A\*STAR's Institute of Microelectronics to Drive Advanced 3D Chip Packaging with World-Class R&D Lab in Singapore**  
 Wed Mar 7, 2012 2:31 am CST  
 \*Reuters is not responsible for the content in this press release.  
 0 COMMENTS  
 ... 3D chip packaging expected to be a major inflection point for the semiconductor industry, allowing smaller packages, lower power consumption and higher data bandwidth.  
 ... ability of its kind focused on developing next-generation innovative growth of mobile devices.  
 ... Materials, Inc., the global leader in providing manufacturing display and solar photovoltaic industries, and the Institute of Microelectronics, a research institute under the Agency for Science, Technology and Innovation (A\*STAR), the Centre of Excellence in Advanced Packaging at A\*STAR, and the Singapore Minister for Trade and Industry, Mr. Lim Heng Kiang.

# A\*STAR robotics programme to help drive manufacturing productivity

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**A\*STAR and Airbus to collaborate on aviation research**  
 SINGAPORE AIR SHOW > 2014  
 by **IAN SHEPPARD**  
 February 13, 2014, 12:35 AM

Airbus has become the newest member of the Singapore Agency for Science, Technology and Research (A\*STAR) aerospace program, it was announced at the Aerospace Technology Leadership Forum in downtown Singapore on Monday. Airbus joins various other OEMs as members—such as Boeing, Embraer and Bombardier, GE, P&W, Rolls-Royce, Safran and Honeywell—and major aviation Singapore companies—such as ST Aerospace and SIA Engineering.

The all-new Airbus A350-900 flew in the Singapore Airshow flight display. (Photo: Mark Wagner)

**Awards and Accolades**

**Winner of 2013 President's Technology Award**

Professor Li Haizhou and his team is recognised for making a remarkable breakthrough in human language technology that transforms the interface of mobile applications and breaks down the language barriers for Asian society.

Prof Li was also conferred 2014 IEEE Fellowship for his leadership in multilingual, speaker and language recognition research and development.

Prof Li Haizhou, Ms Aw Ai Ti, Dr Su Jian, Dr Ma Bin

## 6 – CUSTOMERS’ AND RESULTS

### 6.1 CUSTOMERS’ & OPERATIONAL RESULTS

#### 27. Current levels and trends for customer satisfaction and retention indicators linked to innovation-focused strategies

Enterprise development will be a key thrust in A\*STAR’s S&T plan going forward. There will be enhanced and concerted efforts to engage and anchor multi-national companies (MNCs) in Singapore, seed the innovative capacities and gear local enterprises for growth”.

By providing robust research and commercialisation infrastructures, A\*STAR enables the knowledge created by our scientists to be exploited by industries (local and international) to expand existing industries and create new ones. – This is in line with A\*STAR mandate to create an Innovation Economy for Singapore. The table below shows A\*STAR’s customers segment and requirements:

#### CUSTOMER SATISFACTION MEASURES

Industry	A*STAR Offerings	Dept	Customer Requirements	Value Creation
<b>Corporations :</b> <b>1. International -</b> Multinational Corporations (MNCs), <b>2. Singapore:</b> - Globally Competitive Corporations (GCCs) - Promising Local Enterprises (PLCs)	1. MANY (A*STAR RIs) to many	A*STAR COUNCILS (BMRC, SERC & JCO) AND A*STAR RIS	<ul style="list-style-type: none"> <li>• Cutting Edge Technologies and Capabilities</li> <li>• Unique research expertise, capabilities, talents, support, assets and facilities</li> </ul>	<ul style="list-style-type: none"> <li>• Foreign Investments – human capital, intellectual property and unique R&amp;D facilities</li> <li>• Centre of Excellence for region or specialised areas or unique technology</li> <li>• Creation of New jobs and industries for Singapore economy</li> </ul>
	2. MANY (A*STAR RIs) to one			
	3. One (A*STAR R) to Many	A*STAR RIs	<ul style="list-style-type: none"> <li>• Collaboration and co-develop applications and solutions</li> <li>• Industry and academic collaborators</li> </ul>	
	4. One (A*STAR RI) to One			
Small & Medium Enterprises (SMEs)	Growing Enterprises with Technology Upgrade (GET-Up) - Technology for Enterprise Capability Upgrading (T-Up)	SERC - Capabilities Upgrading Initiatives (GET-Up)	<ul style="list-style-type: none"> <li>• Technology Upgrading</li> <li>• Secondment of Expert for</li> <li>• Grant/Subsidy</li> <li>• Technical Consultancy</li> </ul>	<ul style="list-style-type: none"> <li>• Raised Productivity</li> <li>• Improvement of Operational Efficiency</li> <li>• Development of Technical Capabilities</li> <li>• Development of New Products/Services</li> <li>• Enhance Technological Learning and Capabilities</li> </ul>
	Technology Adoption Program (TAP)	SERC - Technology Adoption Program (TAP)	<ul style="list-style-type: none"> <li>• Unique Assets and Facilities</li> <li>• Cutting Edge Technologies and Capabilities</li> <li>• New industry –service industry</li> </ul>	
CORPORATIONS & SMES	Technology Transfer - Licensing and StarT-Up	ETPL	<ul style="list-style-type: none"> <li>• Technologies/ Licenses</li> <li>• Comprehensive range of license</li> <li>• Technologies available for licensing</li> </ul>	<ul style="list-style-type: none"> <li>• Leapfrog Technical Capabilities</li> <li>• Development of New Products/Services</li> </ul>

Customer Satisfaction Surveys are one of the primary methods for measuring Customer Satisfaction. In A\*STAR’s context – Industry Projects, GET-Up, TAP and Technology Transfer (Licensing and StarT-Ups), the primary criteria to determine “Customer Satisfaction” goes way beyond the passive results of a standard Customer Satisfaction Survey. In the company’s preliminary evaluation to work with A\*STAR, many factors are taken into consideration before the company would proceed to invest their resources – time, capital, human resources, key personnel, R&D capabilities, intellectual property, competitive advantage, etc. alongside A\*STAR’s offering. Some of the variables include:

- Reliability – the ability to undertake, monitor, execute and deliver the agreed outcomes dependably, accurately within the budget, time agreed by A\*STAR and organization as stipulated in agreement
- Assurance – the knowledge, capabilities and expertises of A\*STAR’s staff and their ability to convey trust and confidence through the project
- Tangibles – physical infrastructure (state-of-the art laboratories and equipment, shared facilities, proximity to educational and research institution)
- Customer Knowledge and Intimacy – ability to understand the challenges and needs of the customer, multi-prong provision of solution that would meet needs, ability to provide the network of partners (private and/or public) in the co-solutioning process, individualised attention from beginning to end to ensure sustainability and continuity of relationship

## INDUSTRY PROJECTS

A\*STAR seeks to engage international and local Organizations through bilateral collaborations, or direct one-to-one research and development (R&D) collaborations between a private company and a specific A\*STAR Research Institute (RI). This allows companies to enhance their technological edge through the transfer of technology and know-how from the RIs.

A\*STAR's industry projects range from a one-to-one research collaboration agreement (RCA) to the highly complex, multi-partners (public institution and private organization), multi-level (involving Councils, HQ, MTI Statutory boards and other Ministries) and unique Many to Many projects. Given A\*STAR's track record managing industry projects and our reputation for world-class research and development, we are experiencing a corresponding increase in the number of exciting projects. The examples below show a sample of industry projects that are significant not only to the customer but for Singapore and the world.

<b>MANY to One Industry Project</b>	<b>27. Customer Satisfaction on Innovation-Focused Strategies</b>
<p><b><u>Lloyd's Register (LR)</u></b></p> <p>Lloyd's Register signed a master research collaboration agreement (MRCA) with A*STAR to collaborate with A*STAR's research institutes as part of the activities of <b><u>Lloyd's Register Global Technology Centre in Singapore</u></b> as well as to establish a joint lab facility with A*STAR's IHPC to undertake R&amp;D activities in modelling and simulation. The MRCA will enable LR and A*STAR to collaborate on R&amp;D projects as a key part of the GTC's activities.</p>	 <p><i>"Our investment in the new Lloyd's Register GTC in Singapore, coupled with the agreement with A*STAR, represents a shared vision to create a <u>long-term centre of excellence for technology, innovation and research that will benefit Singapore, industry and society at large.</u> It underlines our global commitment to understanding the sciences and technologies that help to ensure that people are safe and that essential assets perform as required."</i></p> <p><i>Richard Sadler CEO, Lloyd's Register</i></p>
<p><b><u>Proctor &amp; Gamble (P&amp;G)</u></b></p> <p>In Sep 2010, A*STAR and P&amp;G signed a 3-year MRCA and had a productive collaboration. In Jan 2011, P&amp;G broke ground in Biopolis for a new 500-man Singapore Innovation Centre (SgIC). The P&amp;G SgIC had TOP in Oct 2013, with official opening planned for 28 Mar 2014. <b>In May 2012, P&amp;G announced that it was moving its headquarters for skin care, cosmetics and personal care to Singapore to be closer to the fast-growing Asia beauty market.</b> The A*STAR-P&amp;G MRCA was renewed for another 5 years from 1 Sep 2013 to 31 Aug 2018.</p>	 <p><i>"The Biopolis to P &amp; G is: Innovation, research capabilities, partnership and talent"</i></p> <p><i>Mr. Joseph Listro Vice President, R &amp; D, Global Prestige, Salon Professional &amp; Asia Innovation, P &amp; G</i></p>  <p><i>"A*STAR has proven to be a leading edge innovation partner across several segments of our business and upstream research work. Expanding our partnership allows P&amp;G to more fully leverage the unique innovation capabilities at A*STAR and its network or research institutions,"</i></p> <p><i>Ms. Laura Becker, Head of P&amp;G Connect+Develop</i></p>
<p><b><u>Other significant Many to One Industry Projects :</u></b></p> <ul style="list-style-type: none"> <li>• Chugai Pharmaceuticals (headquartered in Tokyo) establishing a new company in Singapore in Biopolis in Jan 2012. Named Chugai Pharmabody Research (CPR) - 60 man, S\$200M research facility,</li> <li>• L'Oreal, opened an Advanced Research Centre in IMB on 17 Dec 2012. The center has employed eight scientists and is now expanding its collaborations beyond IMB and A*STAR's Skin Biology Cluster Platform to the biomedical research community across Singapore</li> </ul>	
<p><b><u>EpiGen Consortium</u></b></p> <p>The EpiGen Consortium, an international alliance of the world's leading epigenetics researchers (Singapore Institute for Clinical Sciences of the Agency for Science, Technology and Research (A*STAR), National University of Singapore, University of Southampton, Medical Research Council – Lifecourse Epidemiology Unit, AgResearch Limited, Auckland UniServices Limited) are pleased to announce the creation of a research collaboration with Nestlé Research Center in Switzerland.</p> <p>The partnership brings together scientists from both the public and private sectors to improve human health through the application of epigenetic tools and technologies.</p>	 <p><i>"This important collaboration will build on the ongoing research conducted by Nestlé scientists in the field of metabolic programming to formulate the best nutritional products for mothers and their infants. The comprehensive knowledge of EpiGen researchers combined with Nestlé's scientific expertise will bring epigenetics to the forefront in the understanding of early nutrition for the promotion of health throughout life."</i></p> <p><i>Prof Peter van Bladeren, Vice President Nestlé Science &amp; Research.</i></p>

