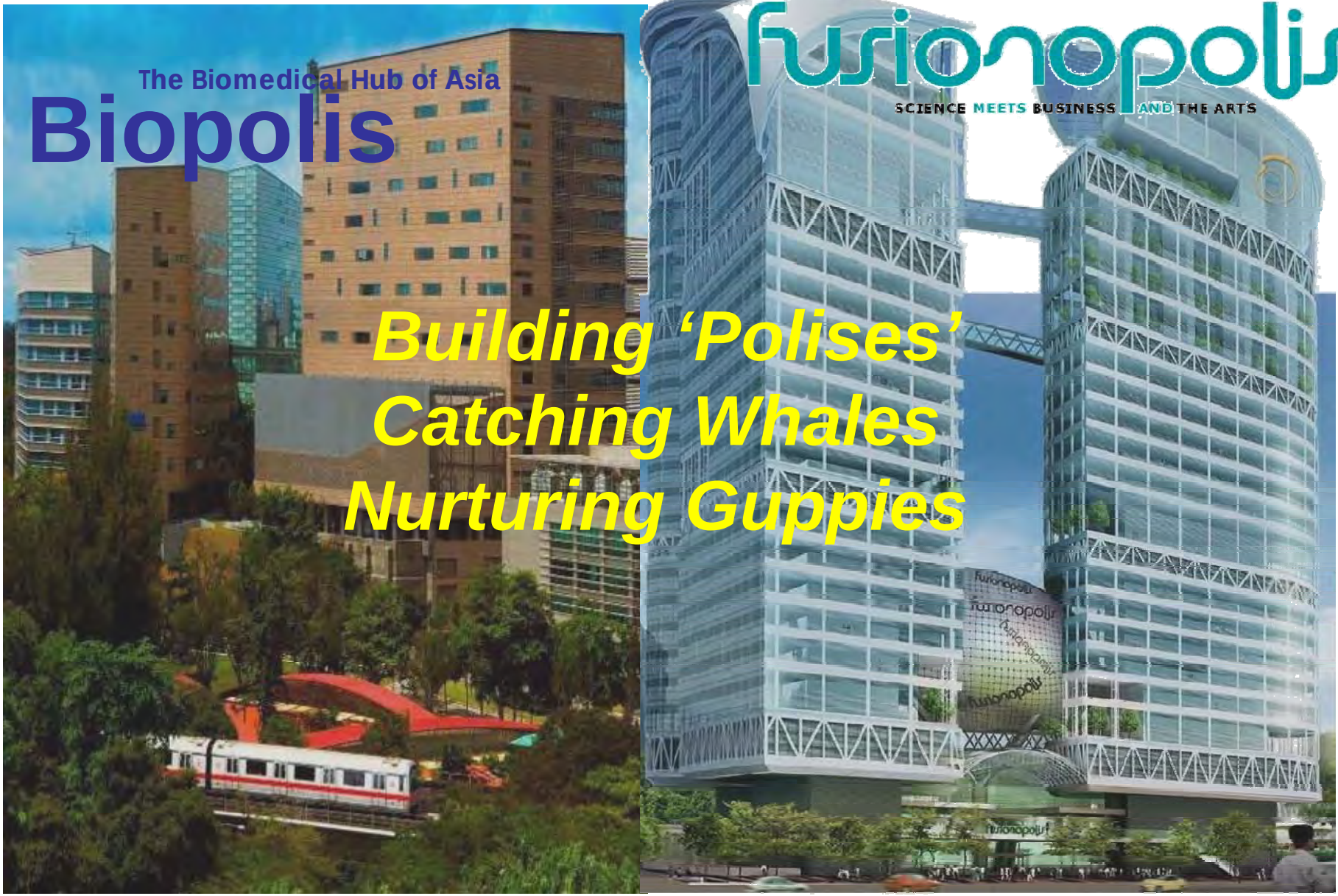
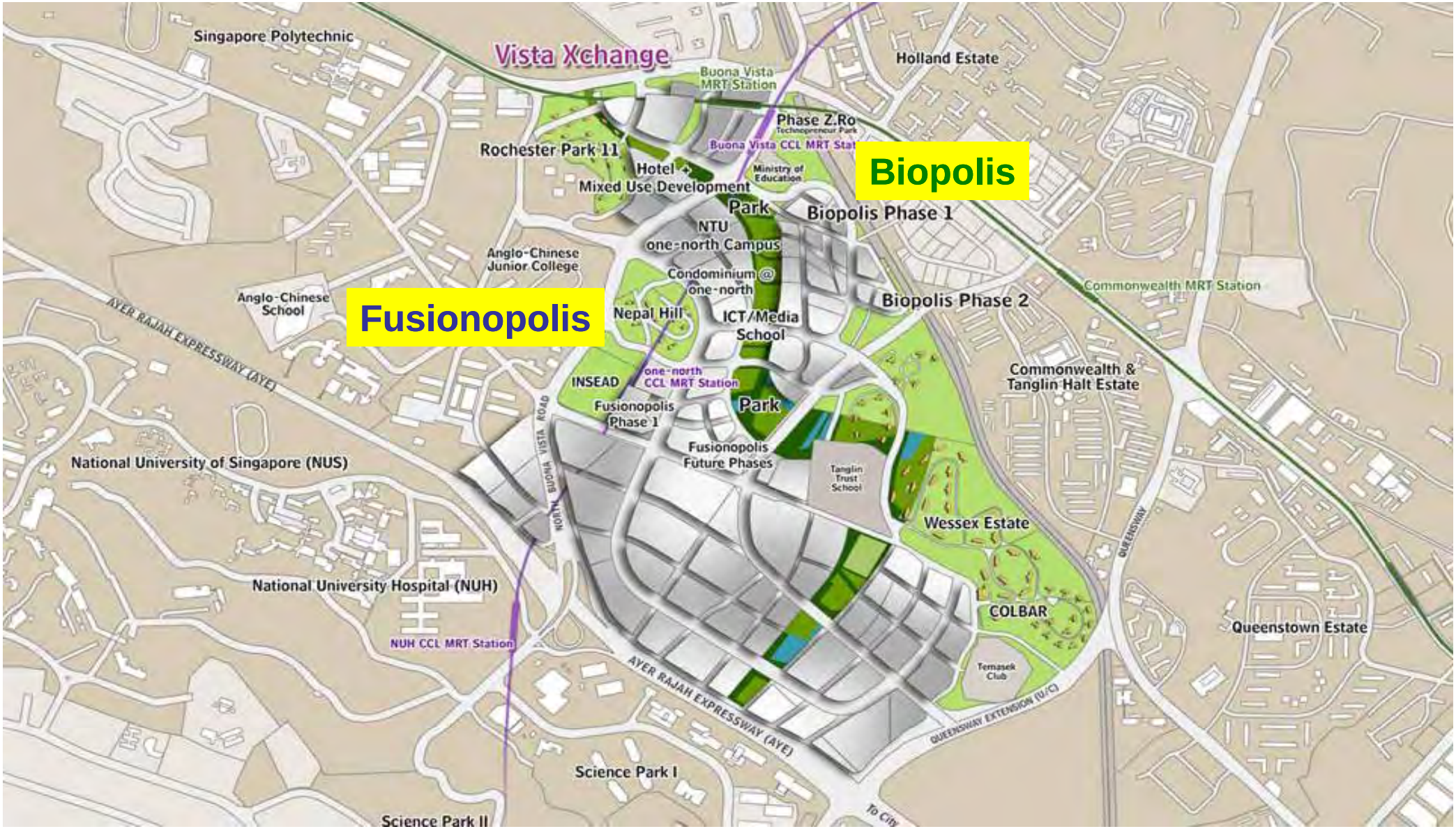

