Creating an innovation economy in Singapore

12 February 2015

Presented by

Mr. Philip Yeo

Chairman, Standards, Productivity and Innovation for Growth
SPRING, www.spring.gov.sg

Chairman, Economic Development Innovations Singapore
EDIS, www.edis.sg
Singapore’s Economy Today

2013 GDP: US$295.1 bil*

- Manufacturing: 19%
- Financial Services: 12%
- Business Services: 16%
- Other Services: 18%
- Wholesale & Retail Trade: 18%
- Construction: 4%
- Transport & Storage: 6%
- Others: 7%

* 2 January 2015 – MTI press release indicates GDP for 2014 is estimated to have grown by 2.8 per cent (Manufacturing by 2.4 per cent)
50 Years of Economic Development

Singapore: A Vibrant Business Hub

- **7,000** Multinational Corporations
  60% with global or regional headquarters.

- **37,400** International Companies
  Including 3,200 from China, 4,400 from India, and 7,900 from ASEAN.

- **116,000** Small & Medium Enterprises
  1,000 identified with the goal of growing revenues to S$100 million.

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**Ease of Doing Business**

<table>
<thead>
<tr>
<th>Rank</th>
<th>Country</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Singapore</td>
</tr>
<tr>
<td>2</td>
<td>Hong Kong</td>
</tr>
<tr>
<td>3</td>
<td>New Zealand</td>
</tr>
<tr>
<td>4</td>
<td>United States</td>
</tr>
<tr>
<td>5</td>
<td>Denmark</td>
</tr>
</tbody>
</table>


**Strong IP Protection**

<table>
<thead>
<tr>
<th>Rank</th>
<th>Country</th>
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<tbody>
<tr>
<td>1</td>
<td>Sweden</td>
</tr>
<tr>
<td>2</td>
<td>Finland</td>
</tr>
<tr>
<td>3</td>
<td>Singapore</td>
</tr>
<tr>
<td>4</td>
<td>Luxembourg</td>
</tr>
<tr>
<td>5</td>
<td>Austria</td>
</tr>
</tbody>
</table>


**Best Labour Force**

<table>
<thead>
<tr>
<th>Country</th>
<th>Score</th>
</tr>
</thead>
<tbody>
<tr>
<td>Singapore</td>
<td>89</td>
</tr>
<tr>
<td>United States</td>
<td>76</td>
</tr>
<tr>
<td>Taiwan</td>
<td>75</td>
</tr>
<tr>
<td>Switzerland</td>
<td>75</td>
</tr>
<tr>
<td>Belgium</td>
<td>73</td>
</tr>
<tr>
<td>Japan</td>
<td>73</td>
</tr>
<tr>
<td>Ireland</td>
<td>73</td>
</tr>
<tr>
<td>Sweden</td>
<td>66</td>
</tr>
<tr>
<td>Germany</td>
<td>66</td>
</tr>
<tr>
<td>Netherlands</td>
<td>65</td>
</tr>
<tr>
<td>Australia</td>
<td>65</td>
</tr>
</tbody>
</table>

Source: BERI’s 2010 Labour Force Evaluation

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Source: Accounting & Corporate Regulatory Authority, 2Q 2010.
Phases of Economic Development

1960s
- The First Industrial Township
- Jurong Industrial Estate
- Flatted Factories

1970s
- Industrial estates with amenities at the fringe of residential towns
- Creating Business Parks: Twin Engine of Manufacturing and Services
- Jurong Island Petrochemical Complex
- Singapore Science Parks

1980s
- Capital Intensive
- Technology Intensive
- Cluster Developments: Key Game Changer

1990s
- Skill Intensive
- Innovation Intensive

2000s
- Knowledge-based Economy
- One-North Development
  - 200 hectares
  - 2000-20 Master Plan

Jobs & GDP Growth

One-North Development
- 200 hectares
- 2000-20 Master Plan
**Our Approach: Industry Development**

*We have no markets, no raw materials. All the industry we’ve created is illogical. But what choice do we have?*