## MANY to One Industry Project

### A\*STAR Aerospace Programme

Started in 2007, the Programme features a growing industry consortium comprising a select membership from leading aerospace OEMs and Singapore aerospace companies. Consortium projects are pre-competitive in nature and distinguished by the way they are identified and driven by industry needs. Aerospace companies also work bilaterally with A\*STAR on commissioned or collaborative research. 5 key research thrusts:

- a. Advanced Materials;
- b. Manufacturing Process and Automation;
- c. Information and Communication; d) Inspection and NDT; and
- d. Computation Modelling and Dynamics



*"The A\*STAR Aerospace Programme increase in membership has effectively opened up new research areas such as inspection techniques, coatings and machining. For Boeing, finding the right partners to conduct R&D and to co-invest with other industries and government agencies like A\*STAR helps us make the best use of our R&D resources."*

*Peter L Hoffman, Director,  
Global R&D Strategy,  
Boeing Research & Technology*



*"A\*STAR's Singapore Institute of Manufacturing Technology (SIMTech) and Rolls-Royce set up a joint Surface Finishing Lab to enhance productivity in manufacturing production. SIMTech and Rolls-Royce have over 75 collaborative projects including those on manufacturing process development for the aerospace and marine sectors."*

*Dr David Low,  
Chief of Manufacturing Technology,  
Advanced Technology Centre  
Rolls-Royce Singapore*

### Other significant Many to One Industry Projects :

- An Memorandum of Understanding (MoU) was signed between Singapore's Agency of Science, Technology and Research (A\*STAR) and the Korea Health Industry Development Institute (KHIDI). A\*STAR-KHIDI Joint Research Fund of US\$5 million has been established, with the first grant call taking place in 2014

## ONE to Many Industry Project

### Centre of Excellence in Advanced Packaging

Applied Materials, Inc., the global leader in providing manufacturing solutions for the semiconductor, flat panel display and solar photovoltaic industries, today signed a research collaboration agreement with the Institute of Microelectronics (IME), a world-renowned research institute under the A\*STAR, to set up a Center of Excellence in Advanced Packaging in Singapore. The Center will be located at Singapore's Science Park II and will focus on developing new capabilities in advanced packaging which is a key growth market for the semiconductor industry. The Center will have a full line of Wafer Level Packaging (WLP) processing equipment and will conduct research in semiconductor hardware, process, and device structures. Applied has led the industry in providing equipment for WLP since 2009 with a comprehensive line of processing systems for production line manufacturing.



*"This collaboration is part of Applied Materials' strategy to expand our global R&D network and extend our leading position in advanced packaging, bringing our development activities closer to our customers in Asia."*

*Mr. Russell Tham,  
Regional President,  
Applied Materials South East Asia*

### Arkay

In March 2013, the Institute of Bioengineering and Nanotechnology (IBN) finalised an MOU to establish an R&D partnership with Arkay, the world's largest independent in vitro diagnostics (IVD) company. Arkay has established a new R&D centre in Biopolis (co-located with IBN). This lab-in-RI arrangement facilitates Arkay's R&D centre operations, as well as access to research expertise and support on specific projects currently under discussion.

ARKRAY will make full use of the knowledge and experience of the excellent researchers IBN has drawn from around the world as well as the great research facilities and environment that Biopolis has to offer as we build on our global R&D functions. The joint development will begin with a focus on infectious disease testing- a field in high demand throughout Asia- and will work to build synergistic development projects and gradually expand our field of work.



*"ARKRAY is excited to embark on this new venture with IBN. We have chosen to set up our newest research center in Singapore because of IBN's distinguished knowledge and expertise in a wide variety of scientific fields, and we believe we can find a lot of opportunities to produce synergy with IBN through a long-term relationship."*

*Mr Takeshi Matsuda,  
President and CEO  
ARKRAY*

### Other significant Many to One Industry Projects :

- The Baidu-IPR Research Centre (BIRC), Baidu's first overseas joint laboratory, was officially opened in Singapore in Jul 2012. The Joint Lab demonstrate, Baidu's confidence in IPR's high level of research quality and expertise in speech and language technologies, particularly IPR's unique capabilities in Southeast Asian Language Resources, Natural Language Processing, Information Retrieval and Extraction, and Speaker Verification technology.
- Drug Discovery & Development (D3) Programme: D3 recently completed its first clinical trial in Singapore, a phase 1 study of a VLP H1N1 influenza vaccine. This project has been jointly developed with ETC and other Singaporean institutes (IMCB, Duke-NUS Graduate Medical School and the DSO National Laboratories) as well as biopharmaceutical company Cytos Biotechnology AG. D Biopharm

## ONE to Many Industry Project

## 27. Customer Satisfaction on Innovation-Focused Strategies

### Business Analytics Translational Centre

Business Analytics Translational Centre (BATC). A\*STAR and the Infocomm Development Authority of Singapore (IDA) jointly opened BATC in Sep 2012. The centre aims to help companies and government agencies use cutting-edge analytics capabilities to mine and manage big data, so as to guide business strategy and planning, and optimise day-to-day business processes.

BATC will also provide training opportunities for researchers, engineers, IT professionals and business analysts from academia and industry to expand the talent pool in business analytics.



*"In today's highly connected society and competitive economy, Organizations are looking to data to better understand their customers and achieve their goals. Analytics is key to deriving value from these data collected. We are pleased to work with A\*STAR to set up the BATC as a focal point for users and developers of analytics technologies to tap on the analytics' intellectual property and capabilities available here today. We look forward to BATC's contribution to strengthen the availability and adoption of analytics in Singapore."*

*Mr Ronnie Tay,  
CEO, Infocomm Development Authority of  
Singapore (IDA)*

### Nestlé, Abbott and Danone Nutricia Research

#### **Nestlé Research Centre**

Nestlé R&D centre, in Singapore, is the Swiss company's first R&D centre in Asia, to focus on its fastest-growing markets in the Asia-Pacific region.

#### **Abbott Asia-Pacific Nutrition R&D Centre**

This R&D laboratory at the Biopolis, its largest stand-alone nutrition R&D centre outside the United States, to cater to the Asian market.

#### **Nutricia Research Centre**

This Nutricia's first Asia-Pacific centre to focus entirely on child and maternal health. It is also the headquarters for Danone's research and clinical partnerships in Asia.



*"The Biopolis provides researchers with cutting-edge facilities and companies with business support. Having the Biopolis as our research base in Singapore also allows us to draw on the local and regional talent pool."*

*Dr. Eline M. Van Der Beek  
Research Director, Danone Nutricia Research*

### Other significant Many to One Industry Projects :

- **Advanced Remanufacturing & Technology Centre (ARTC).** ARTC signed a Memorandum of Understanding (MOU) with its potential members in May 2012 to jointly develop technologies in remanufacturing. MNCs that have signed the MOU include Rolls-Royce, Boeing, Siemens, ABB, Fuchs Lubricants and Carl Zeiss. ARTC will occupy a purpose built facility within CleanTech Park 2 and is the first Remanufacturing Centre in Asia.

## TECHNOLOGY ADOPTION PROGRAMME (TAP)

A\*STAR is committed to working with our SMEs to adopt technology in order to enhance their competitive edge and productivity. Recognising the difficulties that SMEs may face in finding the technological solutions that best meet their needs, the Technology Adoption Programme (TAP) aims to help our SMEs raise their productivity by making technology adoption available, accessible and easy for SMEs. This \$51 million programme is a crucial part of our collective effort to raise productivity and capabilities for the industry in Singapore.

Launched on 12th November by Mr S Iswaran, Minister (Prime Minister's Office) and Second Minister for Home Affairs and Trade & Industry, TAP has made great progress in helping SMEs find ready solution to meet their need. Within a year, the TAP team have made 2,600 engagements and garnered 302 adoptions.

**28. Current levels and trends for the marketplace results linked to innovation-focused strategies**

**29. Favourable comparison of financial and marketplace results with competitors or benchmarks**

## AWARDS IN SCIENCE AND ENGINEERING

A\*STAR is an internationally renowned Organization with a high concentration of scientists and experts in their respective fields. This makes it an effective community for us to play a pivotal role in transforming the Science and Technology landscape in Singapore. Some of the best international scientists have chosen to come to Singapore to invest the prime years of their scientific careers with A\*STAR. This speaks volumes of the attractiveness of the research opportunities.

A\*STAR scientist and engineers have been awarded a range of distinguished awards, accolades and appointments (2009 to present) for their efforts. To cite some examples:

1. Professor Sir George Radda, Chairman, BMRC: BioSpectrum Asia Pacific Lifetime Achievement Award
2. Professor Jackie Y. Ying of IBN: International Union of Biochemistry and Molecular Biology (IUBMB) Jubilee Medal by
3. Prof Lye Kin Mun SERC: Appointment Member on Board on Global Science and Technology, established by the National Research Council (2011) to oversee activities that assess the implications of global advances in emerging areas of science and technology.
4. Human Language Technology Group of I<sup>2</sup>R: President's Technology Award
5. Dr. Joel Yang of IMRE: MIT Technology Review – Innovators under 30s (TR35)
6. Dr Li Jingmei of GIS: 2014 UNESCO-L'Oreal International for Young Women in Life Sciences

More details of the range of distinguished awards,

accolades and appointments by A\*STAR staff can be found in Appendix 1 and 2: Awards & Accolades.

## INNOVATION DEVELOPMENT

Based on its recent analysis of the applied sciences Sath Rao, VP, Emerging Market Innovation and Economic Development Innovation Frost & Sullivan mentioned that “While research and development (R&D) has been increasingly occupying center stage as a key factor for sustainable long-term economic growth, translating R&D investments into palpable competitive advantages for the economy is a continuous challenge for economic development agencies,” He added “A\*STAR has taken a three-pronged approach to ensure that the right infrastructure, opportunities and incentives exist for the active promotion of innovation: the establishment of research facilities that allow world-class research; the development of the nation's technological prowess with focus on growing Singapore's economy, catalyzing new growth areas; and the development of human capital.