The Biomedical Hub of Asia
Biopolis
fusionopolis
SCIENCE MEETS BUSINESS AND THE ARTS
Building 'Polises'
Catching Whales
Nurturing Guppies

Map of Singapore:
Location of one-north

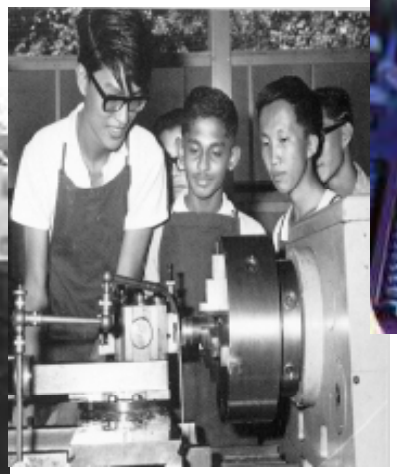
One-North


Singapore Polytechnic
Vista Xchange
Buona Vista MRT Station
Holland Estate
Phase Z.Ro
Rochester Park 11
Buona Vista CCL MRT Station
Biopolis
Hotel + Mixed Use Development
Ministry of Education
Park
Biopolis Phase 1
NTU one-north Campus
Anglo-Chinese Junior College
Condominium @ one-north
Commonwealth MRT Station
Anglo-Chinese School
Fusionopolis
Nepal Hill
ICT/Media School
Biopolis Phase 2
AYER RAJAH EXPRESSWAY (AYE)
one-north CCL MRT Station
INSEAD
Commonwealth & Tanglin Halt Estate
Fusionopolis Phase 1
Park
NORTH BUONA VISTA ROAD
Fusionopolis Future Phases
National University of Singapore (NUS)
Tanglin Trust School
Wessex Estate
QUEENSWAY
National University Hospital (NUH)
COLBAR
Queenstown Estate
NUH CCL MRT Station
Temasek Club
AYER RAJAH EXPRESSWAY (AYE)
QUEENSWAY EXTENSION (U/C)
Science Park I
To City
Science Park II