<table>
<thead>
<tr>
<th>ELECTRONICS</th>
<th>CHEMICALS</th>
</tr>
</thead>
<tbody>
<tr>
<td>• 40% of world’s hard disk media production</td>
<td>• One of world’s top 3 export refining centres</td>
</tr>
<tr>
<td>• 14 silicon wafer fabrication plants</td>
<td>• &gt; 95 leading petroleum, petrochemicals and specialty chemicals on Jurong Island, Singapore’s centrepiece for the energy &amp; chemicals industry</td>
</tr>
<tr>
<td>• 20 semiconductor assembly &amp; test operations</td>
<td></td>
</tr>
<tr>
<td>• 40 IC design centres</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>PRECISION ENGINEERING</th>
<th>BIOMEDICAL SCIENCES</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Largest &amp; most comprehensive aerospace maintenance, repair &amp; overhaul centre in Asia</td>
<td>• &gt; 50 commercial scale manufacturing plants, including 7 world leading biopharmaceutical companies &amp; 25 medical technology companies</td>
</tr>
<tr>
<td>• 70% of world’s production of jack-up oil rigs and FPSO conversion; 20% of world’s ship repair market</td>
<td>• 7,000 researchers in &gt; 50 companies, universities and public sector research centres</td>
</tr>
</tbody>
</table>
Industrial Development: Biomedical Sciences

Manufacturing Output*
S$22.9 billion
(US$18.3 billion)

Manufacturing Employment
16,704 employees

Value-Added*
S$11.8 billion
(US$ 9.4 billion)

GDP Share (2013): 3.81%
Total Employment: >20,000
CAGR (2013): 10%

Compounded Annual Growth Rates (CAGR) computed over 5 years
*Value-Add = Labour Cost + Depreciation + Interest Cost + Profit before Tax + Land Cost
Quality & Operational Excellence
- Zero major observations with regulators
- Track record producing for global markets
- Strong global logistics
- Secure business environment
- Access to talent

Manufacturing for the world
- 29 commercial scale manufacturing facilities
- 7 of the top 10 Big Pharma
- API, biologics, cell therapy, nutrition
Industrial Development: Biomedical Sciences

BioMedical Sciences (BMS) Initiative

**PHARMACEUTICALS**
- Development of small molecule therapeutics

**MEDICAL TECHNOLOGY**
- Medical devices, info tech, diagnostics

**NUTRITION & PERSONAL CARE**
- Development of high-value nutrition and personal care / consumer products

**BIOTECHNOLOGY & BIOLOGICS**
- Development of protein-based therapeutics

**RESEARCH**
- Bioimaging
- Bioprocessing
- Genomics & Proteomics
- Molecular & Cell Biology
- Drug/Biologics Discovery and Development
- Bioengineering & Nanotechnology
- Computational Biology
- Immunology
- Skin Biology
- Nutritional Sciences
- Metabolic Disease