## INTELLECTUAL PROPERTY

A\*STAR was honoured with an Asia IP Elite award in 2012 by the Intellectual Asset Management (IAM) mA\*GAZINE. At the IP Business Congress Asia, IAM identified 48 Asia Pacific companies with the best strategies for maximising the value of intellectual property. A\*STAR was one of two Singapore institutions presented with the award.

In Fig 6.1 A\*STAR improved its ranking from 5th in 2012 to 2nd in 2013 under the Government Agencies category of the Patent Power 2013 Scorecards. This benchmarking was done by IEEE Spectrum, the flagship mA\*GAZINE of the Institute of Electrical and Electronics Engineers (IEEE), the world's largest professional organization devoted to engineering and the applied sciences. This ranking is based on qualitative benchmarking of the US patent portfolio of more than 5,000 Organizations worldwide. Organizations were ranked on their pipeline power, which is a measure of the strength of each Organization's US patent portfolio. A\*STAR ranked highly for pipeline generality and pipeline originality, demonstrating wide academic attribution across industry sectors and more novel inventions filed.

IEEE Spectrum Patent Power Scorecard

Institute of Electrical and Electronics Engineers (IEEE) annual analysis of who's who in patenting innovations (industry, government and universities)

Rank	Government Agency	Country	2013	2012	2011	2010
1	US Navy	United States	1	1	1	1
2	<b>A*STAR</b>	<b>Singapore</b>	<b>2</b>	<b>5</b>	<b>6</b>	<b>12</b>
3	U.S. Army	United States	3	6	8	7
4	Commissariat à l'Énergie Atomique et aux Énergies Alternatives	France	4	4	3	9
5	Centre National de la Recherche Scientifique	France	5	9	5	5
6	U.S. Department of Health and Human Services	United States	6	2	2	2
7	National Aeronautics and Space Administration	United States	7	3	7	8
8	Israel Ministry of Defense	Israel	8	16	-	-
9	Rafael Advanced Defense Systems Ltd.	Israel	9	-	18	-
10	U.S. Department of Energy	United States	10	12	11	6

Fig 6.1 Patent Power 2013 Scorecards

Asia Pacific IP Scorecard 2009: Benchmarking IP Creation in the Asia Pacific Economies by: Prof. Wong Poh Kam & Ho Yuen Ping NUS Entrepreneurship Centre (a five-year research project Research Project Sponsored by

the IP Academy (Singapore) and NUS Entrepreneurship), ranked Singapore 7th in the region in terms of absolute number of patents produced. Singapore inventors contributed 6226 patents to the United States Patent and Trademark Office (USPTO) in 1980-2009.

Within Singapore, the pattern of institutional ownership of Singapore invented patents has changed in the last 3 years. A\*STAR is the leading patenting organization in Singapore in terms of number of patents granted in the period 2007-2009. Three of the top 5 assignees for patents granted in 2007-2009 are local organizations (A\*STAR, Chartered Semiconductor and Creative Technologies). This represents a change in the dominance of USA firms as the leading patent assignees of Singapore invented patents since the 1990s.

### The pattern of institutional ownership of Singapore invented patents has changed in recent years

Top 10 Assignees of Singapore Patents 2007-2009

Organization	Country	Patent Count 2007-2009	Rank for 2007-2009	Rank for 2001-2006
<b>A*STAR</b>	<b>Singapore</b>	<b>100</b>	<b>1</b>	<b>9</b>
Micron Technology Inc	USA	96	2	4
Chartered Semiconductor	Singapore	95	3	1
Creative Technology	Singapore	84	4	11
Seagate Technology	USA	71	5	2
Marvell International	USA	70	6	-
Stats Chippac	Singapore	66	7	-
National University of Singapore	Singapore	50	8	5
Infineon Technologies	Germany	44	9	13
Hewlett-Packard Company	USA	43	10	3

Fig 6.2 Asia Pacific IP Scorecard 2009

In an internal benchmarking study on Patent, Licensing & Start-Ups, A\*STAR is comparable to leading MNCs in number of patents, licenses and Start-Ups per billion dollar of R&D spending.

Institution	R&D \$b	# Patents /\$b	# Licensing /\$b	# Start-ups /\$b
<b>A*STAR (FY12)</b>	<b>1</b>	<b>300</b>	<b>157</b>	<b>14</b>
UCal System <sup>1</sup>	6.75	142	43	8
Columbia U	0.89	237	85	16
Harvard	1.04	204	82	8
MIT	1.86	350	63	13
Fraunhofer	3.17	155	No details	No details
CSIRO <sup>2</sup>	0.9	304	120	0

<sup>1</sup> From FY11 AUTM Licensing Report

<sup>2</sup> From The National Survey of Research Commercialisation 2010-2011

Fig 6.3 Benchmark of Patent, Licensing & Start-Ups

## STANDARDS

The standards arena involves competition of technologies against the very best in the world, and the demands on quality are very exacting. There are many compelling reasons why standards activities benefit the research institute. Firstly, standards are industry driven. They exist largely to facilitate inter-operation and exchange that is part and parcel of trade. Thus, participating in standards activities help align research to industry.

Secondly, having technology accepted as standards and successfully commercialised is one of the fastest ways to get widespread adoption. The stakes are high for many participants, with everyone trying to gain a competitive edge. Finally, success at the standards arena also raises the profile and visibility of the contributing Organization. As a Singapore entity, A\*STAR demonstrates to the rest of the world the innovativeness and capability of the city state to do cutting edge R&D. Singapore will not be known just as a passive user and adopter of standards, but also a creator of standards that influence the world.

The following tables show recent standards that A\*STAR's Institute for Infocom Research (I<sup>2</sup>R) has played a part in.

IEEE Standards	Technology	Technology
IEEE 802.11n	High Speed Wireless LAN	6 proposals incorporated into specifications 3 informative contributions
IEEE 802.15.4a/b	Low Rate Wireless Personal Area Networks	7 proposals incorporated into specifications 16 informative contributions
IEEE 802.16j	Multihop relay for Broadband Access Networks	1 proposal in evaluation
IEEE 802.22	Wireless Regional Area Networks	22 6 proposals with core patents in evaluation 1 informative contribution

Institute of Electrical and Electronics Engineers (IEEE) is the world's largest professional association dedicated to advancing technological innovation and excellence for the benefit of humanity.

ISO/IEC Standards	Technology	Technology
JTC1 SC17	Biometric Match on Card and Biometric Quality	1 proposal accepted into draft 1 informative contribution
15444-1	JPEG 2000	1 proposal incorporated into draft 1 informative contribution
MPEG 4 Part 10	Video compression standard	1 proposal accepted into draft and extensions 3 patents in informative contributions
MPEG 4 SLS	Scalable to lossless audio compression	16 proposals with 7 core patents published a s standard
MPEG 4 ALS 2	Audio lossless coding	proposals with 2 core patents published as standard

ISO/IEC JTC 1 is Joint Technical Committee 1 of the International Organization for Standardization (ISO) and the International Electrotechnical Commission (IEC). Its purpose as a technical committee is to develop, maintain, promote, and facilitate standards in the fields of information technology (IT) and Information and Communications Technology (ICT).

Standards Body	Technology	Technology
WiMedia (formerly 802.15.3a)	High Rate Wireless Personal Area Networks	1 proposal accepted into draft 6 informative contributions
3GPP LTE (c/o ETSI)	3GPP LTE (c/o ETSI)	1 proposal accepted into draft 5 informative contributions

WiMedia - The MultiBand OFDM Alliance (MBOA), an industry organization dedicated to developing technical specifications for very high-speed, short-range ultrawideband (UWB) wireless communications. As a legal entity, the MBOA will publish and manage

the industry-supported ultrawideband specifications for rapid adoption by the consumer electronics, personal computing and mobile industries.

ETSI, the European Telecommunications Standards Institute, produces globally-applicable standards for Information and Communications Technologies (ICT), including fixed, mobile, radio, converged, broadcast and internet technologies.

### INFORMATION TECHNOLOGY

The FutureGov Awards (ASIA), recognises the region's most successful public sector projects in the use of ICT to improve efficiency, service quality and transparency. A\*STAR ISO 27001-certified Information Security Management System beat four other shortlisted projects to win the 2013 FutureGov Award in the Information Security category. A\*STAR is only the second Singaporean public agency to win in this category since 2007.

In late 2011, A\*STAR started on its journey to achieve ISO 27001 certification for the A\*STAR Data Centre and Biopolis Campus Network Services, implementing information security-centric processes for the operation of its Data Centre. The aim was to ensure the availability of timely, accurate information while preventing and minimising security incidents. A\*STAR's success in this was recognised as it received the certification, after having passed the certification audit with zero non-conformity in January 2013. The savings from reduction of security incidents and manpower is estimated to amount to S\$125,000 for the year 2012.

CIO Asia mA\*GAZine's annual CIO 100 index highlights top 100 regional enterprises and Organizations that have excelled through creative and innovative IT projects in the past year. Companies that achieve CIO 100 listing have broken new ground by using IT systems, initiatives and projects to provide added value to their customers. Through the creative use of IT Technology to implement Electronics Purchase Request System (ePRS), A\*STAR CIO, Dr John Kan is listed as one of the CIO Asia mA\*GAZine's CIO 100 Honorees in 2014.

A\*STAR achieved the FIRST certification in Feb 2014. FIRST, or Forum of Incident Response and Security Teams, is a recognized global leader in incident response that provides timely information about current security threats and vulnerabilities.

Achieving FIRST certification and being a member allows A\*STAR to be better equipped with the knowledge and resources to improve on Cyber Security readiness, coordinate cyber information sharing and manage cyber risks. We will also gain timely access to information on high-impact cyber activities that may affect A\*STAR.

The Next Generation Research Network (NGRN) is a high-performance network that will cater for research and scientific users, separating A\*STAR's scientific and research traffic from corporate traffic, which will result in a better user experience for both groups of users. NGRN will facilitate high-speed connectivity with local research and education partners (e.g. NUS, NTU, SUTD) and also international connectivity with partners in US, Europe and Japan.

