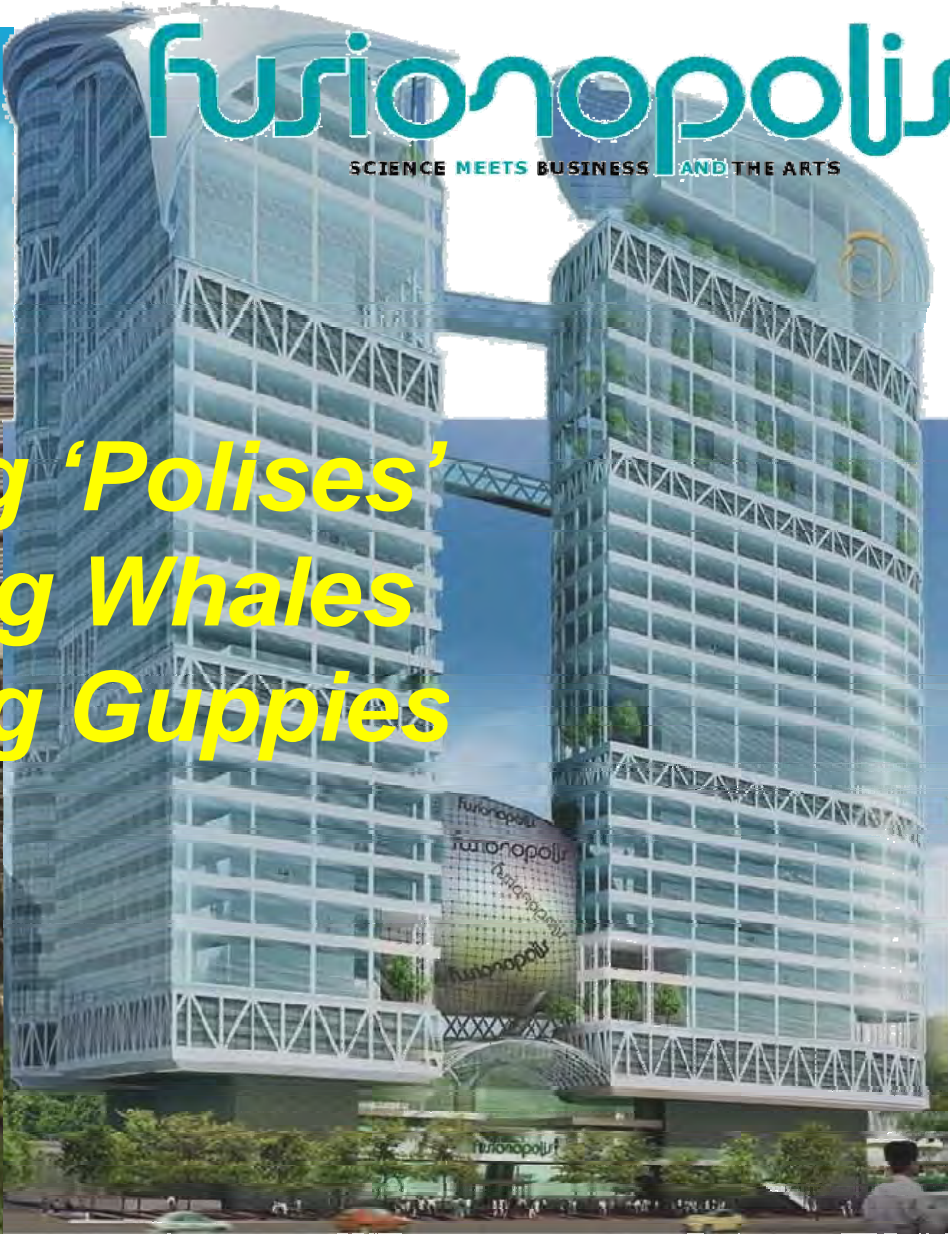


The Biomedical Hub of Asia

Biopolis

Building 'Polises'
Catching Whales
Nurturing Guppies



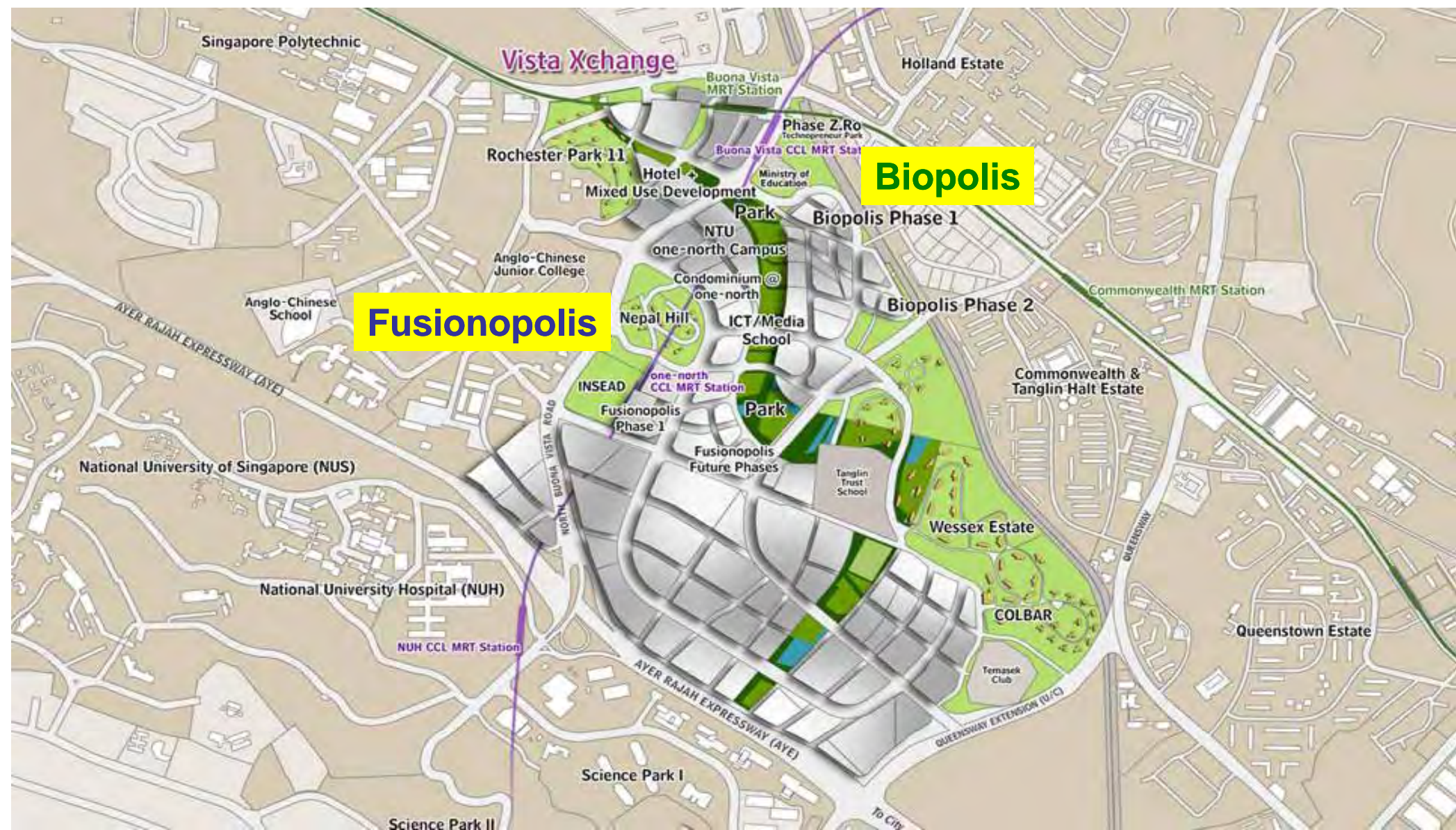
fusionopolis

SCIENCE MEETS BUSINESS AND THE ARTS

Map of Singapore: Location of one-north



One-North

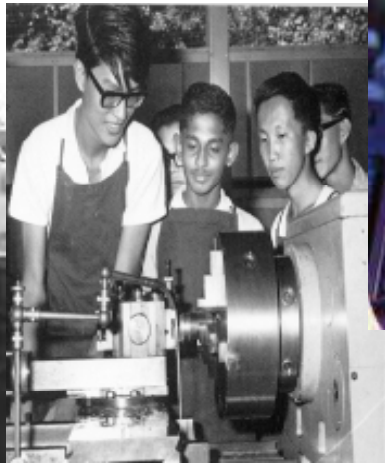


One North Bird's Eye View





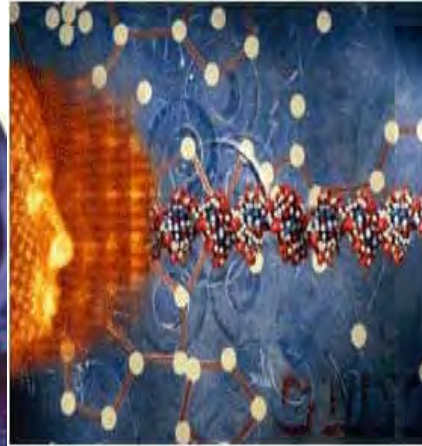
Labour-intensive
1960s



Skills-intensive
1970s



Capital-intensive
1980s



Technology-intensive
1990s



**Innovator of
new products
& services**

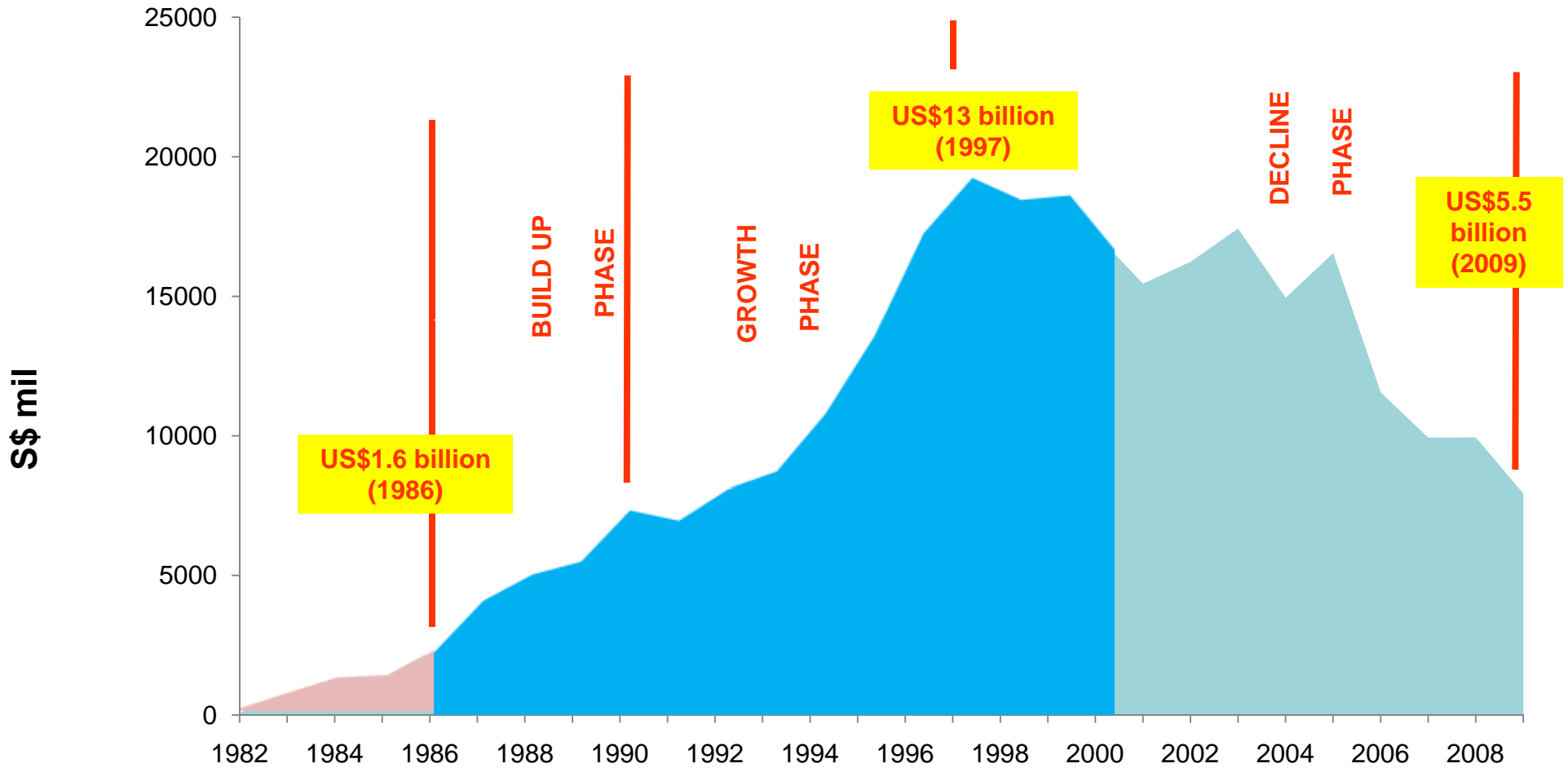
**Knowledge-
Intensive**

2000+

Keep moving up !