**INDUSTRY**
<table>
<thead>
<tr>
<th>Research Institutes</th>
<th>Basic Translational</th>
<th>Clinical</th>
<th>Service Delivery</th>
</tr>
</thead>
<tbody>
<tr>
<td>Institute of Molecular &amp; Cell Biology</td>
<td>Institute of Medical Biology</td>
<td>Ministry of Health</td>
<td>Public Sector Healthcare Groups</td>
</tr>
<tr>
<td>Genome Institute of Singapore</td>
<td>Experimental Therapeutics Centre</td>
<td>National Medical Research Council</td>
<td>1. Singapore Health Services</td>
</tr>
<tr>
<td>Institute of Bioengineering &amp; Nanotechnology</td>
<td></td>
<td></td>
<td>• Singapore General Hospital</td>
</tr>
<tr>
<td>Bioprocessing Technology Institute</td>
<td></td>
<td></td>
<td>• KK Women and Children’s Hospital</td>
</tr>
<tr>
<td>Bioinformatics Institute</td>
<td></td>
<td></td>
<td>• National Cancer Centre</td>
</tr>
<tr>
<td>NUS School of Medicine</td>
<td></td>
<td></td>
<td>• National Dental Centre</td>
</tr>
<tr>
<td>NUS Cancer Science Institute</td>
<td></td>
<td></td>
<td>• National Heart Centre</td>
</tr>
<tr>
<td>Duke-NUS Graduate Medical School</td>
<td></td>
<td></td>
<td>• National Neuroscience Institute</td>
</tr>
<tr>
<td></td>
<td><strong>Consortia</strong></td>
<td><strong>Hospital Institutions</strong></td>
<td>2. National Healthcare Group</td>
</tr>
<tr>
<td></td>
<td>Singapore Biomaging Consortium</td>
<td>1. Tertiary Centres</td>
<td>• Tan Tock Seng Hospital</td>
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<tr>
<td></td>
<td>Singapore Immunology Network</td>
<td>• National University Hospital</td>
<td>• Institute of Mental Health</td>
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<td></td>
<td>Singapore Stem Cell Consortium (now subsumed into IMB)</td>
<td>• National University Cancer Institute</td>
<td>• National Skin Centre</td>
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<tr>
<td></td>
<td><strong>Singapore Institute for Clinical Sciences</strong></td>
<td>• National University Heart Centre</td>
<td>• Communicable Disease Centre</td>
</tr>
<tr>
<td></td>
<td>• Develop programmes in translational &amp; clinical medicine</td>
<td><strong>Outram Campus</strong></td>
<td>3. National University Health System</td>
</tr>
<tr>
<td></td>
<td>• Focus on Growth, Development &amp; Metabolism</td>
<td>• Singapore General Hospital</td>
<td>• National University Hospital</td>
</tr>
<tr>
<td></td>
<td>• Develop Clinician Scientists</td>
<td>• National Cancer Centre</td>
<td>• National University Cancer Institute</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• National Heart Centre</td>
<td>• National University Heart Centre</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• National Neuroscience Institute</td>
<td>4. Alexandra Health</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Singapore National Eye Centre</td>
<td>• Khoo Teck Phuat Hospital</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Duke-NUS Graduate Medical School</td>
<td>5. Jurong Health</td>
</tr>
<tr>
<td></td>
<td></td>
<td>2. Others with specific capabilities</td>
<td>• Alexandra Hospital</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• KK Women and Children’s Hospital</td>
<td>• Ng Teng Fong General Hospital</td>
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<tr>
<td></td>
<td></td>
<td>• Tan Tock Seng Hospital</td>
<td>6. Eastern Health Alliance</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>• Changi General Hospital</td>
</tr>
</tbody>
</table>

**Private Sector Healthcare Groups**
- Parkway Group
- Raffles Medical Group
- Thomson Medical
Building Biomedical R&D Capabilities

Phase 1: 2000 – 2005
Developing Basic Science Capabilities

- Genome Institute of Singapore
- Institute of Molecular & Cell Biology
- Institute of Bioinformatics
- Institute of Bioengineering & Nanotechnology
- Bioprocessing Technology Institute
- Singapore Bioimaging Consortium
- Singapore Institute for Clinical Sciences

Phase 2: 2006 – 2010
Translational & Clinical Research

- Experimental Therapeutics Centre
- Institute of Medical Biology
- Clinical Imaging Research Centre
- Translational Laboratory in Genetic Medicine
- p53 Laboratory
- Molecular Engineering Laboratory
- Other BMRC labs and joint initiatives:

Integrating for Impact

Before 2000
BMS Phase 1: Developing Basic Research Capabilities

**World Class Expertise**
Core technologies and expertise in areas including genomics analysis, animal disease models, stem cells, drug screening, construction and mass production of monoclonal antibodies, bioimaging

- Institute of Molecular & Cell Biology
- Bioprocessing Technology Institute
- Genome Institute of Singapore
- Bioinformatics Institute

**World Class Infrastructure**
Biopolis: 4M sq ft integrated research campus

- Institute of Bioengineering & Nanotechnology
- Singapore Stem Cell Consortium
- Singapore Bioimaging Consortium

**World Class Talent**
Pioneers and thought leaders from around the globe

- Singapore Institute for Clinical Sciences
- Experimental Therapeutics Centre
- Institute of Medical Biology
# BMS Phase 2: Translational & Clinical Research (TCR) Efforts

## Initiatives to promote TCR

1. **(TCR) Flagship Programme**
   - 5 strategic disease-orientated areas
   - Each awarded S$25mil over 5 years
   - Cancer, Metabolic Disease, Eye Disease, Neuroscience, Infectious Diseases

2. **Bedside & Bench Grant Call**
   - Foster collaboration between basic scientists and clinical investigators
   - Funded for up to 3 years

## Supporting Infrastructure

- Investigational Medicine Units
- Singapore Clinical Research Institute
- Clinical Imaging Research Centre

## Talent Attraction / Development

- Developing a pipeline of Clinician Scientists
  - S'pore Translational Research Investigator Award (STaR)
  - Clinician Scientist Award (CSA)
BMS Phase 3: Integrating for Impact