### EMPLOYER OF CHOICE

A\*STAR strives to be an 'Employer of Choice'. Time, effort and resources are invested and to create a great working environment for a diverse and talented pool of staff to work, live and play in. The outcome of such efforts is to build a positive employment brand which helps A\*STAR to both attract and retain staff, which is vital during current times when exceptional talent is in short supply due to the global war for talent.

A\*STAR received a number of awards and accolades in 2013 which strengthened our reputation as an Employer of Choice. From 2012–2013, A\*STAR was consistently rated by Natural Sciences and Engineering students as the Top Ideal Employer in Universum's yearly graduate survey. JobsCentral, a renowned HR consultancy and online e-recruitment specialist, placed A\*STAR as the most popular government agency amongst computing students in Singapore. With a strong brand positioning, A\*STAR has remained a top 10 Employer of Choice, as ranked by JobsCentral, over the last three years.

The comparative surveys below reinforce A\*STAR's efforts as an Employer of Choice.

The Universum Top 100 Ideal Employers student survey reveals how students perceive employers. A\*STAR is the only public sector organization to be in the top 5 for 2 years.

Company	Ranking 2014	Ranking 2013
Singapore Airlines	1	4
Google	2	2
<b>Agency For Science, Technology And Research (A*STAR)</b>	<b>3</b>	<b>1</b>
Rolls-Royce	4	5
ExxonMobil	5	3
Ministry of Education (MOE)	6	8
Shell	7	6
Apple	8	9
GSK (GlaxoSmithKline)	9	7
Keppel Corporation	10	10

The Singapore's 100 leading graduate employers feature the votes of students and graduates of their perception of industry leaders in the Singaporean graduate recruitment market. The top positions are dominated by accounting, banking and finance companies. However, A\*STAR has steadily moved from 70th in 2010 to 4th in 2013 when compared with both private and public sector companies in the areas of biomedical science, research & development and engineering.

Employer	2013	2012	2011	2010
<b>Agency For Science, Technology And Research (A*STAR)</b>	<b>4</b>	<b>3</b>	<b>4</b>	<b>70</b>
Ministry Of Health (MOH)	6	10	47	81
Rolls Royce	28	31	16	21
Defence Science and Technology Agency (DSTA)*	39	9	23	19
DSO National Laboratories	92	59	26	22
GlaxoSmithKline*	35	14	23	30
Ministry of Education (MOE)	26	7	15	22
National University Health System (NUHS)*	38	38	32	
3M	14	16	37	59
Ministry Of Health (MOH)	6	10	47	61
Singapore Technologies Engineering	-	72	42	2
Pfizer	69	44	61	42

The JobsCentral Employers of Choice (EOC) Survey is conducted annually to provide employers with an insight into how they are perceived by undergraduates and fresh graduates in Singapore. A\*STAR steadily maintains herself within the top 5 public sector organization.

GOVERNMENT/ GOVERNMENT-LINKED EMPLOYERS OF CHOICE	2013	2012	2011	2010
Changi Airport Group	1	-	-	-
Economic Development Board	2	1	3	2
National University of Singapore	3	4	1	4
<b>Agency For Science, Technology And Research (A*STAR)</b>	<b>4</b>	<b>7</b>	<b>5</b>	<b>8</b>
Defence Science and Technology Agency	5	9	2	5
Singapore Tourism Board	6	3	7	1
Ministry Of Education	7	2	6	3
Monetary Authority Of Singapore	7	6	9	6
Civil Aviation Authority of Singapore	9	15	13	10
Ministry Of Finance	1	4	10	7
Government of Singapore Investment Corporation	11	13	-	12
DSO National Laboratories	12	12	0	13
SPRING Singapore	13	10	8	11
Health Promotion Board	14	14	12	-
Nanyang Technological University	15	8	4	9
Ministry Of Foreign Affairs	16	11	14	14
JTC Corporation	17	20	16	26
Health Sciences Authority	18	17	11	19

The table below summarises A\*STAR's HR accomplishment from 2011 to present.

ORGANIZER	AWARD	2013	2012	2011
<p>UNIVERSUM is The Global Employer Branding Leader. Conducting the world's largest research study on talent career expectations.</p>	<p><b>Universum Top 100 Ideal Employers</b></p> 	<ul style="list-style-type: none"> <li>• <b>Engineering &amp; Natural Science: 1st</b></li> <li>• Health &amp; Medicine: 2nd</li> <li>• Information Technology: 26th</li> </ul>	<ul style="list-style-type: none"> <li>• <b>Engineering &amp; Natural Science: 1st</b></li> <li>• Health &amp; Medicine: 1st Information Technology: 29th</li> </ul>	<p>No survey was held in 2011</p>
<p>Group GTI is the world's largest graduate career advice ,media and research business and recruitment services.</p>	<p><b>Singapore's 100 leading graduate employers</b></p> 	<ul style="list-style-type: none"> <li>• <b>Winner of Public Sector (Engineering) Category</b></li> <li>• Most Popular Graduate Employers: 4th</li> </ul>	<ul style="list-style-type: none"> <li>• <b>Winner of Scientific Research &amp; Development Category</b></li> <li>• Most Popular Graduate Employers: 3rd</li> </ul>	<ul style="list-style-type: none"> <li>• Most Popular Graduate Employers: 4th</li> </ul>
<p>The JobsCentral Group is one of the top providers of jobs, education, scholarships and career information and applications.</p>	<p><b>JobsCentral Employers of Choice Survey</b></p> 	<ul style="list-style-type: none"> <li>• Choice Employer: 4th</li> </ul>	<ul style="list-style-type: none"> <li>• Choice Employer: 7th</li> </ul>	<ul style="list-style-type: none"> <li>• Choice Employer: 5th</li> </ul>
<p>Human Resources Excellence Awards is organised by the Human Resources mA*GAzine, aims to honour and award outstanding HR practices and provide a platform for HR practitioners to network and celebrate their achievements.</p>		<ul style="list-style-type: none"> <li>• Excellence in Employer Branding: 3rd</li> <li>• Excellence in Employee Development: Finalist</li> <li>• Excellence in Leadership Development: Finalist</li> <li>• HR Team of the Year: Finalist</li> </ul>	<p><i>(The inaugural HR Excellence awards was held in 2013)</i></p>	
<p>HRM Singapore organises the HRM Awards are open to all Singapore based employers from the private and public sectors - including all MNCs, local companies, government agencies. and SMEs etc</p>	<p><b>HRM Awards</b></p> 	<ul style="list-style-type: none"> <li>• Best Employer Branding: Finalist</li> <li>• Best HR Leader: Finalist</li> </ul>	<ul style="list-style-type: none"> <li>• Best Employer Branding: Finalist</li> <li>• Best HR Team: Finalist</li> <li>• Best HR Manager: Finalist</li> <li>• Best HR Young Achiever: Finalist</li> </ul>	<ul style="list-style-type: none"> <li>• Best Employer Branding: Finalist</li> <li>• Best HR Team: Finalist</li> <li>• Best Graduate Development Practices: Finalist</li> </ul>

## JOURNALS – NATURE PUBLISHING INDEX (ASIA-PACIFIC TOP 200)

Nature is a prominent interdisciplinary scientific journal. It was ranked the world's most cited by the Science Edition of the 2010 Journal Citation Reports and is widely regarded as one of the few remaining academic journals that publish original research across a wide range of scientific fields. Research scientists are the primary audience for the journal, but summaries and accompanying articles are intended to make many of the most important papers understandable to scientists in other fields and the educated general public.

The Nature Publishing Index Asia-Pacific tracks research published in Nature journals from the Asia-Pacific region during the past 12 months. For many years, science in the Asia-Pacific region has been dominated by Japan. However, as seen through the lens of the Nature Publishing Index (NPI), the fastest growth in high-quality research is now coming from other countries — in particular China and Singapore (NUS, A\*STAR and NTU).

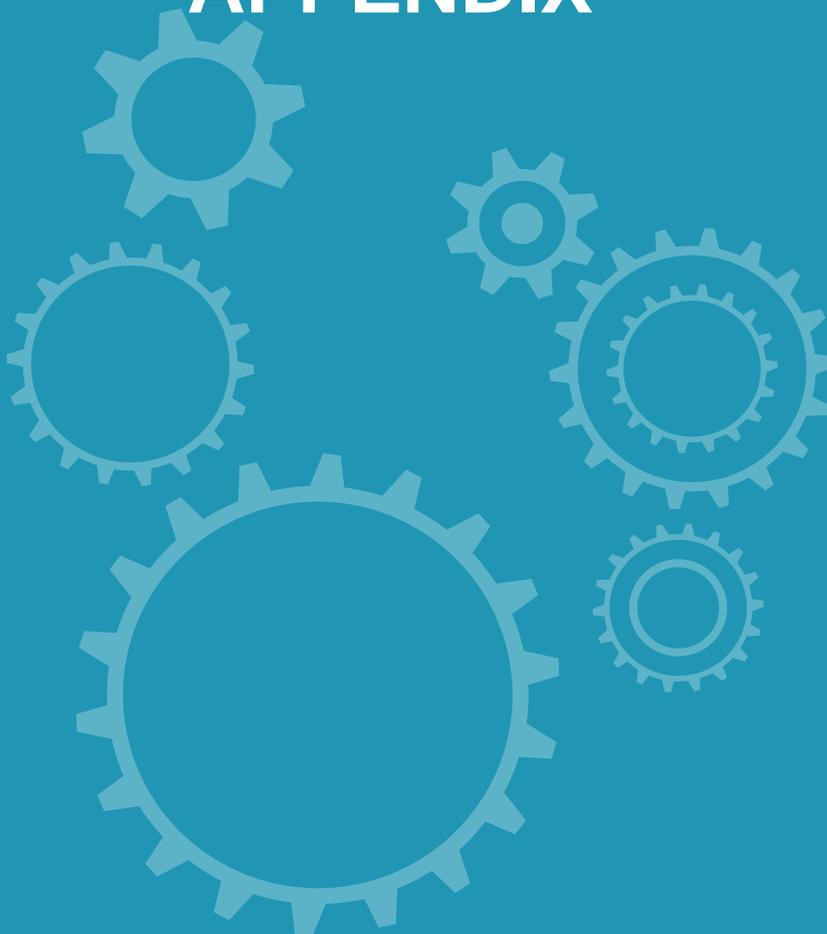
The 2013 edition of the Nature Publishing Index (NPI) includes 757 institutions based in the Asia-Pacific region. Below are the top 25, with comparison alongside the 5-year cumulative from 2009-13. With 2013 and last year's scores.

These rankings are based on the number of papers that were published within the last 5 years and 12 months from the institutions listed below. These rankings only include papers that were published as research articles (Articles, Letters and Brief Communications) or reviews in Nature and/or Nature monthly research journals.