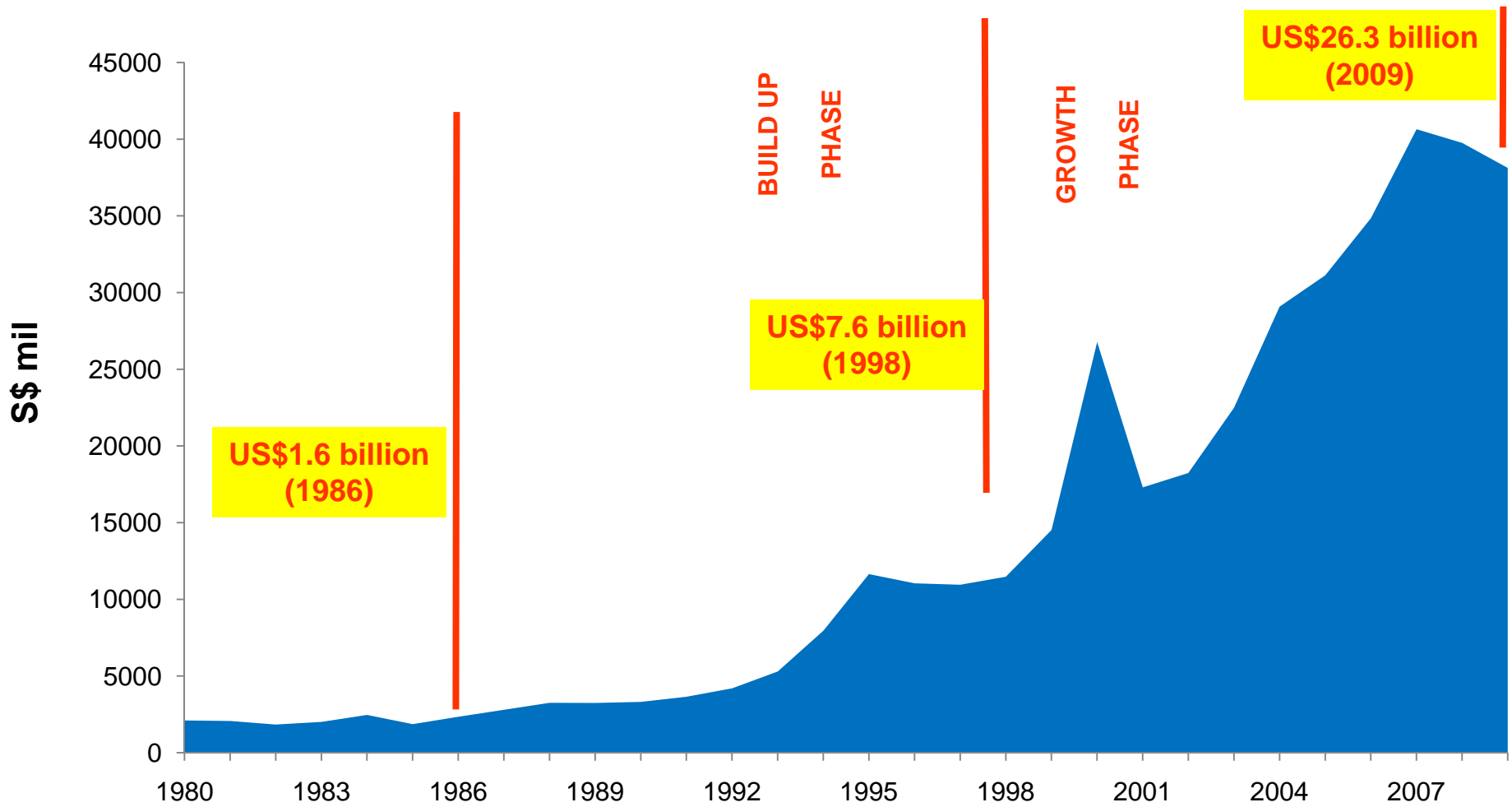
Building the Data Storage Industry Cluster

Cumulative Output (1986-2009): US\$178 billion



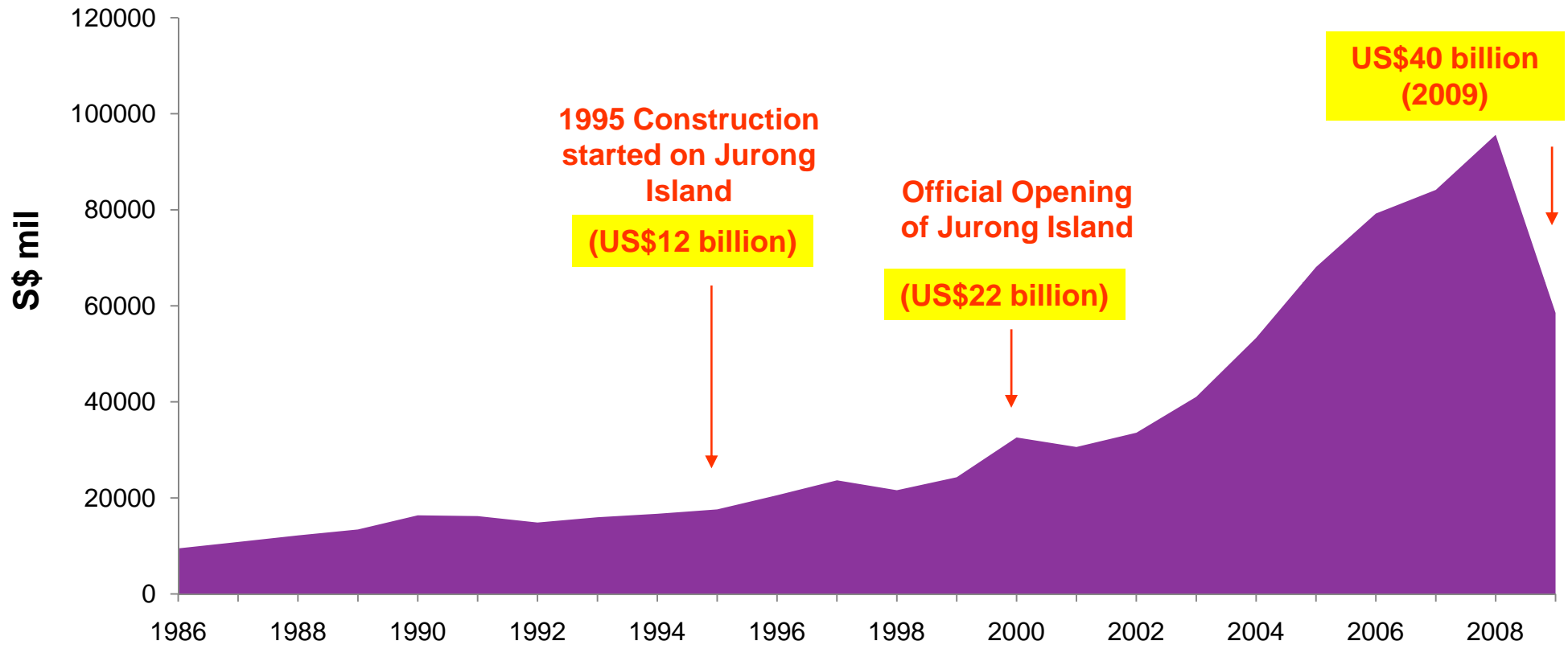
Building the Semiconductor Industry Cluster