Basic Discovery 译 研究卓越
Translational Clinical Research 临床合作
Economic and Health Outcomes 产业参与和商业化

BMRC Technology Platforms

Constant Pipeline of Talent
Other Innovations: Global Hydrohub

Resource-constrained: Struggled with water needs

Impetus to seek alternative water sources & explore advanced water technologies to be self-sufficient

Establishment of Environment & Water Industry Programme Office

Focus
- Attract major international water companies – anchor R&D, engineering, manufacturing and HQ operations in Singapore
- Encourage companies and research institutes to develop test-beds and commercialise cutting-edge water technology
- Export technologies globally
- Groom Singapore-based water companies to be international players

Global Hydrohub
- 150 water companies

Research Centres to support needs of the stakeholders

Incentives to drive development of innovative water solutions
- R&D grants in municipal and industrial water treatment solutions

PUB
EDB
NUS
EWT
SPRING
GE Power & Water
VEOLIA
Hyflux
semcorp

NEWRI
SCELSE
NUS Deltaires
Ngee Ann Polytechnic

Environmental & water technology research
Other Innovations: Smart Sustainable Buildings

Vision: To realise Smart Sustainable Buildings of the future, today.
Pre-Project Innovation Consortium - World’s first integrative design platform launched in Singapore to accelerate innovation in building industry

Research areas:

- Energy Efficiency
- Construction productivity
- Zero-carbon buildings

Developer, Architect or Engineer
- Well-respected in the industry for sustainability & innovation efforts
- Extensive regional footprint and strong pipeline of future projects

Equipment, Products, Materials companies
- Significant presence in Singapore
- Meaningful R&D presence in Singapore or willingness to invest in innovation activities

Unique solutions* developed in Singapore
- Prototypes could be implemented in the Leads’ future projects in Singapore and outside of Singapore
- 3 year developmental timeframe, with regular workshops defined by Leads

*First in Asia or similar accolade

Consortium Lead

Prototypes

Building Solutions Companies
Other Innovations: Safe City Test Bed

Develop a Safety and Security industry with strong innovation capacity through public-private partnerships

Jointly driven by the Economic Development Board and the Ministry of Home Affairs

1. Pooling of agencies’ data sets together into a “black box”

2. If a trigger is reached, an alert will be routed to the relevant agency

Test-bedding of new Safe City technologies in multiple locations in Singapore

Solutions based on information-sharing model developed by selected government agencies

4 industry consortia selected to participate

Consortia developed and tested solutions based on agencies’ challenges

Trigger can be pre-determined or based on machine-learning
Fostering Innovation & Enterprise: An Integrated Strategy

A Strong Ecosystem of Stakeholders
Innovation through planning and policies

Spur R&D growth to *enhance economic competitiveness*

- Deepen long-term S&T capabilities
- Encourage private sector R&D investment

S$4 b

S$6 b

S$13.9 b

S$16.1 b

- Make targeted R&D investments in areas of competitive advantage
- Build critical mass of private-sector BMS R&D activities
- Intensify efforts to engage private sector in R&D
- Focus on R&D with economic outcomes
- Foster public-private partnerships
- Increase support for commercialisation

*1st steps to align public RIE investments with industry needs and economic value capture*

Economic outcomes key focus since NTP 1991–1995*
“Singapore’s long term aim is 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.

Research and innovation underpin the competitiveness of our industries, catalyse new growth areas, and transform our economy.

Increasingly, intellectual capital will be critical for our next phase of economic development. Hence, the government will allocate S$16.1 billion [~1% of GDP] to support research, innovation and enterprise activities in the next 5 years.”
RIE 2015 Innovation & Enterprise Strategies

RIE2015 signaled an increase in focus on I&E as a key pillar of Singapore’s R&D strategy.