INSTITUTION	Country	Ranking		
		2009-13	2013	2012
The University of Tokyo	Japan	1	2	1
Chinese Academy of Sciences (CAS)	China	2	1	2
Kyoto University	Japan	3	3	3
RIKEN	Japan	4	4	4
Osaka University	Japan	5	5	5
Tohoku University	Japan	6	7	12
The University of Melbourne	Australia	7	8	6
Nagoya University	Japan	8	15	7
University of Science and Technology of (USTC)	China	9	9	8
National University of Singapore (NUS)	Singapore	10	6	9
Tsinghua University	China	11	10	10
Australian National University (ANU)	Australia	12	11	13
The University of Queensland (UQ)	Australia	13	16	15
Seoul National University	South Korea	14	20	24
Peking University	China	15	14	11
<b>Agency for Science, Technology and Research (A*STAR)</b>	<b>Singapore</b>	<b>17</b>	<b>19</b>	<b>16</b>
Korea Advanced Institute of Science and Technology (KAIST)	South Korea	18	13	27
Hokkaido University	Japan	19	18	20
BGI China	China	20	17	18
The University of Sydney	Australia	21	25	25
Kyushu University	Japan	22	34	19
Nanyang Technological University (NTU)	Singapore	23	12	35
Monash University	Australia	24	26	32
Keio University	Japan	25	31	28



# APPENDIX



Agency for  
Science, Technology  
and Research

SINGAPORE

**CREATING AN INNOVATION ECONOMY**

# APPENDIX 1 — HONOURS, AWARDS AND ACCOLADES

## Prestigious awards for the Science & Engineering (Internationally and locally)

2 0 1 4



**Dr Li Jingmei**  
GIS

**2014 UNESCO-L'Oreal International for Young Women in Life Sciences**

Dr Li Jingmei, a post-doctoral research fellow at A\*STAR's Genome Institute of Singapore (GIS) and 2007 recipient of the A\*STAR Graduate Scholarship, was among 15 exceptional winners internationally to be awarded a fellowship by the UNESCO-L'Oreal International Fellowships Programme for Young Women in Life Sciences. Dr Li's research focuses on studying the genetic and epidemiologic characteristics of mammographic density and its use as a surrogate marker of breast cancer risk and survival, as well as the genetic epidemiology of breast cancer in general. The UNESCO- L'Oreal International Fellowships programme supports women researchers around the world, aiming to advance women's contribution to science and pay tribute to exceptional women scientists.



**SIMTech**

**LTA Excellence Award 2014 - Most Innovative Solution Award**

SIMTech's innovative design, development and implementation of the RFID-based Personnel Tracking System (PTS) that is used to ensure safety and movement of workers in confined spaces, such as underground tunnels. The system was implemented for MRT Downtown Line Stages 2 and 3, enabling contractors to oversee the safety of the personnel working on site.

2 0 1 3



**Professor Sir George Radda**  
Chairman, BMRC

**BioSpectrum Asia Pacific Lifetime Achievement Award 2013**

Professor Sir George Radda, Chairman of A\*STAR's Biomedical Research Council (BMRC) has been conferred the Biospectrum Asia Pacific Lifetime Achievement Award for his tireless efforts in building bioimaging capabilities in Singapore and for his pioneering work in Nuclear Magnetic Resonance (NMR) methods used to study the human body. Under his leadership, Sir George advanced Singapore's biomedical research potential and was instrumental in helping BMRC in a number of industry collaborations especially in the Bioimaging sector. As Chairman of Singapore Bioimaging Consortium at A\*STAR (2005-2010), Sir George spearheaded significant tie-ups with key industry players such as Bayer and GE Healthcare. Currently, he is leading a new program on cancer metabolism and development of Magnetic Resonance Spectroscopy as Director of Functional Metabolism Research Group. Sir George also held the position of a scientific advisor to the Dean, National University of Singapore Medical School from 2005-2011 and advocated the importance of human capital development in the universities.



**Professor Wieslaw L. Nowinski**  
SBIC

**2013 Pioneer in Medicine Award**

Professor Wieslaw Nowinski, principal scientist and director of A\*STAR's Biomedical Imaging Lab, was awarded the 2013 Pioneer in Medicine Award at the 10th Annual World Congress of the Society for Brain Mapping & Therapeutics (SBMT). The award is given to individuals who have significantly contributed to the scientific advancement in the fields of medicine and image guided therapy through a multidisciplinary approach and have enabled the development of state-of-the-art technology and scientific discovery. Professor Nowinski is conferred this prestigious award for his pioneering work in human brain atlas. His brain mapping work consists of years of research on stroke, deep brain stimulation, medical image processing, virtual reality, computer-assisted diagnosis and treatment, and future directions in computer-aided radiology and surgery.



**Professor Boris Luk'yanchuk**  
DSI

**BioSpectrum Asia Pacific Lifetime Achievement Award 2013**

The 2013 President's Science Award (PSA) was conferred on Professor Boris Luk'yanchuk of A\*STAR's Data Storage Institute (DSI). Professor Luk'yanchuk was recognised for "for his outstanding input to the theory of laser-matter interactions and light scattering by nanoparticles, in particular to Fano resonance in plasmonic materials.



**Team Gxav**  
I2R

**11st Prize in GE Flight Quest**

A team of data analytics researchers from A\*STAR's Institute for Infocomm Research (I2R) has won the first Flight Quest, a global open innovation challenge organised by General Electric and Alaska Airlines to create new algorithms to better predict flight arrival times and reduce passenger delays. Team Gxav &\* comprises Mr Xavier Conort, Dr Cao Hong, Dr Clifton Phua, Dr Yap Ghim-Eng and Dr Kenny Chua. Their winning algorithm produced flight arrival estimates that were at least a 40% improvement over current industry flight time predictions, and has the potential to save time for travellers and translate to significant cost savings for airlines.



## Human Language Technology Group I<sup>2</sup>R

### President's Technology Award 2013

The 2013 President's Technology Award (PTA) 2013 was conferred to A\*STAR's Institute for Infocomm Research, (I<sup>2</sup>R) Human Language Technology Group comprising Dr Li Haizhou, Dr Ma Bin, Ms Aw Ai Ti, and Dr Su Jian. The group made a remarkable breakthrough in human language technology that transforms the interface of mobile applications and breaks down the language barriers for Asian society.



## Dr Patrick Tan GIS

### Human Genome Organisation (HUGO) Chen New Investigator Awards

Dr Patrick Tan, a Principal Investigator at the Genome Institute of Singapore (GIS) has received the Chen New Investigator Award from the international Human Genome Organisation (HUGO) for his significant contributions to the research on genomic profiles of Asian cancers. The award is given to scientists who have made significant contributions to their fields of genomic research in their early career years. The Award Review Committee commended Dr Tan for his outstanding education background, excellent publication record and his long standing body of work in cancer genomics. Dr Tan's work focuses on developing genomic approaches to unlock the molecular and clinical diversity of gastric cancer, paving the way for personalized treatments.



## I<sup>2</sup>R & IMRE

### IES Prestigious Engineering Achievement Awards 2013

#### Applied Research & Development

- Metamaterial Zero-Phase-Shift Line Antennas - I<sup>2</sup>R
- AGLAIA: Automatic Glaucoma Diagnosis and Its Genetic Association Study through Medical Image Informatics - I<sup>2</sup>R

### IES Prestigious Engineering Achievement Awards 2013

#### Technology Innovation

- Voiceprint Technology: My Voice Tells Who I am - I<sup>2</sup>R
- EyeFly 3D - Making 3D available for anyone, anytime, anywhere - IMRE
- AgilFence Perimeter Intrusion Detection System (PIDS) – ST Electronic (but includes I<sup>2</sup>R)



## I<sup>2</sup>R & IMRE

### Applied Research & Development

- EyeFly3D – Making 3D Available for Anyone, Anytime, Anywhere: A development by A\*STAR's Institute of Materials Research and Engineering (IMRE), Nanoveu Pte Ltd and Temasek Polytechnic (TP), which is based on nanoimprint technology, produced the flexible EyeFly3D screen protector that turns mobile devices into glasses-free 3D viewing platforms. Together with software applications developed for Apple iOS and Android platforms, the simple plastic film allows users to play 3D content and also converts 2D pictures into 3D easily.
- AgilFence Perimeter Intrusion Detection System (PIDS): The Institute for Infocomm Research (I<sup>2</sup>R) together with ST Electronics (Satcom and Sensor Systems) and Changi Airport Group developed a security fencing which incorporates a unique intelligent adaptive signal processing algorithm, allowing for reliable detection, location and response to perimeter intrusion. This is the first successful deployment of such a large scale fiber Bragg grating-based perimeter intrusion detection system (PIDS) in the world.



## Dr Florent Ginhoux SIgN

### EMBO Young Investigator 2013 Award

Dr Florent Ginhoux, Principal Investigator at the Singapore Immunology Network (SIgN), has been awarded the prestigious EMBO Young Investigator 2013 Award. The European Molecular Biology Organization (EMBO) Young Investigator Programme (YIP) recognises young, promising researchers who are less than forty years of age and who have established their first laboratories in Europe and EMBO cooperation partner countries in the past four years. Dr Ginhoux is the second scientist in Singapore to win this award, after Dr Bruno Reversade, Principal Investigator, Institute of Medical Biology, who won it in 2012.



## A\*STAR

### WIPO-IPOS Innovation Award 2013

A\*STAR has obtained patent protection innovations which in turn are licensed to MNCs, small medium enterprises and spin-off companies. A well developed patent strategy and portfolio is necessary in an increasingly globalised and competitive economy. This award underscores A\*STAR's commitment to deliver economic impact for Singapore by increasing the value of our intellectual property. The Patent Cooperation Treaty (PCT) system has been one of the key patent filing routes for A\*STAR to extend the coverage of our patent protection to more jurisdictions, thereby benefitting our licensees and partners.



**Dr. Joel Yang**  
IMRE

***TR35@Singapore Award***

Dr Joel Yang, a Principal Investigator at the Institute of Materials Research and Engineering (IMRE), has been conferred the inaugural "TR35@Singapore Award" on 16 March 2012. Dr Yang received the award for his cutting-edge research in nanotechnology, particularly in developing a practicable approach to fabricating densely-spaced sub-10-nm structures. His outstanding research in nanotechnology, recently applied to nanoplasmonics – a field that looks at how light behaves at the nanometer-size scale. Some of his other work at IMRE involves process development for future high-density hard disk drives and the development of a new process to create micrometer-sized 'photo-realistic' images.