Cumulative Output (1986-2009): US\$247 billion



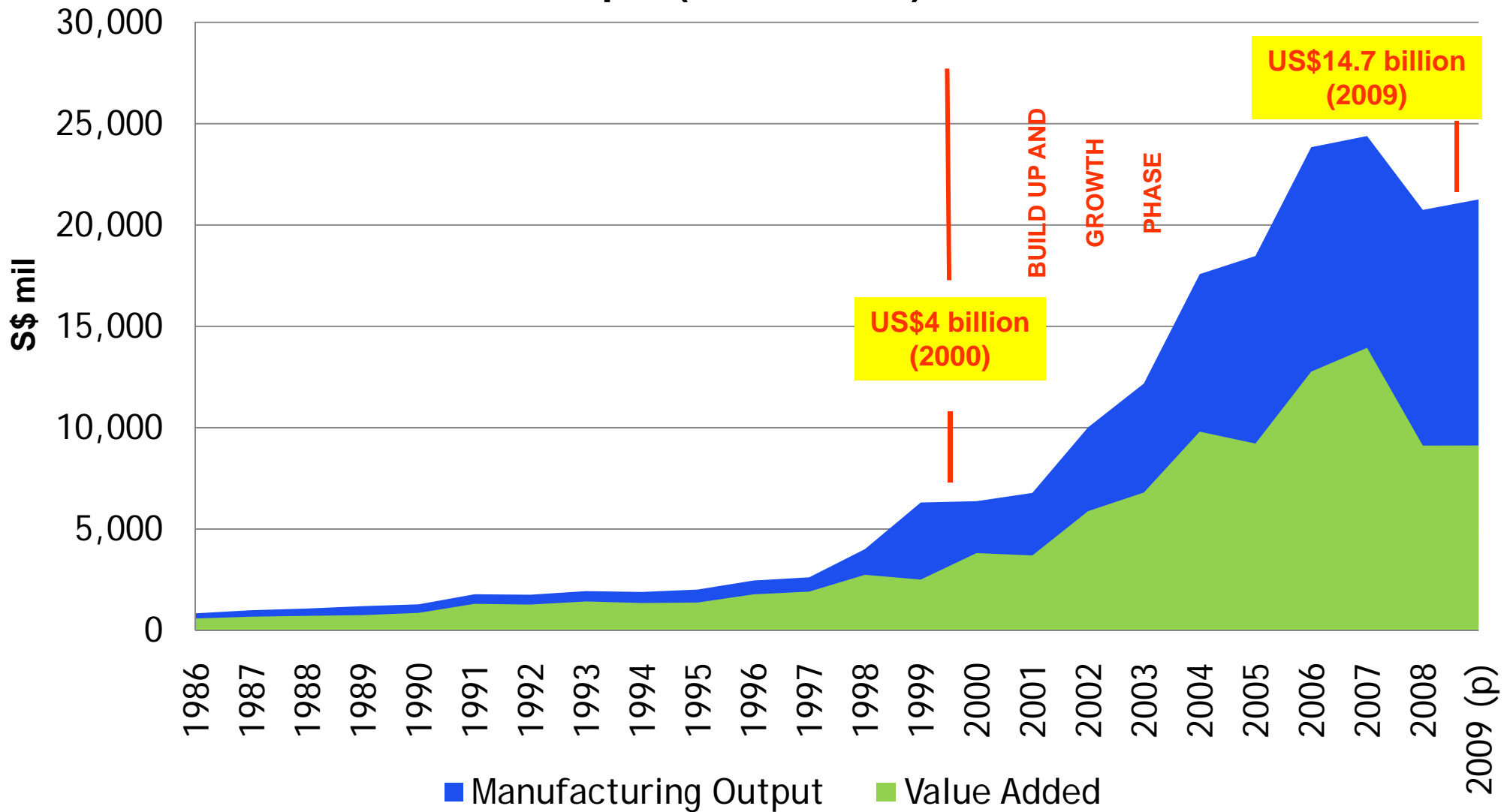
Building The Chemicals Industry Cluster

Cumulative Output (1986 – 2009) - US\$505 billion



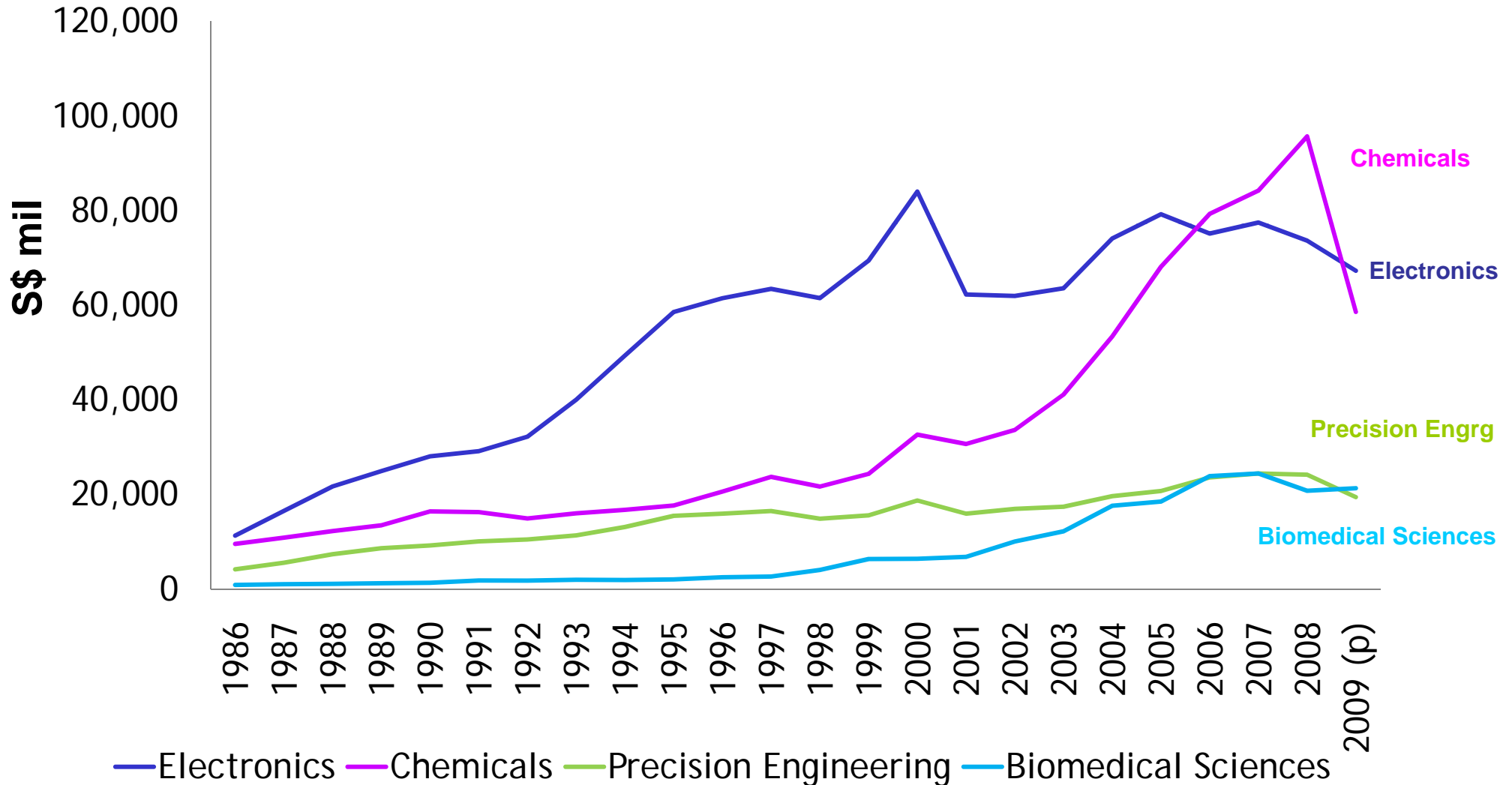
Building The Biomedical Sciences Industry Cluster

Cumulative Output (1986 – 2009) - US\$120 billion

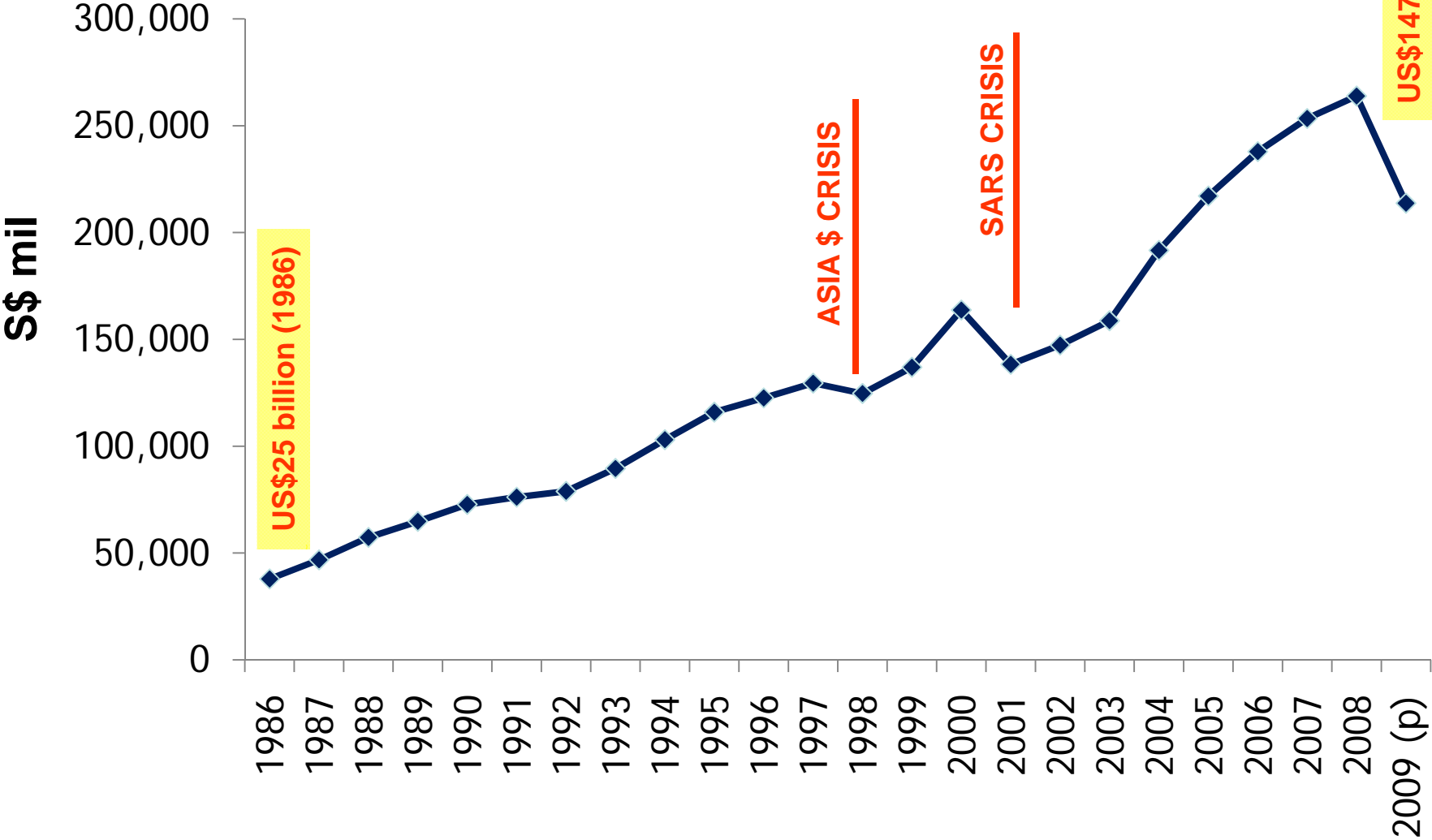


Manufacturing

Total Manufacturing Output of 4 key clusters :
US\$115 billion (2009)

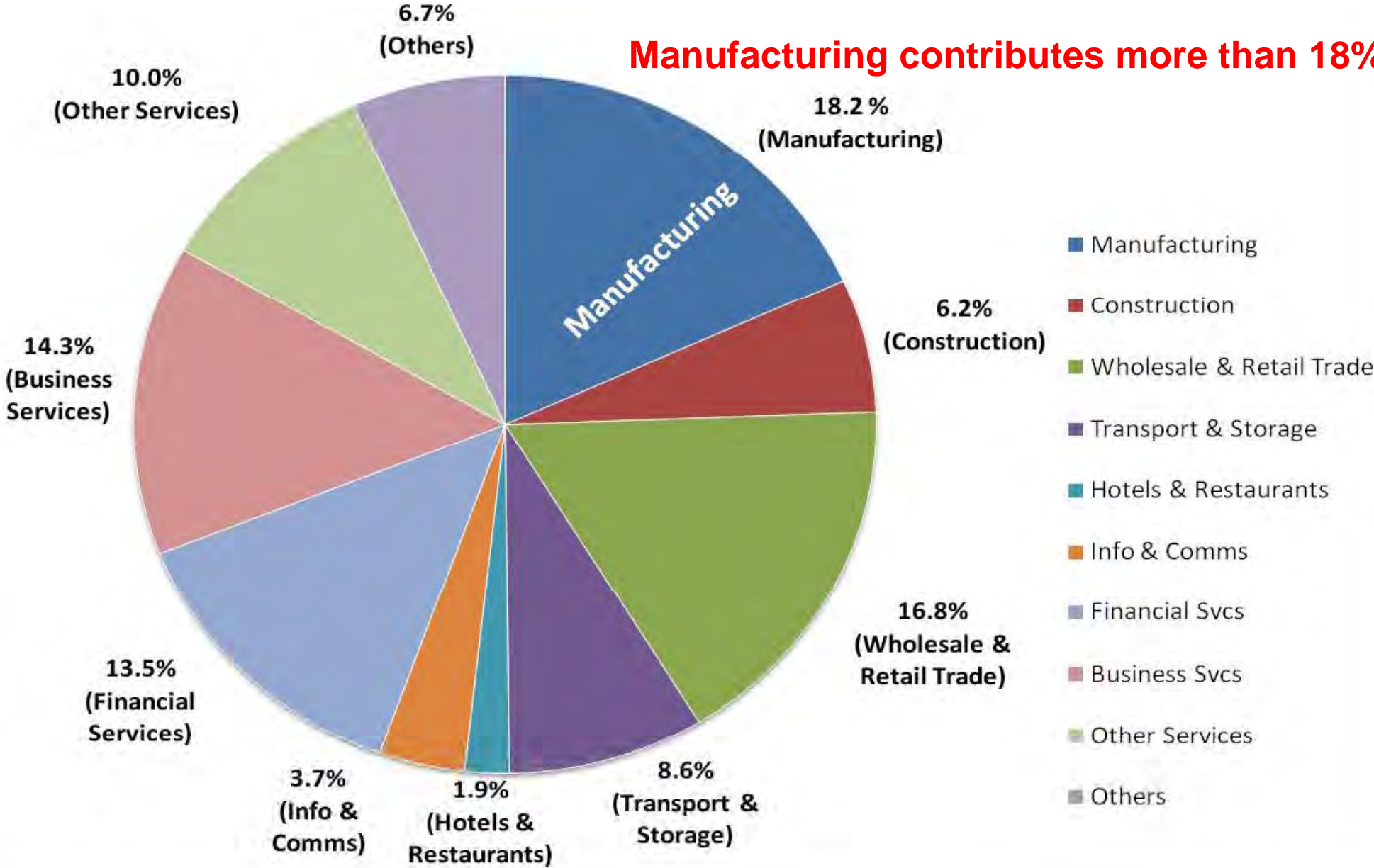


Total Manufacturing Output (1986 – 2009)