One North Bird’s Eye View

Labour-intensive

1960s

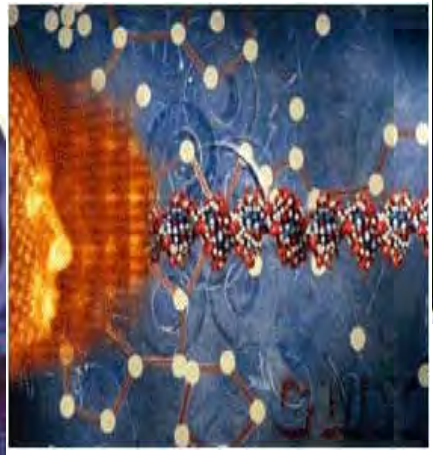


Skills-intensive

1970s

Capital-intensive

1980s



Technology-intensive

1990s

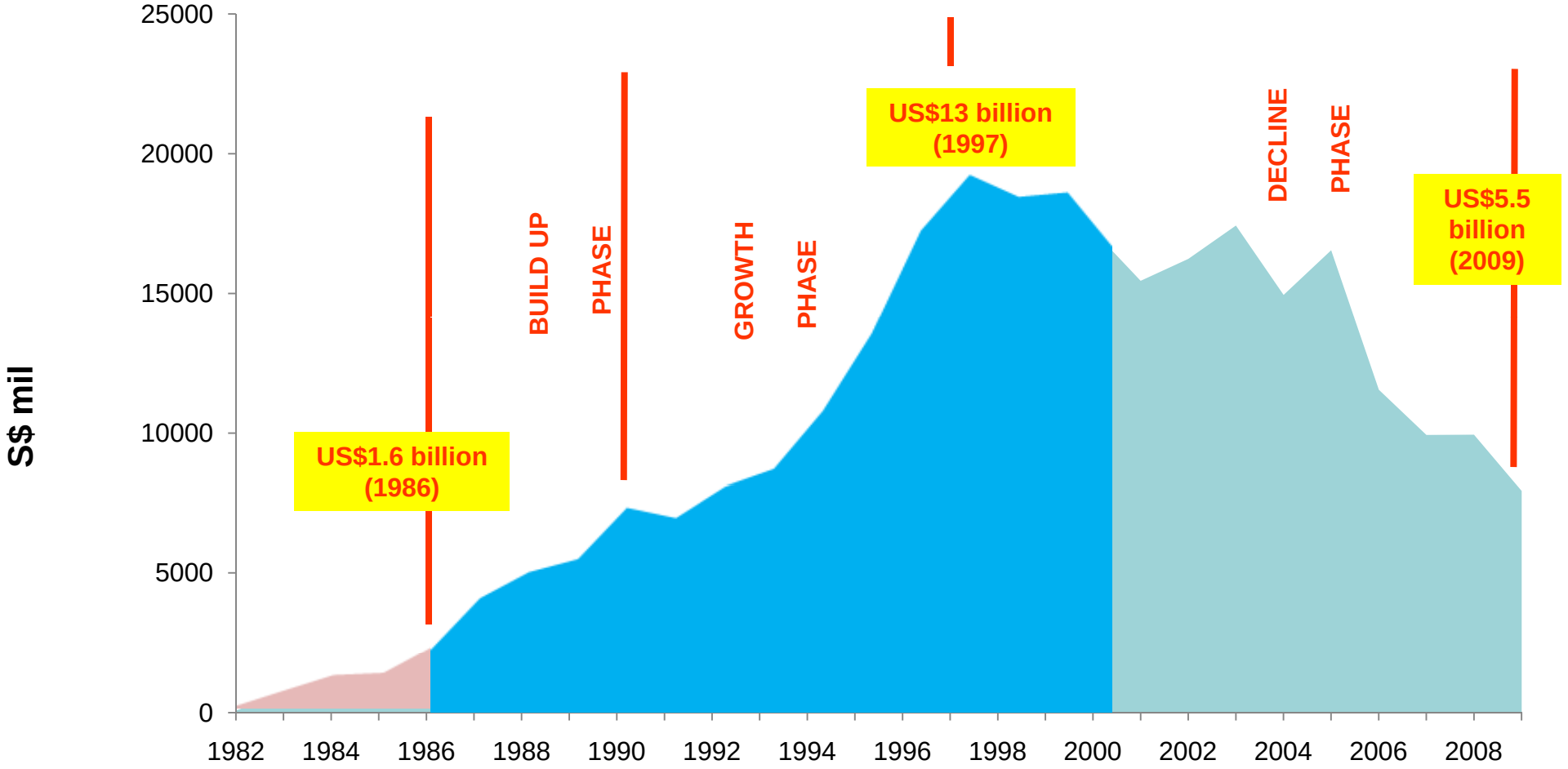
Knowledge-Intensive

2000+

Keep moving up !

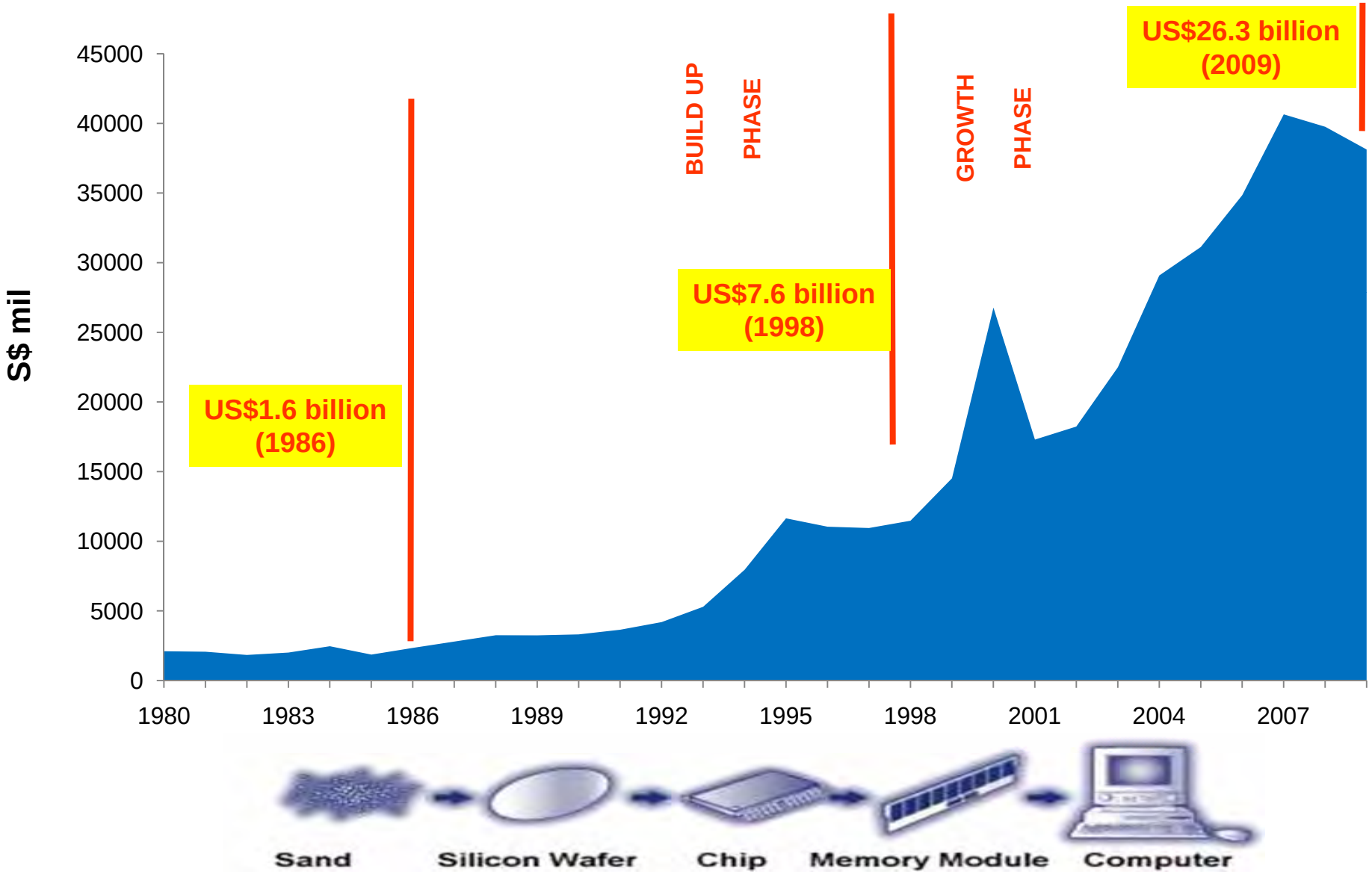
Building the Data Storage Industry Cluster