Innovation and enterprise strategies aimed to cover the entire value chain from technology development to pre-IPO, targeted primarily at technology enterprises in manufacturing & other export-oriented sectors.
Overview of 2015 Programmes

**Enhancing Translational Capacity**
- **Proof-of-Concept (POC) Grants**
  - ETPL Gap Funding
  - NRF POC
- **Innovation Grant to IHLs**
  - MOE Translational R&D and Innovation Fund \(\text{New}\)
- **Centres of Innovation (COIs)**
  - Centres of Innovation
- **Private Sector Translation Services**
  - Private Sector Translators \(\text{New}\)

**Developing IP Ecosystem**
- **Technology Transfer Office (TTO) Funding**
  - A*STAR
  - Autonomous Universities \(\text{New}\)
  - Hospitals \(\text{New}\)
- **IP Portal and Intermediary**
  - IPI Pte Ltd \(\text{New}\)

**Developing the Technology Enterprise Sector**
- **Early stage technology start-ups**
  - Technology Incubation Scheme
  - Early Stage Venture Funds
- **Overseas spinoffs from MNCs or foreign SMEs**
  - Technology Commercialization Scheme \(\text{New}\)
- **Sector Specific Accelerators**
  - Biomedical Sector Accelerator \(\text{New}\)
- **Secondment of Researchers to Industry**
  - A*STAR
  - Polytechnics \(\text{New}\)

**Encouraging Entrepreneurship**
- **Global Entrepreneurial Executives (GEE) Scheme**
- **Entrepreneurship Education Fund for Universities**
- **Innovation & Entrepreneurship Institute**
Offer technology consultancy and facilities to develop technology projects and solutions

Highlights - Centres of Innovation (COIs)

- Environmental & Water Technology COI
- Marine & Offshore Technology COI
- COI for Electronics
- Materials COI
- Precision Engineering COI
- COI for Supply Chain Management
- Food Innovation & Resource Centre

> 1,600 projects, 3000 SMEs supported (cumulative)
Innovation Capital

BMS Licensing

Licensing Revenue

BMS Start-ups

Trend of Patent Filing vs Patent Utilization Rate

- **Number of Patents Filed**
- **Patents Licensed**
Human Capital

Private Sector

16.8% growth

Public Agencies

10.9% growth

Source: National R&D survey 2012
Research Scientists & Engineers (RSEs) grew from 4,300 to 30,100 (between 1990-2012) RSEs in the private sector grew more than tenfold from 1,360 to 16,500

<table>
<thead>
<tr>
<th>Manpower Growth</th>
<th>Public</th>
<th>Private</th>
<th>Total</th>
</tr>
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<tbody>
<tr>
<td>CAGR 1990-2012(PhD)</td>
<td>9.6%</td>
<td>15.8%</td>
<td>10.3%</td>
</tr>
<tr>
<td>CAGR 1990-2012 (Overall)</td>
<td>7.2%</td>
<td>12.0%</td>
<td>9.2%</td>
</tr>
</tbody>
</table>

55% of total RSEs work in the private sector

Source: National R&D Survey of Singapore
A*STAR’S SCIENTIFIC LEADERSHIP
Building up Human Capital: Catch a few Whales
Senior Scientific Leaders to help develop local talent

(First Row: L to R) – Dr Sydney Brenner, SENIOR FELLOW; Sir David Lane, CHIEF SCIENTIST; Sir George Radda, CHMN, BMRC; Sir John O’Reilly, CHMN, SERC; Prof Edward Holmes, DY CHMN, BMRC; Prof Judith Swain, SENIOR FELLOW; Dr Tan Geok Leng, ED SERC; Dr Benjamin Seet, ED BMRC

(Second Row: L to R) - Prof Lam Kong Peng, ED BTI; Prof Birgitte Lane, ED IMB; Prof Jackie Ying, ED IBN; Prof Ng Huck Hui, ED GIS; Prof Hong Wanjin, ED IMCB; Prof Laurent Rénia, ED SigN, Prof Alex Matter CEO ETC; A/P Chong Yap Seng, Ag ED, SICS; Prof Patrick Cozzone ED SBIC

(Third Row: L to R) – Prof Kwong Dim Lee, ED IME; Dr Thomas Liew, ED NMC; Dr Lim Ser Yong, ED SIMTech; Dr Keith Carpenter, ED ICES; Dr Pantelis Alexopoulos, ED DSI; Prof Andy Hor, ED IMRE; Prof Alfred Huan, ED, IHPC; Dr Lee Shiang Long, ED I2R
Local Human Capital – Grow PhD Guppies

Guppy – 0.03 meters
1,300 new Singaporean PhDs@ One-North

Cambridge Chemistry PhD
Cambridge Medicine/PhD
Imperial College Chemistry BSc
Cambridge Natural Science Biology BSc
Stanford Developmental Biology PhD
Cambridge Medicine/PhD