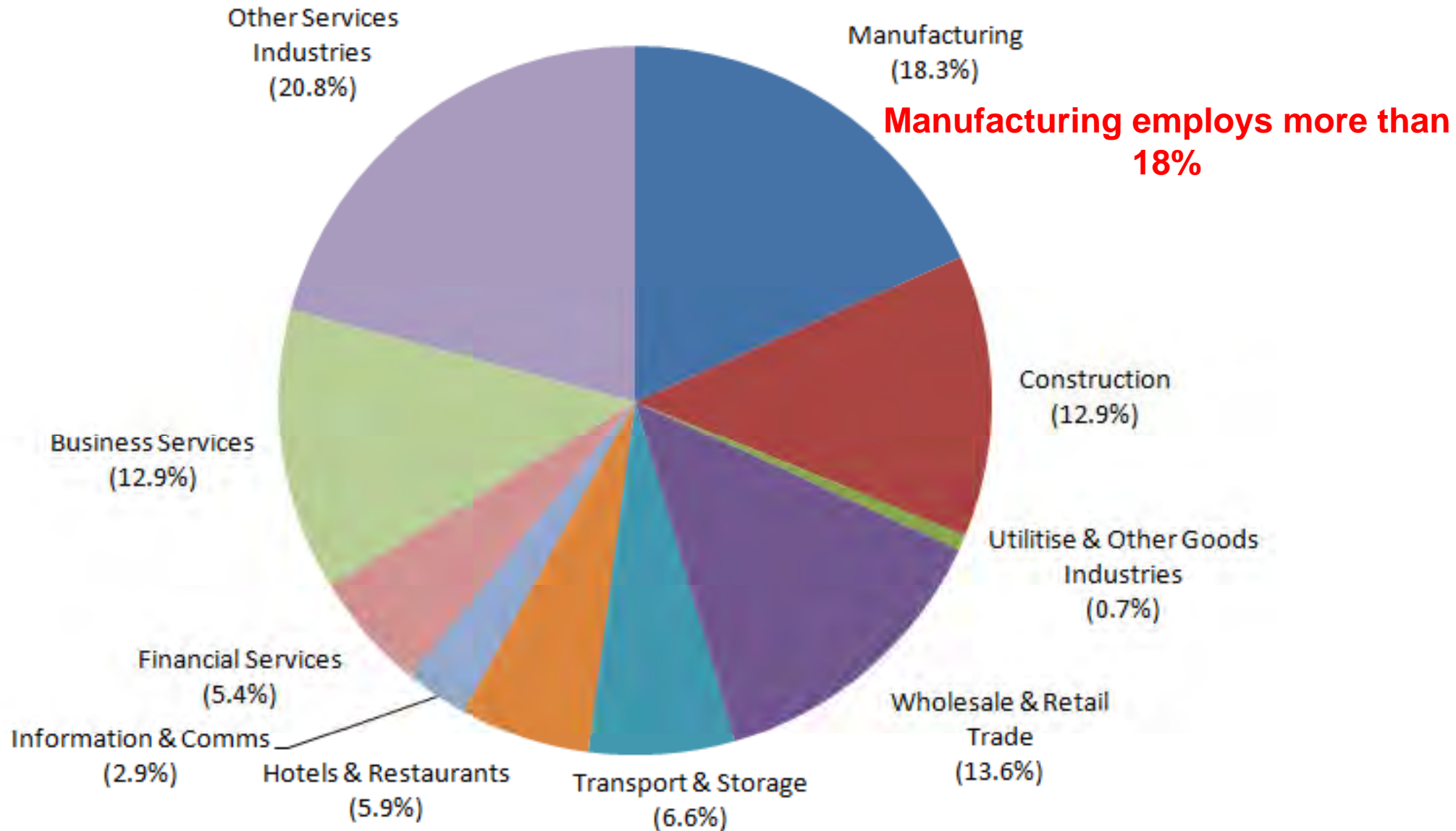


2009 GDP Pie (US\$ 160 billion)

Manufacturing contributes more than 18%



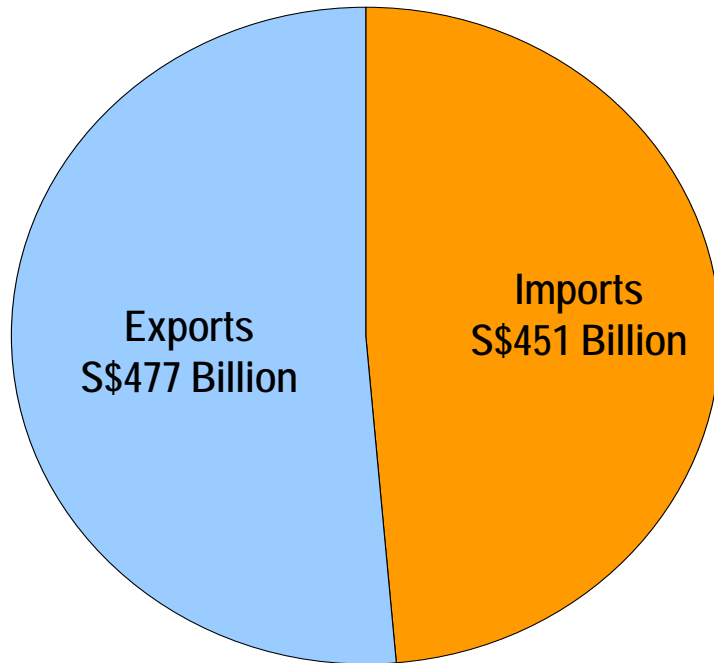
2009 Employment (2,952,500)*



*As of 3rd Quarter 2009

Singapore is highly trade-dependent:

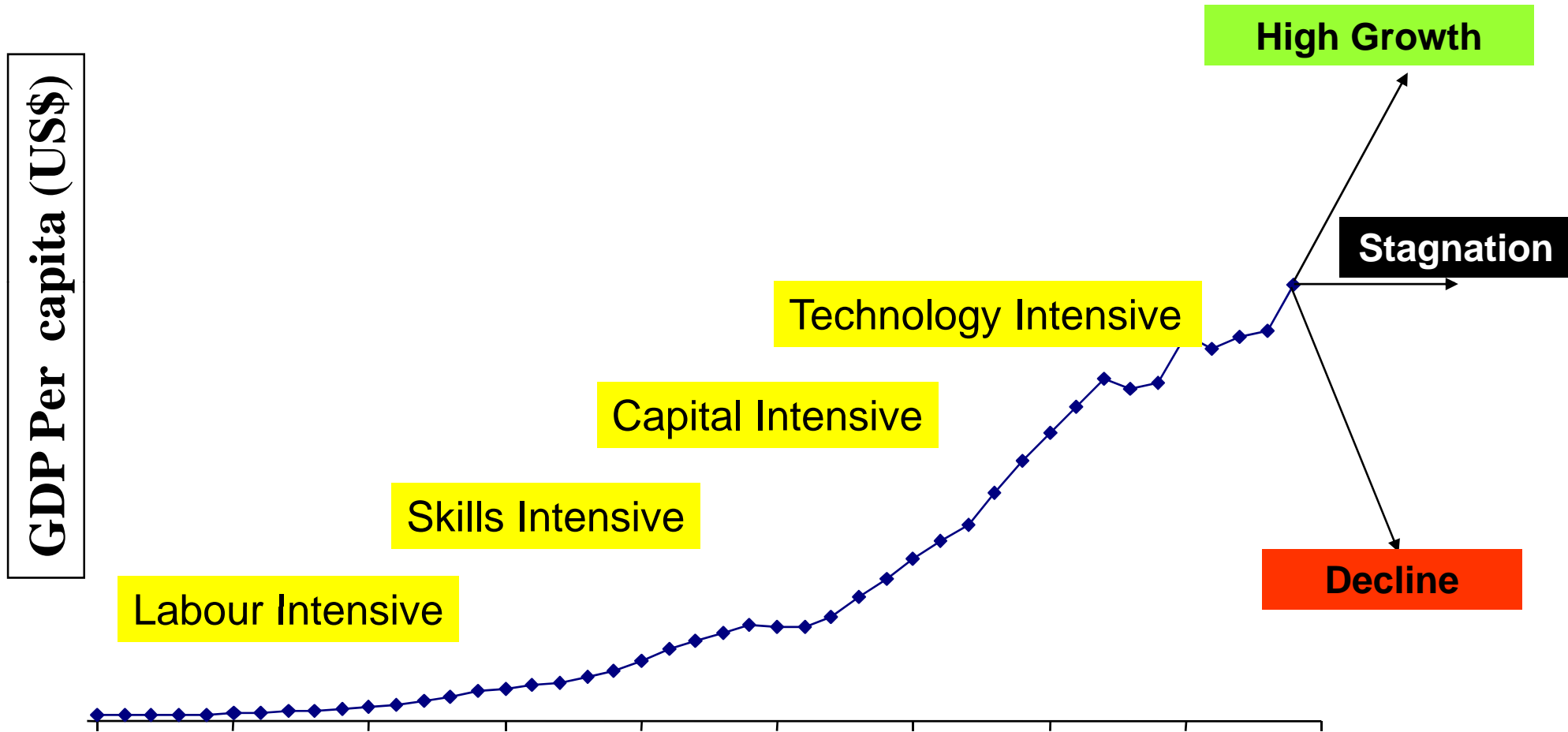
Trade is more than 4x of GDP



2008 Trade (US\$660 Billion)



Where do we go from here?



Key Challenges for Singapore

- **Face Global Competition**
- **Transit from Manufacturing to “know-how”, a Knowledge Based Economy (KBE)**
- **Nurture an Enterprise culture:**
 - Passion (risk taking)
 - Determination (hard work)
 - Vision (Global)
 - Focus (Operational)



Moving forward to a Knowledge Based Economy model

1965 – 1978:
Export Oriented
Industrialisation

1979 – 1985:
Industrial Restructuring

1986 – 2000:
Capability Building and
Economic Diversification

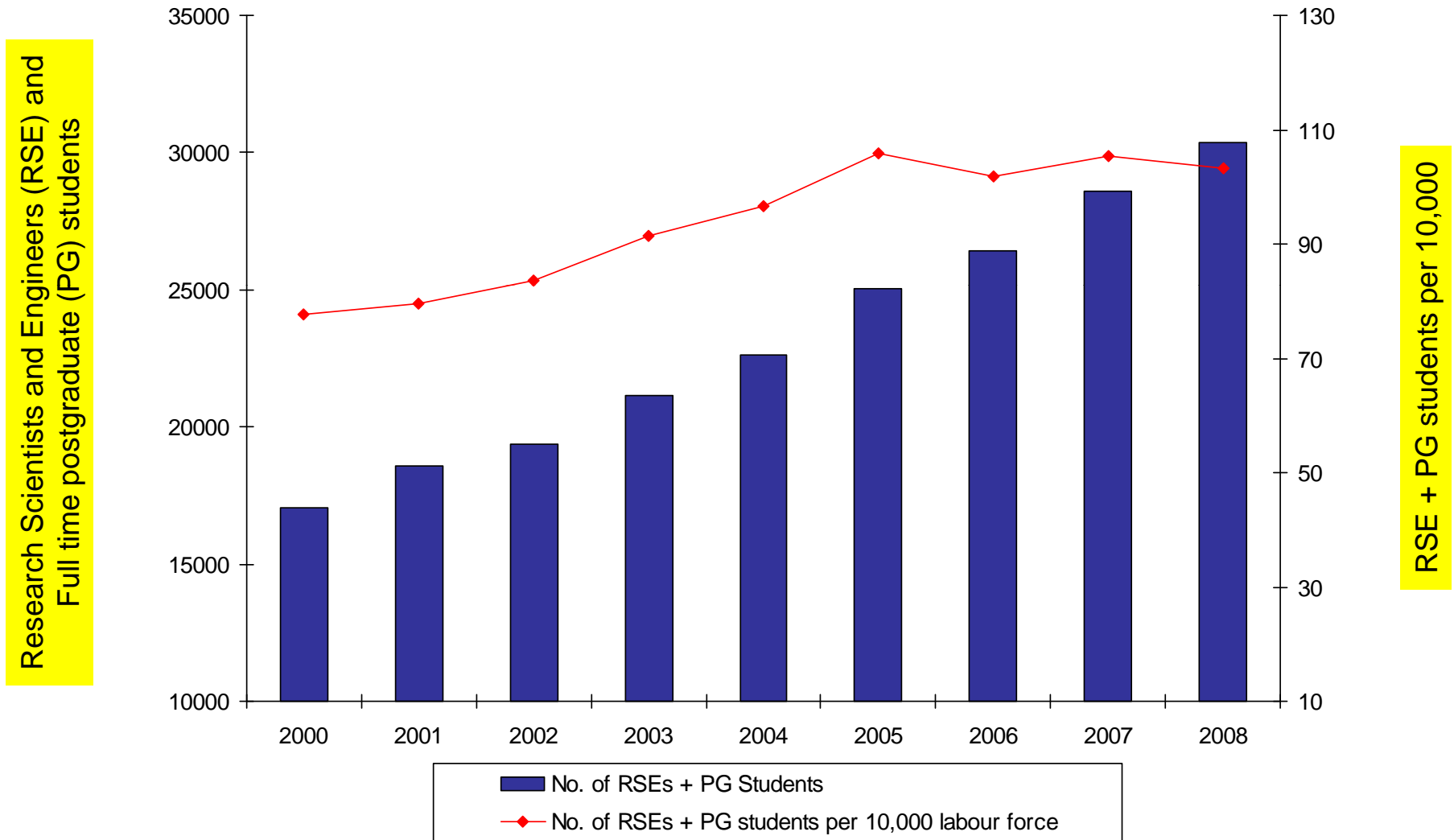
2001 onwards:
Transforming to Knowledge-
Based Economy