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



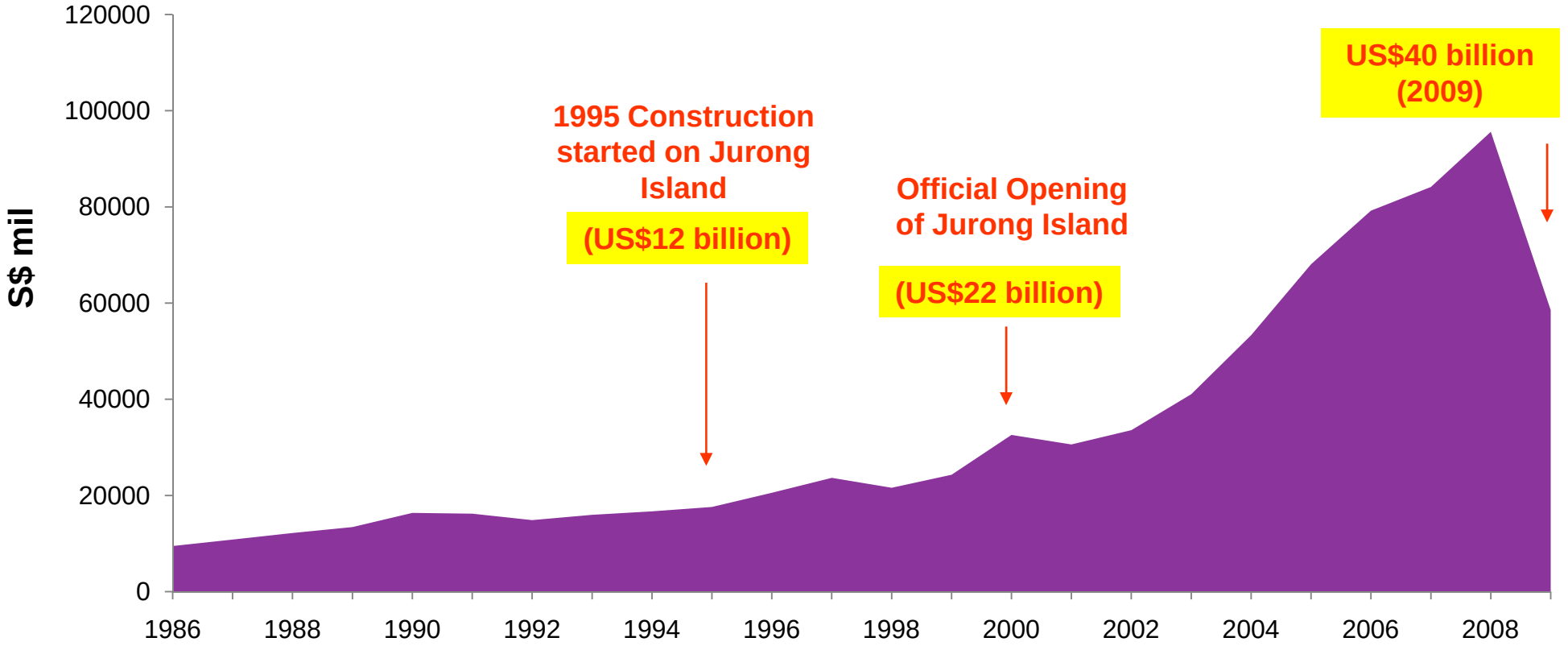
Building the Semiconductor Industry Cluster