**Young Scientist Award 2012**

Dr Joel Yang was awarded the Young Scientist Award for his research on nanolithography and nanoplasmonics.



**Dr Jonathan Loh**  
IMB

***TR35@Singapore Award***

Dr Jonathan Loh Yuin-Han, a Principal Investigator at the Institute of Medical Biology (IMB) has been conferred the inaugural "TR35@Singapore Award" on 16 March 2012. Dr Loh was awarded for his outstanding research on the epigenetic reprogramming of somatic cells. He is the first researcher to have successfully converted human blood cells to pluripotent stem cells, which provide a readily accessible source of stem cells and an alternative to harvesting embryonic stem cells. This crucial step will pave the way for the development of more efficient ways of generating patient-specific pluripotent stem cells for research and clinical use. This innovation also offers the hope of replacing current methods of generating induced pluripotent stems cells, which are harvested via invasive surgical skin biopsies, with just a routine blood sample.



**Prof Jackie Y. Ying**  
IBN

***International Union of Biochemistry and Molecular Biology (IUBMB) Jubilee Medal***

Prof Jackie Y. Ying was awarded the International Union of Biochemistry and Molecular Biology (IUBMB) Jubilee Medal at the Miami 2012 Winter Symposium on Nanotechnology in Biomedicine from 26-29 Feb 2012. The Jubilee Medal honours exceptionally successful scientists in the field of biochemistry and molecular biology, and was awarded to Prof Ying for her research in nanomedicine. Prof Ying also delivered the IUBMB Jubilee Lecture on "Nanocomposite Design of Advanced Biomaterials" at the symposium, which was jointly organized by the University of Miami, Nature Publishing Group and Scripps Institute.



**Prof Sir David Lane**  
A\*STAR Chief Scientist

***Cancer Research UK Lifetime Achievement Award 2012***

A\*STAR Chief Scientist, Professor Sir David Lane is the recipient of this year's Cancer Research UK Lifetime Achievement Award. The award recognises his contribution to the pioneering research that led to the discovery of the p53, often called the 'guardian of the genome'. The p53 protein, which is mutated in more than 50 per cent of cancers, was first discovered in 1979 and since then Professor Lane has dedicated his career to understanding how it protects against cancer. This discovery revolutionised scientists' understanding of how cells grow and divide and opened a new window on cancer.



**Professor Dim-Lee Kwong**  
IME

***President's Science and Technology Medal 2012***

The 2012 President's Science and Technology Medal was awarded to Professor Dim-Lee Kwong, Executive Director of A\*STAR's Institute of Microelectronics (IME). Professor Dim-Lee was recognised "for his distinguished, sustained and exceptional contributions to Singapore's science and engineering landscape, particularly in advancing the semiconductor industry through R&D and the forging of strategic research partnerships between industry and public sector agencies".



**Professor Wang Yue**  
IMCB

***President's Science Award 2012***

The 2012 President's Science Award (PSA) was conferred on Professor Wang Yue of A\*STAR's Institute of Molecular and Cell Biology (IMCB). Professor Wang was recognised for his "ground-breaking discoveries in the biology and virulence of the fungus *Candida albicans*, a leading cause of serious hospital-acquired infections".



**Dr. Patricia Ng**  
SlgN

**2012 L'Oreal-Unesco International Fellowship**

Dr Patricia Ng, Research Fellow at the Agency for Science, Technology and Research's (A\*STAR) Singapore Immunology Network (SlgN), was among 15 exceptional winners from around the world to receive the International Fellowship accolade at the 14th Annual L'Oréal-UNESCO Awards for Women in Science held at the UNESCO Headquarters in Paris, France. Dr Ng's doctorate research focuses on the challenge of re-engineering antibodies, the body's main arm against infection, so that they become more effective in fighting disease. Her investigation objective is to develop an improved antibody which can be adapted onto other antibodies that bind to viruses. These engineered antibodies are posited to improve the killing of common and sometimes deadly viruses, such as the rotavirus and enterovirus which are linked to diarrhea and hand-foot-mouth disease respectively.



**I2R**

**Pride@Boeing Award (2012)**

The Sensor Infrastructure and Data (SID) team from I2R was awarded the Pride@Boeing Award by Boeing in recognition of their successful delivery of a sensor platform called Sensor Infrastructure and Data (SID). This was Boeing's first research collaboration project with a university or research institution that resulted in a factory transition: the Boeing Network Enabled Manufacturing Team (NEM) was able to apply the SID platform successfully in the Boeing 777 Commercial Airplanes production as an Intelligent Factory Alert System.



**Human Language Technology Group**

**I2R**

**National Institute for Standards and Technology (NIST) Speaker Recognition Evaluation International Benchmarking 2012**

Human Language Technology Team at I2R consisting Dr Lee Kong, Dr Ma Bin, Dr You Changhai, Dr Sun Hanwu, Dr Anthony Larcher and Dr Li Haizhou, came in 1st in accuracy ranking, out of 43 international teams including major voice biometrics companies and world leading universities.

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**Professor Jackie Y. Ying**  
IBN

**2011 Silver Award at the Asian Innovation Awards**

IBN's MicroKit won the Silver Award at the Asian Innovation Awards 2011 organized by The Wall Street Journal Asia. The Asian Innovation Awards recognize innovations that break with conventional processes in creative ways. Developed in Singapore by IBN Executive Director, Professor Jackie Y. Ying and her team members, Guolin Xu and James Tseng-Ming Hsieh, the MicroKit is an automated diagnostic device that can detect viruses rapidly and accurately within two hours. Current efforts to contain infectious diseases are often hampered by the time it takes to diagnose and isolate those carrying the virus. Conventional diagnostic tests can take up to half a day and can only be conducted in dedicated biosafety laboratories by clinical personnel, who might risk accidental exposure to the virus.



**Dr Zhang Rui**  
I2R

**IEEE ComSoc Asia-Pacific Best Young Researcher Award**

Dr Zhang Rui, a research scientist at A\*STAR's Institute for Infocomm Research (I2R), won the "6th IEEE ComSoc Asia-Pacific Best Young Researcher Award" for his outstanding participation and active involvement in IEEE ComSoc publications and conferences in the last 3 years. Since joining I2R in 2007, Dr. Zhang has conducted extensive research in various aspects of wireless communications. He has worked on several frontier research areas, including multi-user communication systems with multi-antenna transmitters and/or receivers (multi-user MIMO), cognitive radio and cooperative communication. Currently, he is continuing his research in these areas, exploring new promising areas of wireless communications research related to energy issues, such as energy efficiency, energy harvesting and smart grid.



**Professor Dim-Lee Kwong**  
IME

**2011 IEEE Frederik Philips Award**

Prof Dim-Lee Kwong, Executive Director of A\*STAR's Institute of Microelectronics, was recognized with the 2011 IEEE Frederik Philips Award "for leadership in silicon technology and excellence in the management of microelectronics research and development." Prof Kwong has led IME in developing next-generation R&D programs such as in MEMS, bioelectronics and silicon photonics, which are attracting the interest of Fortune 500 companies, and offer the potential of anchoring high-value added manufacturing activities locally. Past recipients of the IEEE Frederik Philips Award include co-founder of Intel Gordon E. Moore, who famously formulated Moore's Law that predicted computing advancements, and CTOs of IBM, Hitachi and Motorola. The award will be presented at a ceremony at the IEEE International Electron Devices Meeting in December 2011.



**Stem Cell Group  
GIS**

***President's Science Award (PSA)***

The 2011 President's Science Award (PSA) was conferred to A\*STAR's Genome Institute of Singapore (GIS) Stem Cell Group comprising Dr Lim Bing, Dr Lawrence Stanton, Dr Ng Huck Hui and Dr Paul Robson. The Stem Cell Group at A\*STAR's Genome Institute of Singapore (GIS) was recognised as being the first in the world to map the gene regulatory networks controlling stem cell functions. Using cutting-edge genomic technologies, the team has advanced the critical know-how to maintain embryonic stem cells, and induce them to create a wide range of specialised cell types in the body.



**Prof Lye Kin Mun  
SERC**

***Appointment Member on Board on Global Science and Technology, established by the National Research Council (2011)***

In 2011, Prof Lye Kin Mun was appointed member on the Board on Global Science and Technology (BGST), established by the National Research Council in 2009 to oversee activities that assess implications of global advances in emerging areas of science and technology.



**Prof Wolfgang Hoefler  
IHPC**

***IEEE's Microwave Pioneer Award 2011***

Prof Wolfgang Hoefler, from IHPC, received the "Microwave Pioneer Award" from the IEEE Microwave Theory and Techniques (MTT) Society, "For pioneering contributions to time domain computational methods in microwave engineering, in particular the transmission line matrix (TLM) method." The MTT Society presents annual awards to outstanding members of the microwave community for contributions made to the field of microwave technology and engineering.

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**Prof Edison LIU  
GIS**

***Re-elected as President, Human Genome Organization (HUGO)***

Prof Liu was re-elected by the HUGO Council in Feb 2010. The re-election is in recognition of the significant work he has done in the organization, such as restructuring the membership rules as well as establishing web and social networking for the organization since 2007.



**Prof David Townsend  
SBIC**

***2010 IEEE Medal for Innovations in Healthcare Technology***

Prof Townsend, co-inventor of the PET/CT scanner, is awarded this prestigious medal for the design, commercial development and clinical implementation of the PET/CT scanner. The scanner makes diagnostic imaging of cancer faster and more accurate to benefit millions of patients.



**IME**

***President's Technology Award 2010***

The 2010 President's Technology Award (PTA) was presented to the team of research engineers from A\*STAR's Institute of Microelectronics. The team led by Dr Patrick Lo Guo-Qiang, consisted of Dr Yu Mingbin, Dr Ang Kah Wee and Dr Liow Tsung-Yang. Their research on silicon photonics enabled them to successfully design a modulator that could transmit optical signals at an ultra fast speed. The team also developed high performance and low-cost silicon photonics devices with industry-viable fabrication solutions and designs, which enabled industry partners to accelerate innovation of their products and allowing the companies to gain a foothold in the upcoming optoelectronics market. The silicon photonics research at IME has already begun to bring in potential investors to consider Singapore as a launch pad for their operations and services.