NUS Biomedical Sciences PhD
NTU Biological Sciences BSc
Stanford Genetics PhD
Imperial College London Cancer Biology PhD
Harvard Stem cells Post-Doc
Human Capital: International Guppies

MIT
Materials Science & Engineering (Malaysia)

Stanford
Chemical Engineering (Shanghai)

MIT
Bio Engineering (Hong Kong)

Stanford
Electrical Engineering (India)

MIT
Chemical Engineering (Vietnam)
Long Term Human Capital Pipeline

Evelyn Thangaraj
2005 A*STAR YRAP Scholar from India
(currently A*STAR Scholar, MBBS-PhD,
Imperial College, London)

Le Ngoc Phuong Lan
2005 A*STAR YRAP Scholar from Vietnam
(currently A*STAR Scholar, PhD
Biochemistry, University of Oxford)

10-14 yrs 15-18 yrs 19-23 yrs 24-30 yrs < 35 yrs

Guppies Senior Guppies Young Whales

Youth Science A*STAR Science Awards & YRAP NSS(BS) AUS NSS(PhD) AGS SINGA AIF AGS (Post-doc)

A*STAR - Agency for Science & Technology Research
YRAP - Young Researchers Attachment Programme
NSS - National Science Scholarship
AUS - A*STAR Undergraduate Scholarship
AGS - A*STAR Graduate Scholarship
SINGA - Singapore International Graduate Award
AIF - A*STAR International Fellowship
Nurturing a Talent Pipeline of 1,300 Singaporean PhDs

Awarded more than 1,300 PhD Scholarships to develop Singaporean R&D talent since 2001
More than 460 scholars have completed their PhDs and are contributing to Singapore’s Research, Innovation and Enterprise (RIE) environment

Dr Karen Crasta
Assoc Prof, Lee Kong Chian School of Medicine, Nanyang Technological University
A*STAR International Fellow
NRF Fellow 2013

Dr Cheok Chit Fang
Principal Investigator, IFOM-p53 Lab
National Science Scholar (PhD)

Dr Melissa Fullwood
Assistant Professor, Yale-NUS College
Junior Principal Investigator, Cancer Science Institute
Joint Principal Investigator, Institute for Molecular and Cell Biology
National Science Scholar (BS-PhD)
NRF Fellow 2013

Dr Jonathan Loh Yuin Han
Principal Investigator, Institute of Molecular & Cell Biology (IMCB)
A*STAR Graduate Scholar

Dr Seah Kwang Hwee
Associate Patent Examiner, Intellectual Property Office of Singapore (IPOS)
A*STAR Graduate Scholar
Scientific Career Development

**Scholars Contributing to Public R&D**

**Young Scientific Leaders Heading Research Labs**

- **Cheok Chit Fang**
  NSS (PhD) 2001
  Principal Investigator, IFOM
  Srn Research Fellow, p53lab

- **Tan Hwee Pink**
  NSS (PhD) 2002
  Programme Manager, I²R
  International Fellowship 2005

- **Ho Ying Swan**
  NSS (PhD) 2002
  Staff Scientist, BTI
  Set up & leads Metabolomics Group in BTI

- **Jonathan Loh**
  AGS (NUS) 2003
  Principal Investigator, IMCB
  2009 A*STAR Investigatorship
  2010 S'pore Youth Award for S&T
  2009 Young Scientist Award
  2012 TR35 @ Singapore

- **Joel Yang**
  NSS (PhD) 2004
  Scientist III, IMRE
  Asst Prof, Engineering Product Devt, SUTD
  2009 A*STAR Investigatorship
  2012 TR35 @ Singapore
  2010 R&D 100 Awards
  2012 Young Scientist Award, Singapore

- **Melissa Fullwood**
  NSS (BS) 2002
  NSS (PhD) 2006
  Asst Prof, Yale-NUS College
  2009 L'Oreal Singapore for Women in Science National Fellowships
  2010 Lee Kuan Yew Postdoctoral Fellowship, Duke-NUS GMS
  2010 GE & Science Regional Prize for Young Life Scientists
  2013 NRF Fellowship
  2014 Young Scientist Award, Singapore

- **Quek Su Ying**
  NSS (PhD) 2002
  Senior Scientist I, IHPC
  Asst Prof, Dept of Physics, NUS
  2013 NRF Fellowship