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

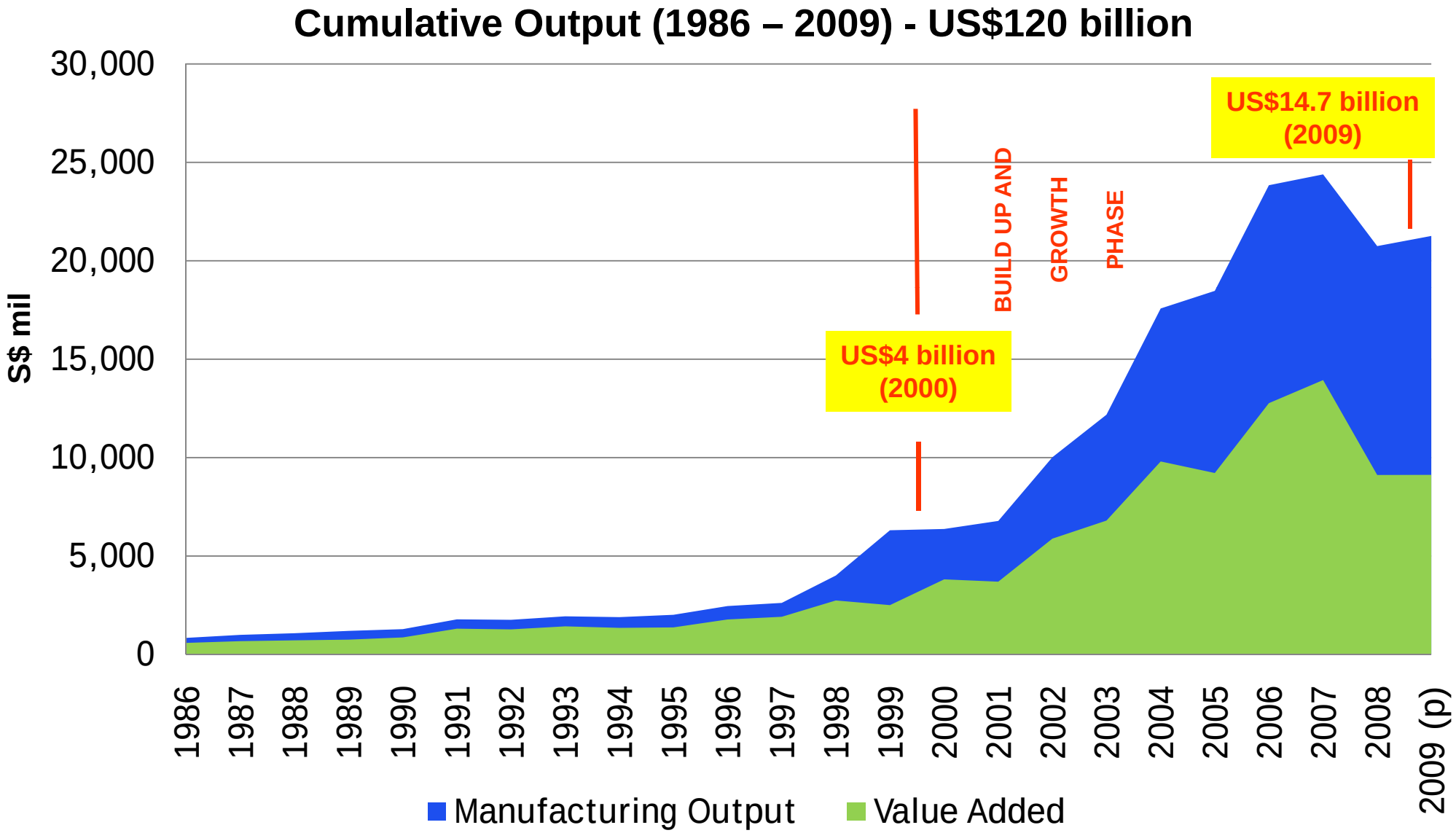


Building The Chemicals Industry Cluster