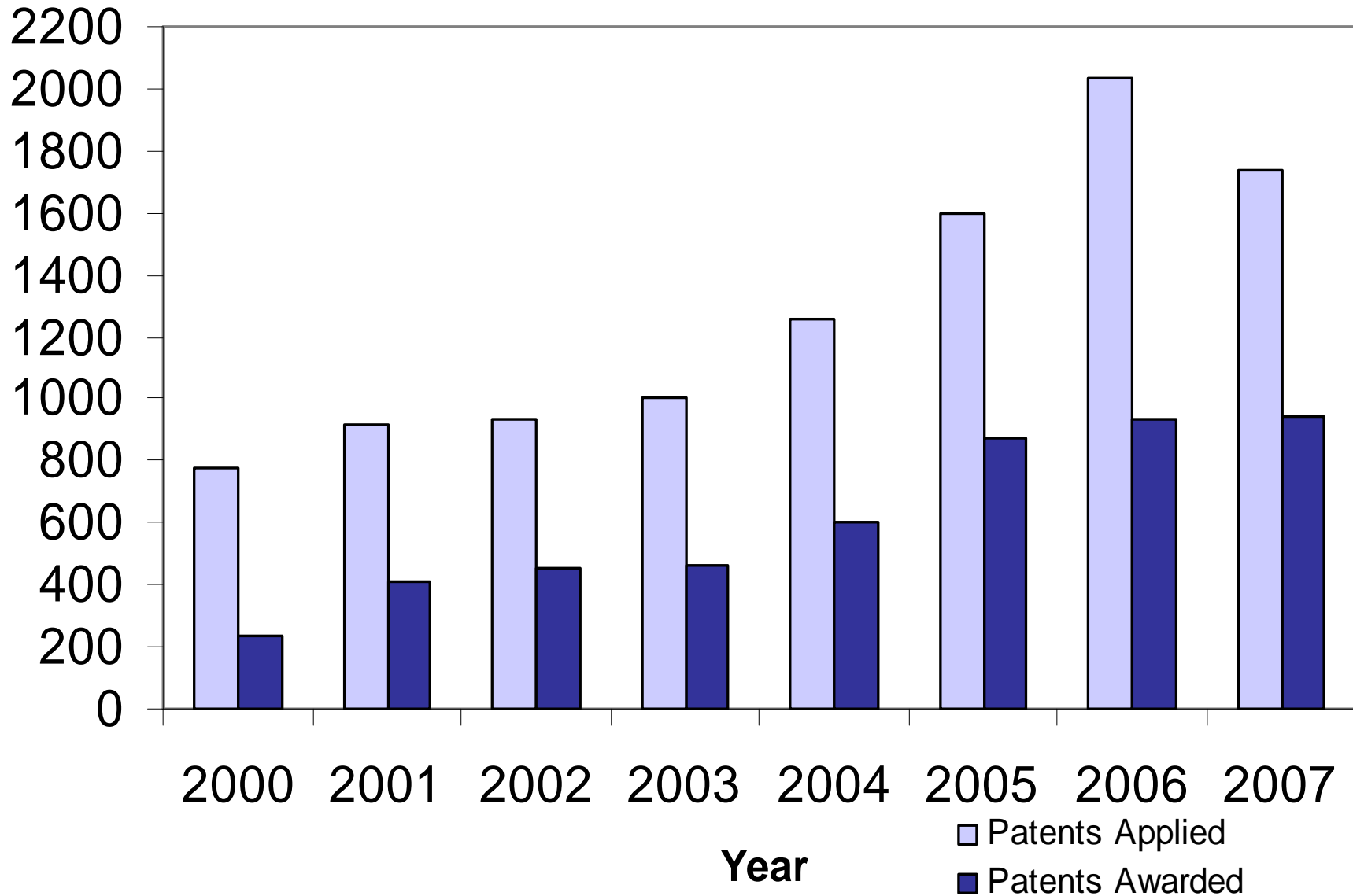
From Manufacturing to Knowledge-Based Economy

- An Economy based on cost efficiency is not sustainable in the long term
- Move up the Value chain with focus on high value-added activities
- Research → Development → Production → Marketing → Distribution → Servicing
- Graduate Education is a necessity for high value-added R&D-oriented industries

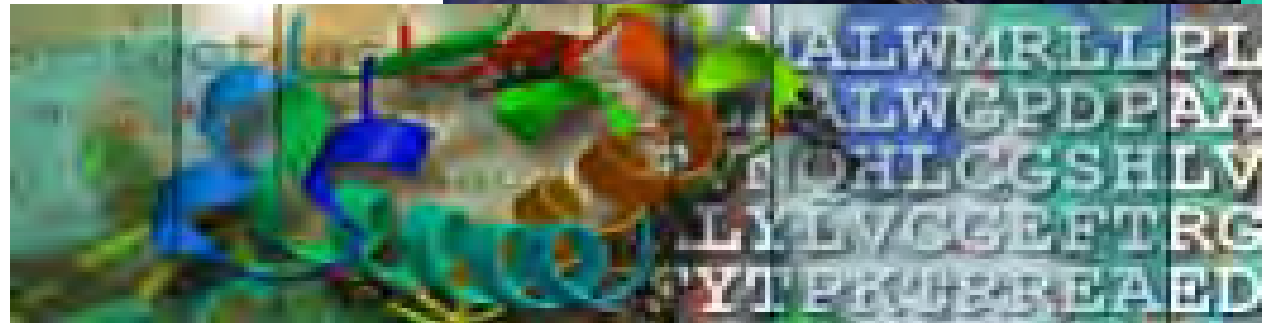
Building up R&D Human Capital (2000 – 2008)



No. of Patents Applied / Awarded



Building up Biomedical Sciences



Vision

Singapore – The Biopolis of Asia

An International Biomedical Sciences Cluster Advancing Human Health
Through the Pursuit of Excellence in
Research & Development, Manufacturing, and Healthcare Delivery



How It All Started....

Prof. John Wong

A/Prof. Kong Hwai Loong



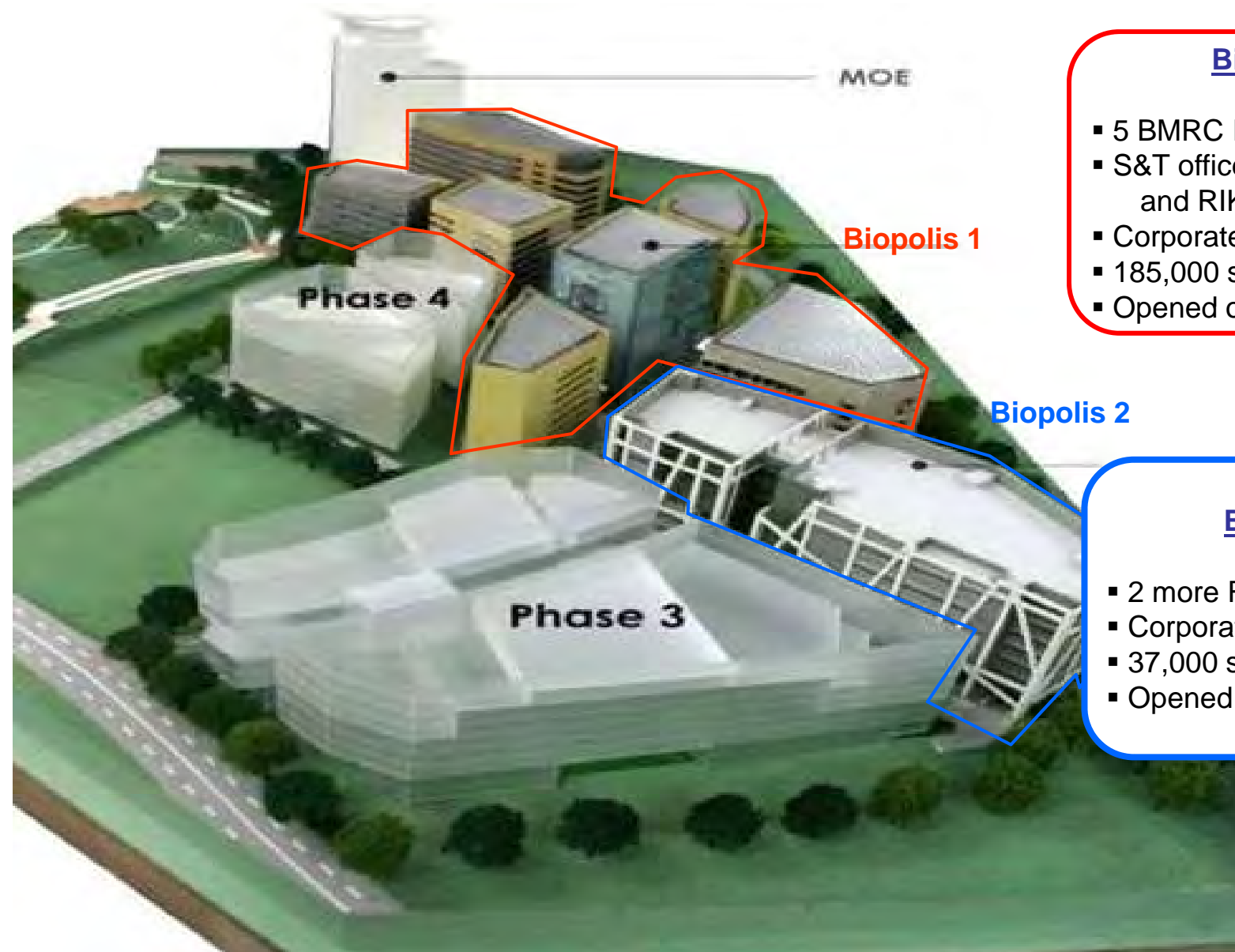
Prof. Tan Chorh Chuan



Breaking New Ground in 2001 ... Biopolis



Biopolis



Biopolis Phase 1

- 5 BMRC Research Institutes
- S&T offices (British High Com and RIKEN)
- Corporate labs (NITD, GSK)
- 185,000 square metres
- Opened on October 2003

Biopolis Phase 2

- 2 more Research Institutes
- Corporate labs (Eli Lilly)
- 37,000 square metres
- Opened on 30 October 2006



Centros



Matrix



Genome



Helios



Chromos



Proteos

Research Community



BIOPOLIS



Nanos



Neuros & Immunos



Biopolis - The Biomedical Hub of Asia

Biopolis Phase 2

Enhancing Public-Private Sector Interactions

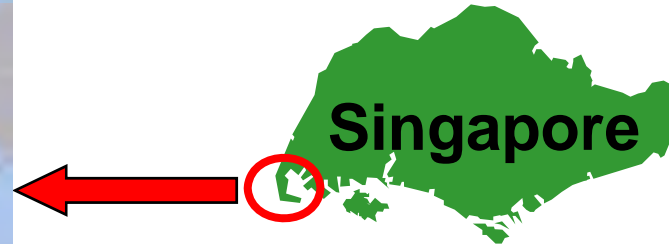


- Institute of Medical Biology (IMB)
- Singapore Immunology Network (SIgN)
- Biological Resource Centre (BRC) Phase 2
 - Corporate Laboratories