- **Juliana Chan**
  NSS (BS) 2002
  NSS (PhD) 2006
  Asst Prof, Div of Bioeng, School of Chem. & Biomolec. Eng., NTU
  2010 S'pore Women’s Weekly Great Women of Our Time Award (S&T)
  2011 L’Oréal For Women in Science National Fellowships

- **Ho Han Kiat**
  NSS (PhD) 2000
  Asst Prof, Dept of Pharmacy, NUS

- **Tan Hwee Pink**
  NSS (PhD) 2005
  Programme Manager, I²R
  International Fellowship 2005

- **Ho Ying Swan**
  NSS (PhD) 2002
  Staff Scientist, BTI
  Set up & leads Metabolomics Group in BTI

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  2010 S'pore Youth Award for S&T
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  2012 TR35 @ Singapore

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  Scientist III, IMRE
  Asst Prof, Engineering Product Devt, SUTD
  2009 A*STAR Investigatorship
  2012 TR35 @ Singapore
  2010 R&D 100 Awards
  2012 Young Scientist Award, Singapore

**Academic Positions in Local Universities**

- **Melissa Fullwood**
  NSS (BS) 2002
  NSS (PhD) 2006
  Asst Prof, Yale-NUS College
  2009 L'Oreal Singapore for Women in Science National Fellowships
  2010 Lee Kuan Yew Postdoctoral Fellowship, Duke-NUS GMS
  2010 GE & Science Regional Prize for Young Life Scientists
  2013 NRF Fellowship
  2014 Young Scientist Award, Singapore

- **Quek Su Ying**
  NSS (PhD) 2002
  Senior Scientist I, IHPC
  Asst Prof, Dept of Physics, NUS
  2013 NRF Fellowship

- **Juliana Chan**
  NSS (BS) 2002
  NSS (PhD) 2006
  Asst Prof, Div of Bioeng, School of Chem. & Biomolec. Eng., NTU
  2010 S'pore Women’s Weekly Great Women of Our Time Award (S&T)
  2011 L’Oréal For Women in Science National Fellowships

- **Vincent Tan**
  NSS (PhD) 2006
  Asst Prof, Dept of Electrical & Computer Eng, NUS
Young Entrepreneurs

- Gideon Ho
  IF 2003
  Chief
  Commercial
  Officer,
  HistolIndex
- Donny Soh
  AGS (O) 2005
  Founder,
  9 Degrees
- Eu Zhi Ang
  AGS (NUS) 2006
  T-Up: Hoiio

  • Co-founded HistolIndex, spun off from A*STAR – which provides stain-free, 3D, quantitative imaging solutions to visualise & stage fibrosis
  • Founder of 9 Degrees, a spin-off company
  • Developed a device with 3D motion sensors to collect data on a player’s tennis stroke or golf swing

Building up SME Capabilities via T-Up

- Yvonne Koh
  NSS(BS-PhD) 2002
  T-Up: The Biofactory Pte Ltd
- Ryan Chaw
  AGS (NUS) 2003
  T-Up: HVS Eng Pte Ltd
- Eu Zhi Ang
  AGS (NUS) 2006
  T-Up: Hoiio

  • Currently seconded to Biofactory and working on development of a kit that can detect a family of disorders caused by gene mutations
  • Completed secondment to HVS Eng., maintenance solutions for fluid-cooled tube & shell heat exchanger systems
  • Currently at IPI
  • Completed secondment to Hoio
  • Currently an Associate Patent Examiner at IPOS

Scientists Contributing Expertise to Industry

- Tanu Kustandi
  AGS (NTU) 2003
- Natalia Tansil
  AGS (NTU) 2004
- Yar Kar Peo
  NSS (PhD) 2001
  Principal
  Engineer, ST
  Electronics
- Shawn Lim
  NSS (PhD) 2003
  Research
  Scientist, L’Oreal
  Research &
  Innovation
- Harmeet Singh
  AGS (NUS)
  Research Scientist,
  L’Oreal Research &
  Innovation
- Low Yen Ling
  NSS (PhD) 2002
  Abbott
  Nutrition
- Ryan Chaw
  AGS (NUS) 2003
  T-Up: HVS Eng Pte Ltd

  • Worked in I2R
  • Heads digital comms section in ST Electronics
  • Current work: digital comm. aspect of Satellite systems
  • Worked in GIS
  • Now involved in collaborations, such as between SlgN and L’oreal, and with National Skin Center (NSC)
  • Worked in IMB
  • Now involved in validation of technologies / techniques for skin & cosmetic applications
  • Opportunity to work with industry while in SICS
  • Seconded, transferred to Abbott,
  • Health products & diet
Biomedical Research Infrastructure
Breaking Ground in Dec 2001: Biopolis Phase 1
one-north: Biopolis