## APPENDIX 2 — HONOURS, AWARDS AND ACCOLADES

### Significant Awards and Recognition for the Science & Engineering (Internationally and locally)

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**Prof Philip Ingham**  
IMCB

***Waddington Medal 2014***

Prof Philip Ingham, Joint Research Director at A\*STAR's Institute of Molecular and Cell Biology (IMCB), has been awarded the Waddington Medal 2014 by the British Society for Developmental Biology for his contributions to developmental genetics of both *Drosophila* and Zebrafish. The award, the United Kingdom's only national award for developmental biology, is given to only one recipient annually for outstanding research performance as well as services to the subject community. Prof Ingham is currently also a Distinguished Professor of Developmental Biology in Lee Kong Chian School of Medicine, Nanyang Technological University.



**Prof Jackie Ying**  
IBN

***Singapore Women's Hall of Fame***

Professor Jackie Y. Ying, Executive Director of A\*STAR's Institute of Bioengineering and Nanotechnology (IBN), has been inducted to the Singapore Women's Hall of Fame (SWHF), which recognizes and honours outstanding women of Singapore. The 108 honourees of the 2014 SWHF were selected from a shortlist of some 200 candidates across different fields of endeavour. Prof Ying is an award-winning researcher in nanotechnology. She has been named one of "One Hundred Engineers of the Modern Era" by the American Institute of Chemical Engineers - and was one of the eight women in the list - for her pioneering work on nanostructured systems, nanoporous materials and host matrices for quantum dots and wires.

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**Dr Melissa Fullwood**  
NSS Scholar

***Singapore NRF Fellowship Award 2013***

Dr Melissa Fullwood, recipient of both the NSS Undergraduate and PhD scholarships, has been awarded the prestigious Singapore NRF Fellowship Award 2013. She is one of the 16 Fellows who was selected out of a total of 142 applications by the distinguished scientists of the NRF Fellowship Interview Panel this year. Dr Fullwood was awarded the fellowship to further her research on the use of novel next-generation sequencing technologies to understand the epigenomics of human cancer cells.



**Dr. Karen Crasta**  
IMCB

***Singapore NRF Fellowship Award 2013***

Dr Karen Crasta, a research scientist at the Institute of Molecular and Cell Biology, has been awarded the prestigious Singapore NRF Fellowship Award 2013. Dr Crasta is one of the 16 Fellows selected from a total of 142 applications received from all over the world. These 16 Fellows were selected by the distinguished scientists of the NRF Fellowship Interview Panel. Dr Crasta's research focuses on understanding the molecular mechanism that dictates cell fate following treatment with anti-mitotic drugs.



**Dr. Su Ying Quek**  
IHPC

***Singapore NRF Fellowship Award 2013***

Dr Su Ying Quek, a research scientist at the Institute of High Performance Computing, has been awarded the prestigious Singapore NRF Fellowship Award 2013. She is one of the 16 young scientists who have been selected as Fellows by the distinguished scientists of the NRF Fellowship Interview Panel this year. Dr Quek's research investigates spin transport across interfaces in emerging materials, in order to predict materials and material properties with applications for next-generation data storage.



**Professor Jackie Y. Ying**  
IBN

***2013 Materials Research Fellowship***

Professor Jackie Y. Ying, Executive Director of A\*STAR's Institute of Bioengineering and Nanotechnology (IBN), has been elected as a 2013 Materials Research Society Fellow for her distinguished contributions to the synthesis of advanced nanostructured materials and her service to the materials community. Professor Ying's laboratory has developed a variety of novel approaches that create nanoporous and nanocomposite materials that are important for catalytic, fuel cell, bioimaging and biosensing applications. Her research group has designed nanostructured biomaterials and miniaturized biosystems for drug delivery, tissue engineering, and molecular diagnostic applications. This recognition is particularly distinguished as the Materials Research Society is the world's largest organization of materials researchers that promotes communication for the advancement of interdisciplinary materials research.



**Prof Alex Matter**  
ETC

**8th Annual Szent-Györgyi Prize for Progress in Cancer Research**

Professor Alex Matter, Chief Executive Officer of A\*STAR's Experimental Therapeutics Centre, has been awarded the 8th Annual Szent-Györgyi Prize for Progress in Cancer Research. The award recognises Professor Matter for his contributions to the development of the first drug specifically targeting a molecular lesion in cancer. Professor Matter is a pioneer of the world's first targeted cancer therapy, commonly known as Gleevec, which has turned chronic myeloid leukaemia from a deadly disease into one that can be treated with an oral pill with nearly 90% long-term survival rate.



**Dr Lynette Cheah**  
ICES

**Inaugural Singapore Challenge, 2013**

Dr Lynette Cheah, clinched the prize for the first Singapore Challenge, organised as part of the inaugural Global Young Scientists Summit@one-north. The first Singapore Challenge, with the theme of "Innovations for Future Cities", saw young scientists presenting ground-breaking ideas to address sustainability challenges faced by global cities. Dr Cheah's proposal was evaluated as the best research proposal out of the 10 finalists. She impressed the judges with her proposal for a dynamic and adaptive transportation network to shift commuters' travel modes in response to real-time feedback. The proposed urban transportation network would allow for taxis to converge at places with predicted high demand, optimise vehicle occupancy rates by having commuters share taxis and car rides and automatically adjust the frequencies of buses and trains. Dr Cheah was presented with a Singapore Challenge medallion by President Tony Tan and awarded a prize of US\$100,000 to pursue her research interests.



**Prof Dr Juliana Chan**  
A\*STAR

**Singapore Youth Award 2013**

Dr Juliana Chan has been awarded the Singapore Youth Award 2013 for her scientific achievements and her outstanding contributions to the Asian scientific community in raising the profile of Asian scientists and their work internationally. Juliana stands out for her achievements and contributions inside and outside of the laboratory. She is concurrently a Research Fellow of A\*STAR, Adjunct Assistant Professor of the Lee Kong Chian School of Medicine and the School of Chemical and Biomedical Engineering at NTU, as well as Adjunct Senior Research Fellow of the Department of Surgery of the Yong Yoo Lin School of Medicine, NUS. Juliana had observed that it was challenging for promising scientists in Asia to receive international coverage and started the online Asian Scientist Magazine in 2011. The magazine has since published over 2,000 articles and has profiled several well renowned scientists.

**The Outstanding Young Persons (TOYP) Singapore Awards 2013  
Medical Innovation Category – Honouree Awardee**

Dr Juliana Chan, a research fellow at A\*STAR, is an honouree awardee in the Medical Innovation category of The Outstanding Young Persons (TOYP) Singapore Awards 2013. The award, given by the Singaporean Chapter of Junior Chamber International (JCI), a worldwide association of young people between the ages of 21 and 40, ranks among the most prestigious local awards to recognise up to 10 outstanding Singaporean young professionals who exemplify the best attributes of young people in their chosen fields. Dr Chan's research focuses on microfluidic-based primary cell cultures.



**Dr Desmond Heng**  
ICES

**The Outstanding Young Persons (TOYP) Singapore Awards 2013**

**Medical Innovation Category – Merit Awardee**

Dr Desmond Heng, Principal Investigator at A\*STAR's Institute of Chemical and Engineering Sciences, is a merit awardee in the Medical Innovation category of The Outstanding Young Persons (TOYP) Singapore Awards 2013. The award, given by the Singaporean chapter of Junior Chamber International (JCI), a worldwide association of young people between the ages of 21 and 40, serves to recognise young people who create positive change and inspire others in their chosen fields, endeavours, and commitment to their communities. Among Dr Heng's research interests and areas are inhalation aerosol drug delivery, oral drug delivery, dissolution technologies, and nanomedicine.



**Dr Lisa Ng**  
SIgN

**The Outstanding Young Persons (TOYP) Singapore Awards 2013**

**Scientific and/or Technological Development Category – Honouree Awardee**

Dr Lisa Ng, a Principal Investigator at A\*STAR's Singapore Immunology Network, is an honouree awardee in the Scientific and/or Technological Development category of The Outstanding Young Persons (TOYP) Singapore Awards 2013. The award, given by the Singaporean chapter of Junior Chamber International (JCI), a worldwide association of young people between the ages of 21 and 40, ranks among the most prestigious local awards to recognise up to 10 outstanding Singaporean young professionals who exemplify the best attributes of young people in their chosen fields. Dr Ng's area of research lies in the immune responses of arthritic arboviruses that are epidemic or highly endemic in the tropical region.



**Dr Jonathan Loh**  
IMCB

***The Outstanding Young Persons (TOYP) Singapore Awards 2013***

**Scientific and/or Technological Development Category – Merit Awardee**

Dr Jonathan Loh, a Principal Investigator at the Institute of Molecular and Cell Biology, is a merit awardee in the Scientific and/or Technological Development category of The Outstanding Young Persons (TOYP) Singapore Awards 2013. The award, given by the Singaporean chapter of Junior Chamber International (JCI), a worldwide association of young people between the ages of 21 and 40, serves to recognise young people who create positive change and inspire others in their chosen fields, endeavours, and commitment to their communities. Dr Loh's research interests lie in dissecting the regulatory mechanisms regulating cell fate changes, and developing novel tools in deriving reprogrammed and differentiated cell types.



**Dr Yeo Sze Ling**  
NSS (PhD) Scholar  
I<sup>2</sup>R

***Her World Young Woman Achiever Award 2013***

Dr Yeo Sze Ling was awarded the Her World Young Woman Achiever Award 2013. The award recognises and rewards young women who have demonstrated the potential for attaining a higher level of success in their chosen fields, celebrating the success of young women who inspire those around them and pave the way for future generations.



**Dr Khor Chiea Chuen**  
GIS

***The Outstanding Young Persons (TOYP) Singapore Awards 2013***

**Scientific and/or Technological Development Category – Merit Awardee  
Young Scientist Award 2013**

Dr Khor Chiea Chuen, Principal Investigator at the Genome Institute of Singapore, is a merit awardee in the Scientific and/or Technological Development category of The Outstanding Young Persons (TOYP) Singapore Awards 2013. The award, given by the Singaporean chapter of Junior Chamber International (JCI), a worldwide association of young people between the ages of 21 and 40, serves to recognise young people who create positive change and inspire others in their chosen fields, endeavours, and commitment to their communities. Dr Khor's research spans many areas of human genetics studied across diverse human traits and disease conditions, with the long term goal of translating genetic findings into predictive medicine to improve healthcare in Singapore.

Dr Khor Chiea Chuen was awarded the 2013 Young Scientist Award for his research on genetics and heredity.



**Dr Li Haizhou**  
I<sup>2</sup>R

***2014 IEEE Fellowship***

Dr Li Haizhou, a Principal Scientist from A\*STAR's Institute of Infocomm Research, was recognised with the 2014 IEEE Fellowship for his outstanding contributions in transforming the interface of mobile applications and breaking down the language barriers for Asian Society. The IEEE grade of Fellow is the highest grade of membership for the world's leading professional association for advancing technology for humanity and is recognised by the technical community as a prestigious honour and important career achievement.