Biopolis Phase 3



Ready Land & Infrastructure



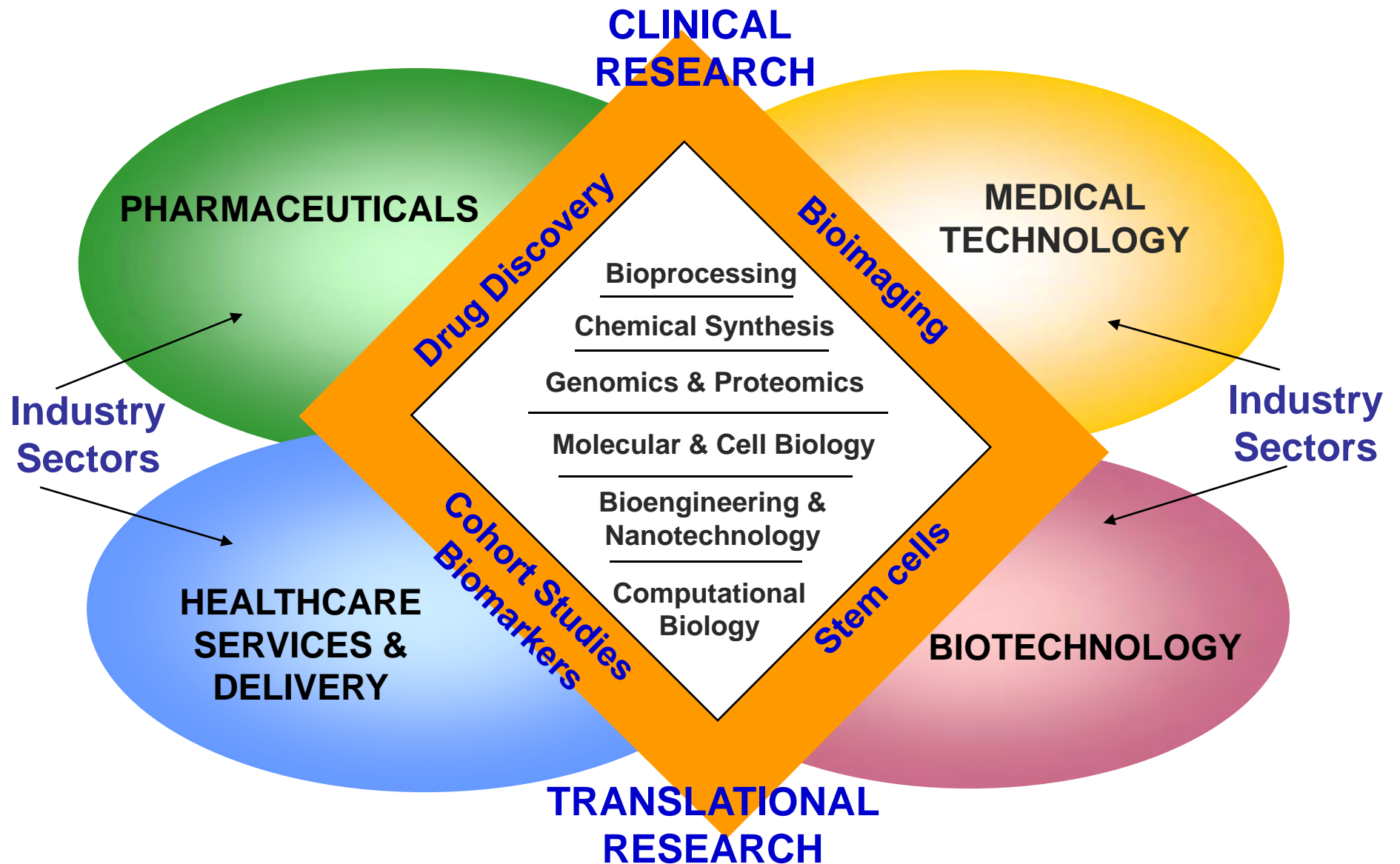
Tuas Biomedical Park

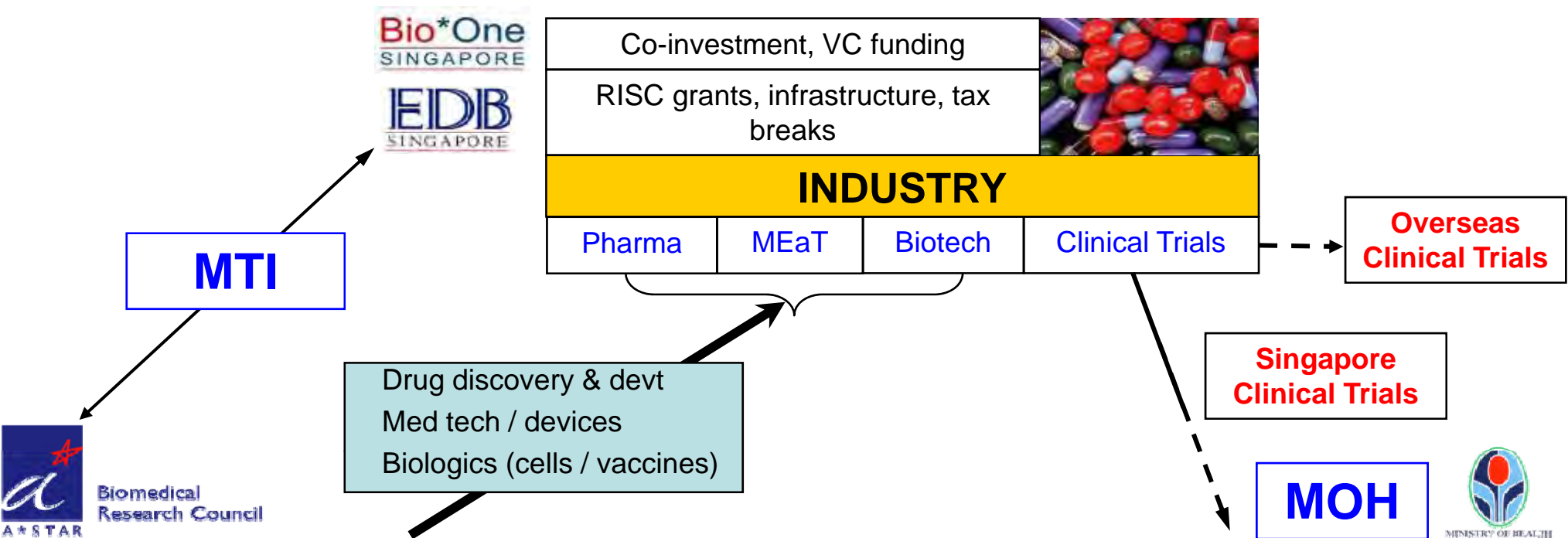
- 360 Ha of prepared industrial land
 - Ready infrastructure provided
- Stable water, Electricity and Telecommunications
 - Sewerage discharge
- Efficient road access and ease of transportation
 - Flexible land payment options
 - Free from natural disasters

Tuas Biomedical Park



Biomedical Cluster Map





Mission-oriented BENCH

Research Institutes

- IMCB, GIS, BTI
- IBN, BII,
- IMB

Research Consortia

- SBIC
- SgN
- SSCC
- Biomarkers

Academic BENCH

Ministry of Education
moulding the future of our nation

NUS, NTU

Translational / Investigational Medicine

A*STAR / BMRC

SICS

STN

SCS

DPF Office

SCCS

MBBS PhD / BMS IF / CSI awards

BEDSIDE

NMRC / HSA

Clinical Research Programmes

- Focus, strategy

Human Capital

- Development, recruitment

Infrastructure

- For Clinical Trials

Regulatory Framework

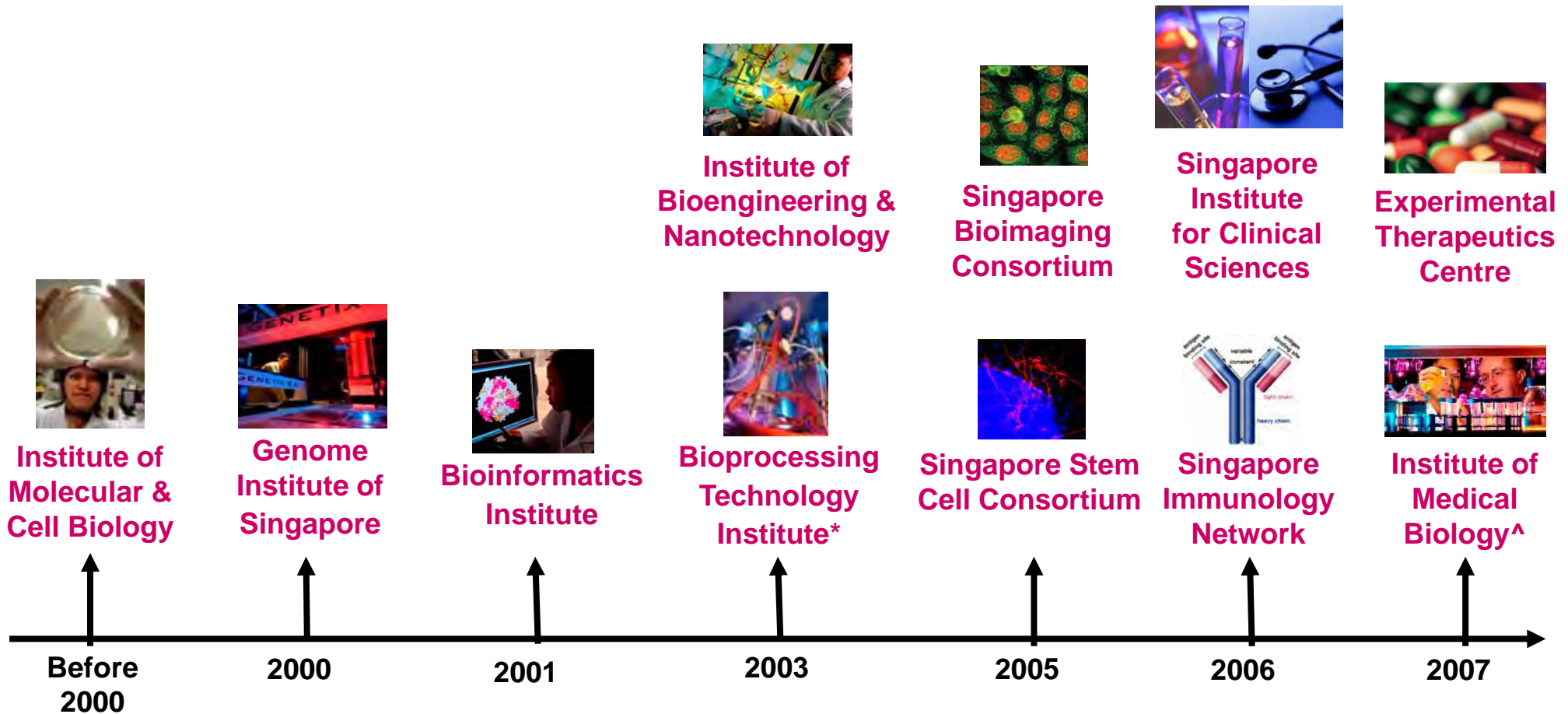
- IRBs

- MEaT = Medical Engineering and Technology
 IMCB = Institute of Molecular & Cell Biology
 GIS = Genome Institute of Singapore
 BTI = Bioprocessing Technical Institute
 IBN = Institute of Bioengineering and Nanotechnology
 BII = Bioinformatics Institute
 IMB = Institute of Medical Biology
 SICS = Singapore Institute for Clinical Sciences
 SBIC = Singapore Bioimaging Consortium
- SgN = Singapore Immunology Network
 SSCC = Singapore Stem Cell Consortium
 STN = Singapore Tissue Network
 SCS = Singapore Tissue Network
 SCS = Singapore Cancer Syndicate
 SSCS = Singapore Consortium of Cohort Studies
 DPF = Data Privacy Framework
 BMS IF = Biomedical International Fellowship
 CSI = Clinician Scientist Investigatorship
 IRBs = Institutional Review Boards

BMRC Research Institutes

Phase 1 (2000-2005)