Home for Biomedical Sciences Research

Biopolis Phase 1: Cluster of 7 Linked Buildings Completed in 2004

Biopolis Phase 2 Completed in 2006

Biopolis Phase 3 Completed in 2011

Biopolis Phase 4 (P&G) Completed in 2013

Biopolis Phase 5 To Complete in 2014

Land Area: 7.5 ha
GFA: 350,000 sqm

Novartis
Abbott
P&G
GlaxoWellcome
Roche
NITTO DENKO
Biopolis – Phase 1

Helios

Matrix

Nanos

Centros

Genome

Proteos

Chromos
one-north: Fusionopolis

Home for Science, Engineering, Infocomm & Media

Land Area: 6.5 ha
GFA: 400,000 sqm

Fusionopolis Phase 1
Completed in 2008

Fusionopolis Phase 3
Completed in 2013

Fusionopolis Phase 2A
To Complete in 2015

Fusionopolis Phase 2B
Completed in 2010

Fusionopolis Phase 4
(LucasFilm)
Completed in 2013

Fusionopolis Phase 5
To Complete in 2014

Fusionopolis Phase 2B
Completed in 2010

Fusionopolis Phase 3
Completed in 2013

Fusionopolis Phase 4
(LucasFilm)
Completed in 2013

Fusionopolis Phase 5
To Complete in 2014
Fusionopolis Phase 1

Infrastructure and scientific platform to fuse and to synergize the knowledge for different domains, bringing together public and private R&D activities

- Fitness Gym & Pool
- Shared Conference Rooms
- Retail and F&B Podium
- one-north MRT Station
- Serviced Work-Live Apartments
- Skybridges and Sky Gardens
- Business and Research Space
- 500-seat Experimental Performance Theatre
One-North Residences
International Sharing

- Singapore started to share its town-planning and industry development expertise with other cities from the 1990s

- The early projects included Batam Industrial Park in Indonesia and Wuxi-Singapore Industrial Park in China

- Over 900,000 jobs have been created in parks developed outside Singapore
China- Suzhou Industrial Park

Over 500,000 Jobs Created (Source: China Economic Review)
Industrial Parks in India

77,000 IT Jobs Created

Bangalore

Hyderabad

Chennai
Vietnam Singapore Industrial Park

140,000 Jobs Created Over 4 Parks

Over US$6 billion of investments

Groundbreaking of 5th Park in Sep 2013
Located in Quang Ngai province, central Vietnam
BPO Prime/PITP in Penang, Malaysia

Map of Penang

Proposed Sites

Business Process Outsourcing Prime (BPO Prime)

- Prime commercial area in Multimedia Super-Corridor (MSC) Penang Cyber City 1
- Gross Development Value: MYR 1.1b (US$ 340 M)
- 28k sqm; GFA: 151k sqm
- 7-mins drive to the airport
- “BPO anchored” mixed development:
Job Creation – Job creation will be at the core of Project PITP’s success. The project will generate ~25,000-30,000 high quality jobs which will in turn drive demand for residential and commercial real estate.

Economic Development – The influx of activity to Project PITP will provide a significant boost to Penang’s economy.

Focus On Education and Innovation – Attracting market leaders in education and knowledge-based sectors such as ICT and advanced manufacturing will leverage Penang’s existing capabilities in precision engineering and electronics.

Penang International Technology Park (PITP)
- Heart of the “The Greater Penang”
- Gross Development Value: MYR 10.1b (US$ 3 B)
- 862k sqm; GFA: 1.8m sqm
- Next to new 2nd Penang bridge
- Integrated “Work-Learn-Live-Play” township model

PITP will create a wealth-generating engine as a sustainable solution to Penang’s economic transformation.
Technology Park in South America

Urban Masterplan – Project Overview

- Public Parks – Protected Area
- Public Parks – Amenities
- Institutional
- Private Protected Areas
- Advanced Technological Park 1
- Advanced Technological Park 2
- Educational
- Office 1
- Office 2
- Retail
- Residential
- Mixed Use 1
- Mixed Use 2
Thank You

Presented by

Mr. Philip Yeo

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