**Dr Chin Jia Min**  
IMRE

***L'Oreal For Women in Science National Fellowship 2013***

Dr Chin Jia Min from A\*STAR's Institute of Materials Research and Engineering (IMRE) has been awarded a fellowship by the L'Oreal Singapore for Women in Science National Fellowship Programme.

Dr Chin, who is Head of the Laboratory of Advanced Porous Materials at IMRE received the Material Science fellowship in recognition of her effort to create sustainable materials and processes that can contribute to improved environmental sustainability. She focuses her research on the creation of porous materials for applications in areas such as gas purification and storage, catalysis, controlled release, green building technology and environmental remediation. Dr Chin's aim is to utilise bottom-up assembly to create materials that have traditionally been accessible only via top-down fabrication.

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**Ms Sarah Ng Boon Hsi**  
NSS (PhD) Scholar

***Forbes Magazine's "30 under 30"***

Ms Sarah Ng Boon Hsi, NSS (PhD) Scholar at the University of Washington, was featured in Forbes Magazine's "30 under 30" list for Science & Innovation for using advanced sequencing methods to identify the genes that cause rare diseases.



**Dr Yeo Sze Ling**  
**NSS (PhD) Scholar**  
**I<sup>2</sup>R**

***Singapore Youth Award 2012***

Dr Yeo Sze Ling, a research scientist at the Institute for Infocomm Research (I<sup>2</sup>R), has been awarded the prestigious Singapore Youth Award 2012, the highest national accolade for youth. The award recognises well-rounded youth who have not only excelled in their professions, but who are committed to community work. Dr Yeo lost her sight at the age of four, but it never stopped her from achieving academic excellence. She earned herself three degrees, including a PhD in Mathematics, and is currently an adjunct assistant professor in the School of Physical and Mathematical Science at Nanyang Technological University (NTU). Dr Yeo also mentors other visually-disabled youths at the Society for the Physically Disabled.



**Prof Paola Castagnoli**  
**SlgN**

***Conferred the honour of the “Order of the Star of Italy”***

Professor Paola Castagnoli, Scientific Director of A\*STAR’s Singapore Immunology Network (SlgN) has been conferred the honour of the “Order of the Star of Italy” (Ufficiale dell’Ordine della Stella d’Italia). This is one of the highest civil honours awarded by the President of the Italian Republic to Italians overseas and foreigners who have made outstanding contributions to the preservation and promotion of Italy’s national prestige abroad. Since assuming her role as Scientific Director and Senior Principal Investigator of SlgN in 2007, Professor Castagnoli has led her research group in discoveries that provided novel insights into the mechanisms of immune diseases. She has also actively engaged and created platforms to forge research collaborations between scientists from Singapore and Italy, in both the public and private sectors. For her outstanding contributions towards promoting scientific exchange and research collaborations between the two countries, Professor Castagnoli is the first Italian scientist in Singapore to be conferred this premier award.



**Prof Wieslaw L. Nowinski**  
**SBIC**

***Outstanding Pole Award 2012***

Professor Wieslaw Nowinski, principal scientist and director of A\*STAR’s Biomedical Imaging Lab, has been awarded the “Outstanding Pole” Award. This prestigious award is given under the patronage of the President of the Republic of Poland. It recognises him for his work in the fields of radiology and neurosurgery and for promoting a positive image of Poland and Poles, both in the country and abroad. Professor Nowinski’s research interests include stroke, vascular diseases, deep brain stimulation and brain atlases. His team was the first to introduce brain atlases into clinical practice, allowing applications such as the treatment of stroke through computer-aided diagnosis and detection.

***Radiological Society of North America 2012 Cum Laude Award & Certificate of Merit Award***

Professor Wieslaw Nowinski was awarded the Cum Laude Award as well as the Certificate of Merit award for his exhibit at the 98th Scientific Assembly and Annual Meeting of the Radiological Society of North America. His scientific exhibit focused on the brain atlas – a 3D interactive atlas of head muscles along with cranial nerves that have been put into use in clinical practice.



**Prof Jeya Henry**  
**SICS**

***Elected to the International Academy of Food Science and Technology (IAFoST)***

Professor Jeya Henry has been elected to the International Academy of Food Science and Technology (IAFoST) in recognition of his outstanding contribution to integrate food science and nutrition on a global scale. He is one of 22 outstanding food scientists and technologists from around the world to be awarded fellowship, providing a pool of scientific expertise and working to promote high standards of ethics and scientific endeavours.



**Dr Law Bee Khuan, Jaslyn**  
**IMRE**

***WIPO-IPOS Innovation L’Oreal For Women In Science National Fellowships 2012***

Dr Jaslyn Law’s research is focussed on how micro/nanotopographies can be used in innovative and enhanced surface functionalities such as anti-reflective films, glasses-free 3D films and high-throughput films. Using a scalable nano-patterning technique, Dr Law has adapted and developed two innovative biomimetic functional films, namely a high-performance anti-reflective film that allows viewers to have wider viewing angles with less glare while providing solar cells with larger areas for light absorption, as well as an enhanced water-pinning film that has potential applications in greenhouse films which require anti-drip properties”.



**Kong Say Li**  
**GIS**

***2012 Ray Wu Prize***

Kong Say Li, a graduate student at the Genome Institute of Singapore (GIS) has been awarded the 2012 Ray Wu Prize, making her the first recipient from Singapore of this award. The Ray Wu Prize is an international prize awarded each year to graduate students for excellence in life science research, and was awarded to Say Li for her research on estrogen receptor regulation and its impact on cellular biology.



**Mr Ngiam Jiquan**  
NSS (PhD) Scholar

***Forbes Magazine's "30 under 30"***

Mr Ngiam Jiquan, NSS (PhD) Scholar at Stanford University, was featured in Forbes Magazine's "30 under 30" list for Education for his work in bringing together machine learning, education and large scale systems as Chief Engineer of the learning platform Coursera. Coursera is a massive open online course (MOOC) platform that offers classes from 33 top-tier universities to more than 1.7 million students at no cost.



**Dr Bruno Reversade**  
IMB

***European Molecular Biology Organization (EMBO) Young Investigatorship Award***

Dr Bruno Reversade, a Principal Investigator at the Institute of Medical Biology (IMB) is the first scientist based outside Europe to be awarded the prestigious European Molecular Biology Organization (EMBO) Young Investigatorship. This Young Investigatorship Programme (YIP) recognises the most outstanding and promising young independent scientists leading their first labs. Dr Reversade was awarded the YIP as the judging panel deemed him to be "a really original scientist" with outstanding research output. His research examines rare genetic conditions which provide insights into common diseases and traits that affect the general population.



**Prof Susanto Rahardja**  
I<sup>2</sup>R

***2012 Nokia Foundation Visiting Professor Award***

Dr. Susanto Rahardja, who is Head of the Signal Department cum Director (Research) at I<sup>2</sup>R, is being recognized for contributions to leadership in digital audio and signal processing.

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**Prof Edward Holmes**  
BRC

***Prestigious Honorary Citizen Award***

Singapore conferred prestigious Honorary Citizen Award on Professor Edward Holmes, Deputy Chairman, Translational and Clinical Science Group (A\*STAR) and Executive Chairman of the National Medical Research Council (NMRC) for his valuable contributions to Singapore. The award is the highest form of recognition bestowed by the Singapore Government for outstanding contributions by individuals to the country's growth and development. It is conferred on those who have made a significant impact in the areas of business, science and technology, information communications, education, health, arts and culture, sports, tourism, community services or security.



**Dr Juliana Maria Chan Shu Ping**  
MEL Labs

***2011 L'Oréal For Women in Science National Fellowships***

Dr Juliana Chan's doctorate research resulted in her designing a new type of nanoparticle, which is a hybrid of liposomes and polymeric nanoparticles, and has the beneficial properties of both classes. Named "nanoburrs", these extremely tiny nanoparticles can carry pharmaceutical drugs within them. Their surfaces are covered with short proteins that selectively adhere to blood vessel walls. This invention is extremely useful for drugs that need to be targeted at blood vessel walls. Theoretically, the same targeted nanoparticle principle can be used to deliver any drug to any part of the body that requires it most.



**Dr Liu Bin**  
IMRE

***2011 L'Oréal For Women in Science National Fellowships***

Dr Liu Bin and her research team are focusing on the synthesis of new energy materials and the design of different device architectures which will result in low cost, high efficiency solar cells. They have specially designed conjugated polymer hole transporting materials (HTM) and organic/inorganic interpenetrating network structures to improve the device efficiency to over seven percent, a champion efficiency for solid state HTM based, dye sensitized solar cells.



**Prof Andy Hor**  
IMRE

***Fellow of Singapore National Academy of Science (SNAS) (2011)***

Prof Andy Hor, Executive Director of IMRE was elected as Fellow of the prestigious Singapore National Academy of Science (SNAS) on 24 Nov 2011. Together with eleven other distinguished local scientists, Prof Hor was inducted into the SNAS Fellowship for his invaluable contributions, passion and commitment to education, research and service in Chemistry for more than 25 years, since he began his career at Singapore in 1984. The SNAS Fellowships recognise outstanding Singapore scientists who have distinguished themselves in their respective fields. The candidates go through a rigorous selection process that requires screening by the SNAS selection committee, review of reports from nominators, lists of publications, and finally a review by the SNAS Council.



**Dr Guan Cuntai**  
I<sup>2</sup>R

***President's International Annual BCI Research Award 2010***

The I<sup>2</sup>R Brain-Computer Interface (BCI) team led by Dr Guan Cuntai working jointly with medical doctors from Tan Tock Seng Hospital and National Neuroscience Institute won the Annual BCI Research Award for their project "Motor imagery-based Brain-Computer Interface robotic rehabilitation for stroke", beating 60 other international entries.



**Dr Jonathan Loh**  
GIS

***Singapore Youth Award for Science and Technology***

Dr Loh clinched the SYA in the S&T category for his achievements in the field of human embryonic stem cell research, and for being a passionate scientist and educator.



**Dr Ng Huck Hui**  
GIS

***Singapore Youth Award - Medal of Commendation for Science and Technology.***

Dr Ng was conferred the SYA for S&T in 2005 for his outstanding scientific achievements, and have since then continued to excel and made significant advancements and breakthroughs in stem-cell research. The medal is conferred in recognition of his scientific excellence and being an excellent role model.