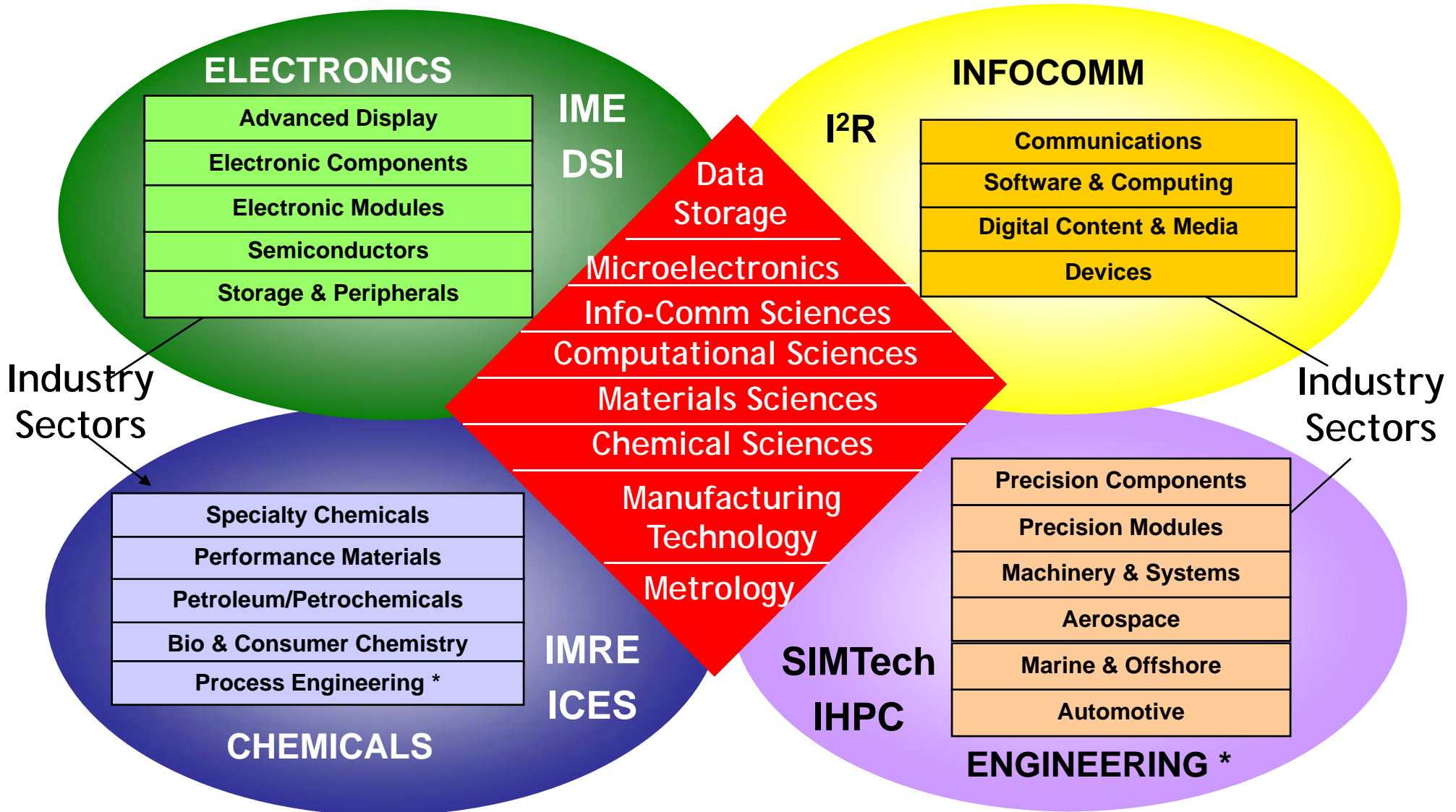
Phase 2 (2006-2010)



*Set-up as BTU in 1990. Became BTC in 1995, established as BTI in 2003

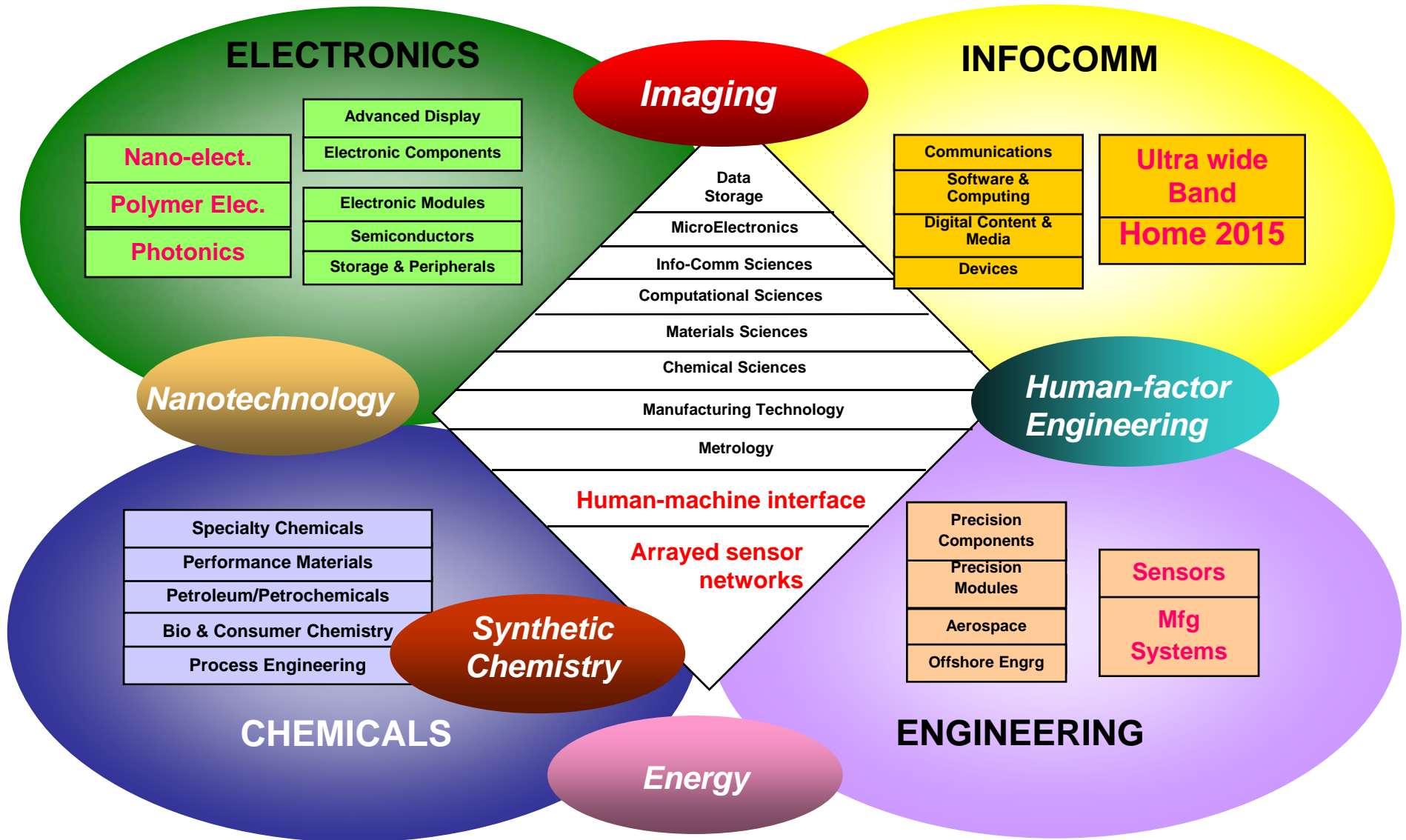
^ The Centre for Molecular Medicine (CMM) was established in 2004, and was repositioned to Institute of Medical Biology in 2007

Science and Engineering Research Council



Alignment of SERC RIs to meet Industry Needs

Developing New Competencies



SERC Research Institutes and Centres



Institute of Microelectronics (IME)



Institute of High Performance Computing (IHPC)



Institute for Infocomm Research (I²R)



National Metrology Centre (NMC)



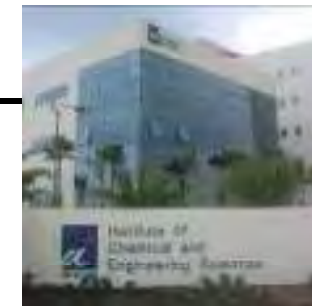
Singapore Institute of Manufacturing Technology (SIMTech)



Data Storage Institute (DSI)



Institute of Materials Research & Engineering (IMRE)



Institute for Chemical & Engineering Sciences (ICES)

1989

1991

1996

1997

2002

2008

Fusionopolis Phase 1 Facilities



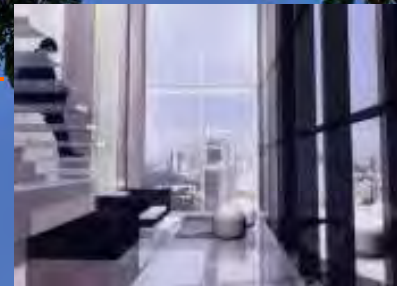
Fitness Gym & Pool



Shared Conference Rooms



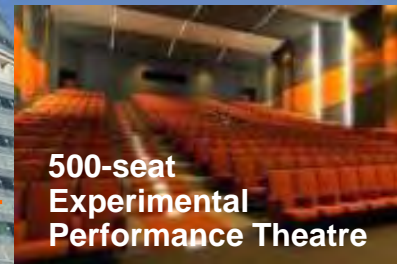
Retail and F&B Podium



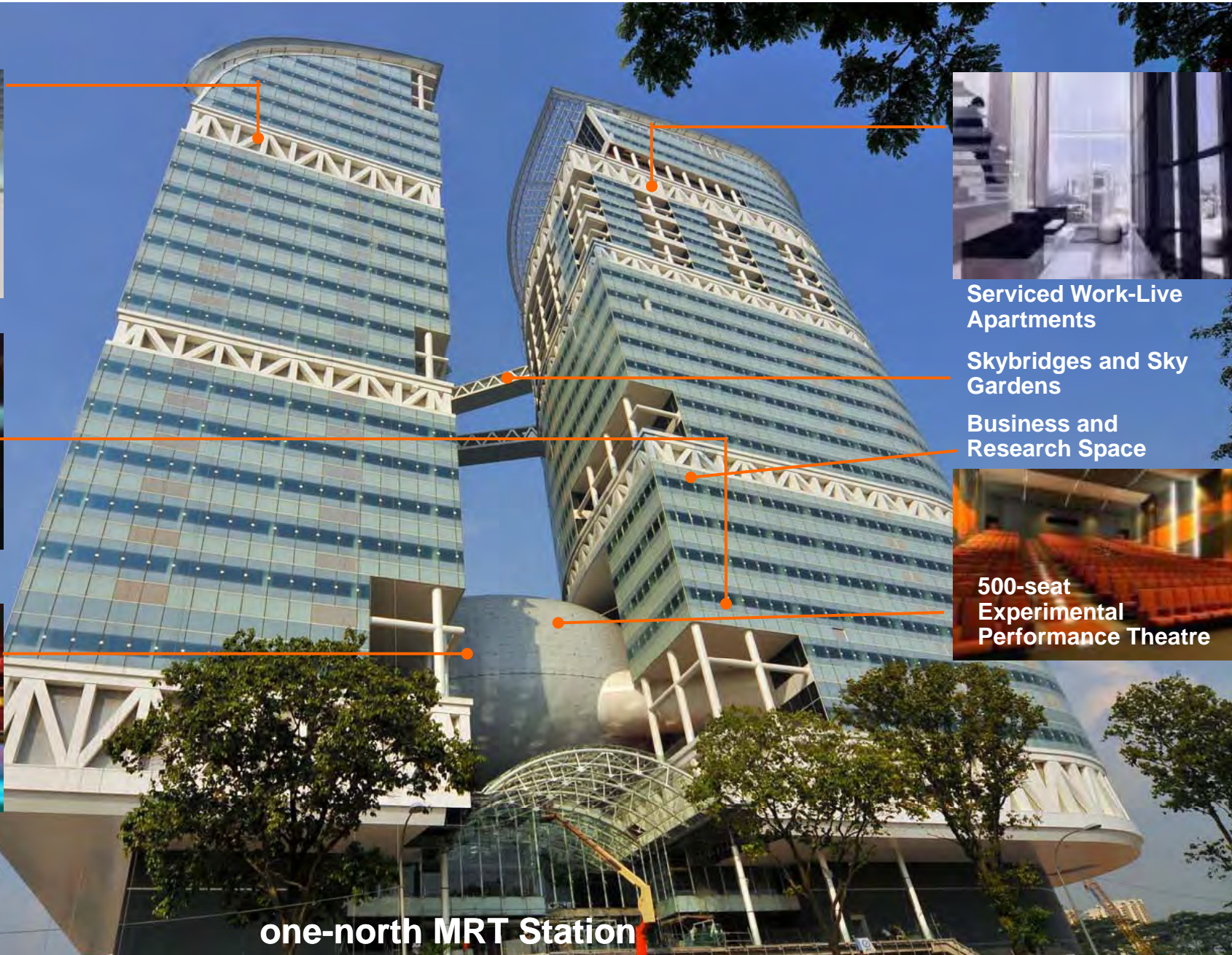
Serviced Work-Live Apartments

Skybridges and Sky Gardens

Business and Research Space



500-seat Experimental Performance Theatre



one-north MRT Station

Fusionopolis Phase 2A



SPRING Singapore @Fusionopolis



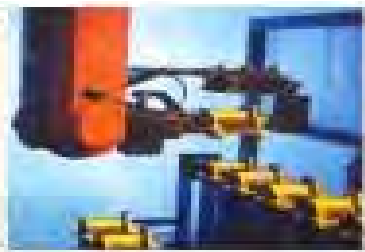
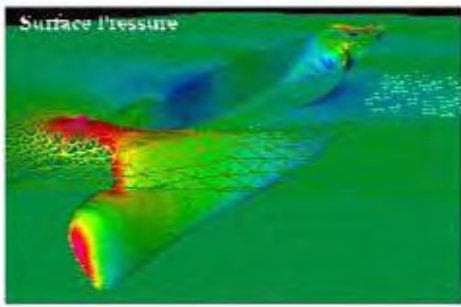
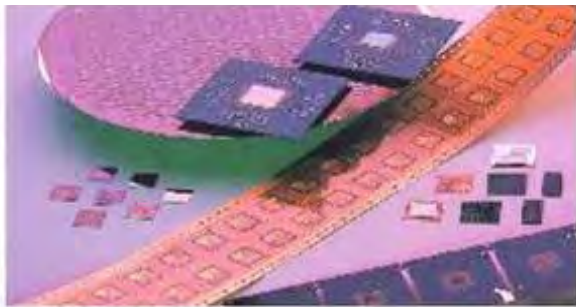


one-north Residences



one-north Residences

Fusion of Science and Engineering



Realising Fusionopolis

A Magnet for the Best and Brightest

Outstanding researchers with diverse cultures to create highly inventive environment

Singapore's most powerful Computers - driving innovations

S'pore's largest R&D cleanroom at your service
State-of-the-art cleanroom

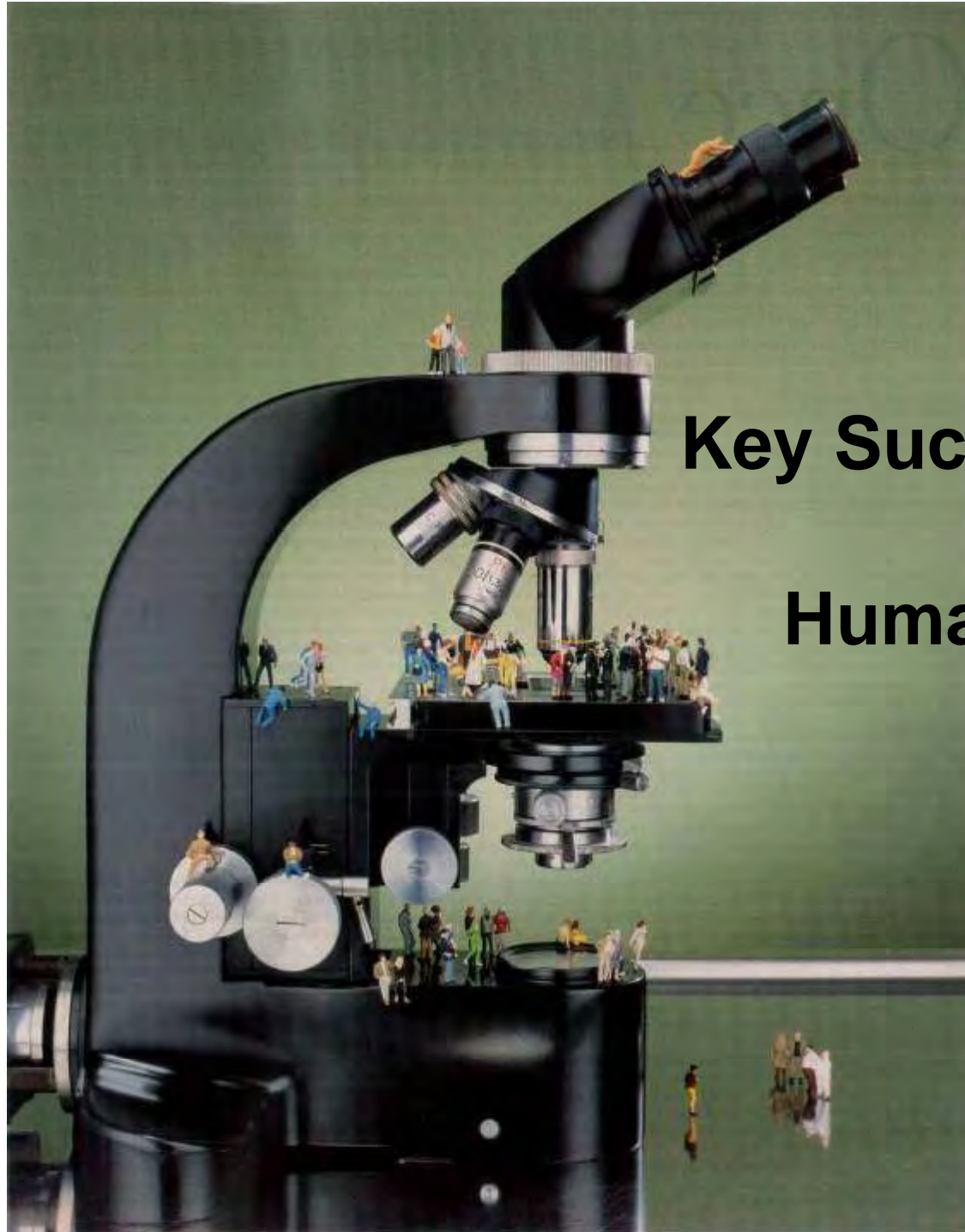
Small Matters!
produce high-resolution, 3D images down to an atomic level

Bringing Technology From the labs to Your Daily Experience
experimental place to innovate and create ideas
for R&D and new applications

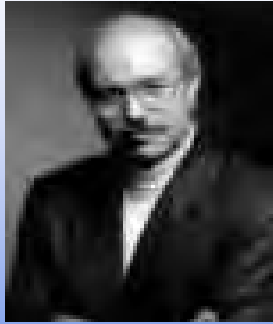
Science meets business
Partnering industry in joint development of next generation technologies

Area of Phase 1 : 120,000m²
Area of Phase 2 : 103,688m²
No. of Researchers : > 1600

Integration of SERC RI Capabilities



Key Success Factor:
Human Capital



Human Capital – Catch a few Whales !



Attracting International Scientific Talent (Whales)

When physician-scientists Judith Swain and Ed Holmes take up their posts in Singapore..., **they will join a star-studded community** at one of the world's most rapidly developing biomedical research centres. ...**they are the latest of many Western scientists who have headed for the impressive facilities of the tiny city-state.**

Naturejobs, 5 Jul 06



Dr Yoshiaki Ito



Sir George Radda



Sir David Lane



Dr Birgitte Lane



Dr Edward Holmes



Dr Judith Swain



Dr Paola Castagnoli



Dr Colin Stewart



Dr David Townsend



Dr Edison Liu



Dr Jackie Ying



Dr Neal Copeland



Dr Nancy Jenkins



Dr Phil Ingham



Dr Jean Paul Thiery



Dr Colin Blakemore



Dr Frank Eisenhaber



Dr Alex Matter



Dr Philippe Kourilsky



Dr Alan Colman



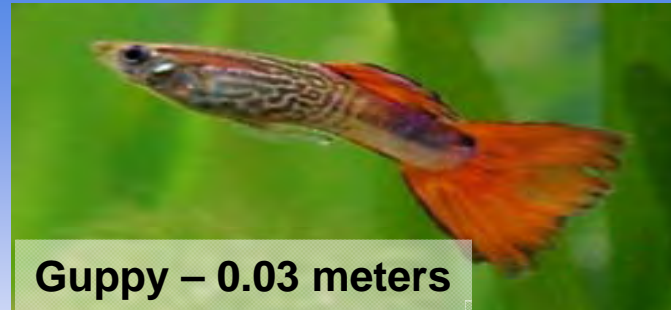
Dr Peter Gluckman



Dr Davor Solter

2001 | 2002 | 2003 | 2004 | 2005 | 2006 | 2007 | 2008 | 2009

Human Capital – Train 1,000 PhD Guppies



Nurturing & Developing Human Capital (Guppies)

Evelyn Thangaraj
2005 A*STAR YRAP
Scholar
(currently A*STAR
NSS BS Scholar)



Talent Pipeline

Le Ngoc Phuong Lan
2005 A*STAR YRAP
Scholar
(currently A*STAR
NSS BS Scholar)



Guppies

Senior
Guppies

Young
Whales



10-14 yrs

15-18 yrs

19-23 yrs

24-30 yrs

< 35 yrs

Youth
Science

YRAP &
A*STAR Science
Awards

NSS(BS)
PGS

NSS(PhD)
AGS
SINGA

AIF
AGS (Post-doc)

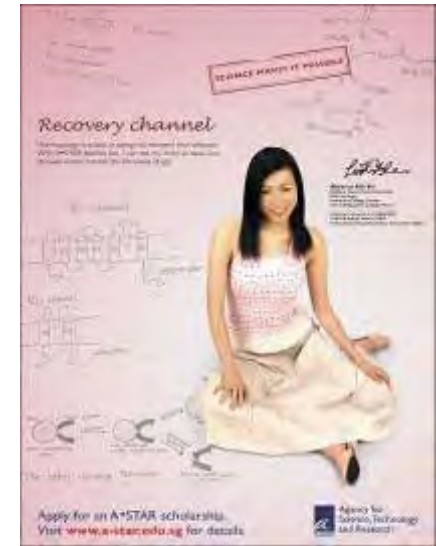
Human Capital: International Guppies



MIT
Physics
(Malaysia)



Stanford
Chemical Engineering
(Shanghai)



MIT
Bio Engineering
(Hong Kong)



Stanford
Computer Science
(India)



MIT
Chemical Engineering
(Vietnam)

Human Capital: Singapore Guppies



**Rockefeller
Bacteriology**



**Stanford
Biochemistry**



**Stanford
Biochemistry**



**Duke
Medicine/PhD**

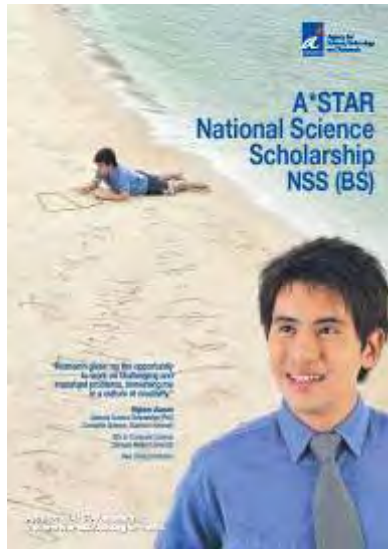


**Cambridge, London
Medicine/PhD**



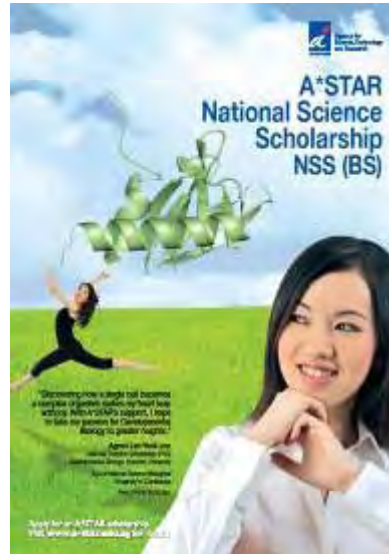
**Carnegie-Mellon
Computer Science**

Human Capital: Singapore Guppies



Stanford
Computer
Science,
PhD

Carnegie
Mellon
Computer
Science,
BSc



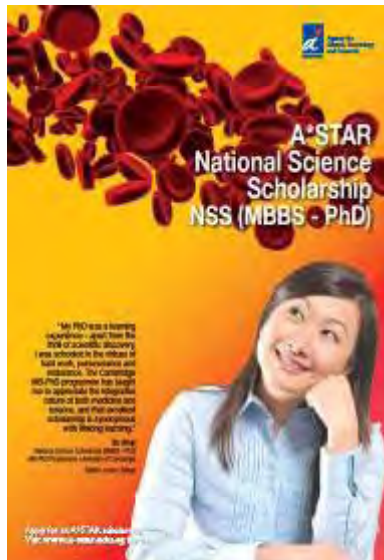
Stanford
Developmental
Biology
PhD

Cambridge
Natural Science
Biology
BSc



NUS
Biomedical
Sciences
PhD

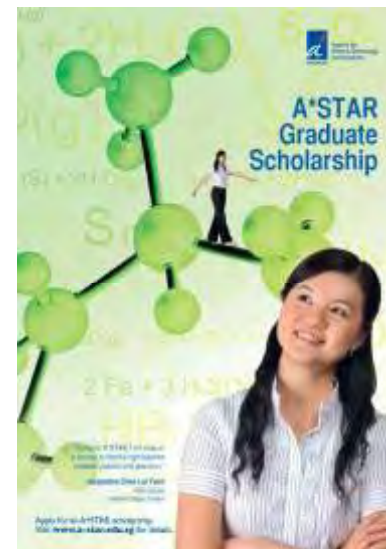
NTU
Biological
Sciences
BSc



Cambridge, London
Medicine/PhD



Stanford
Genetics
PhD



Imperial College London
Cancer Biology
PhD



Harvard
Stem cells
Post-Doc