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

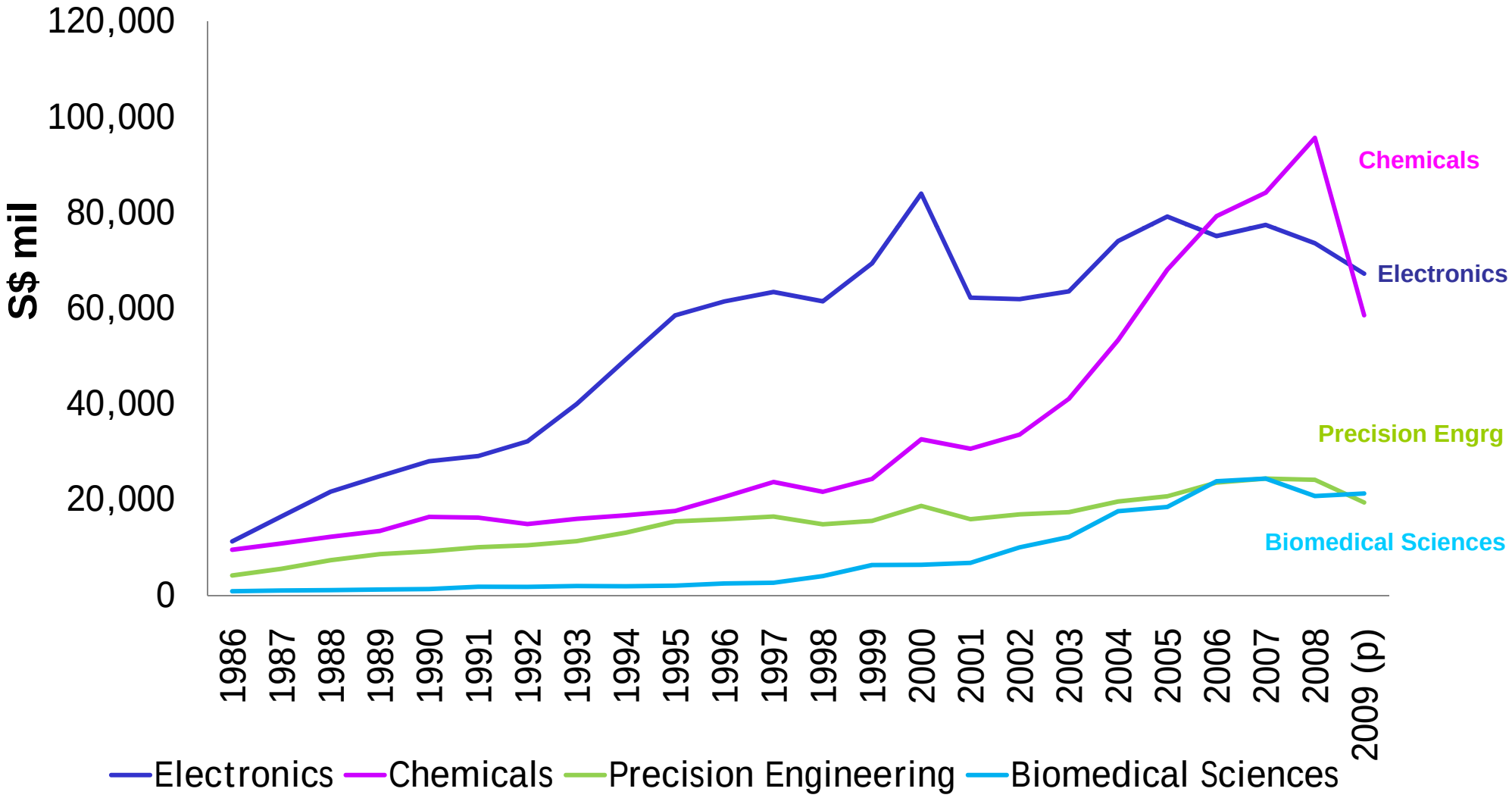


Building The Biomedical Sciences Industry Cluster

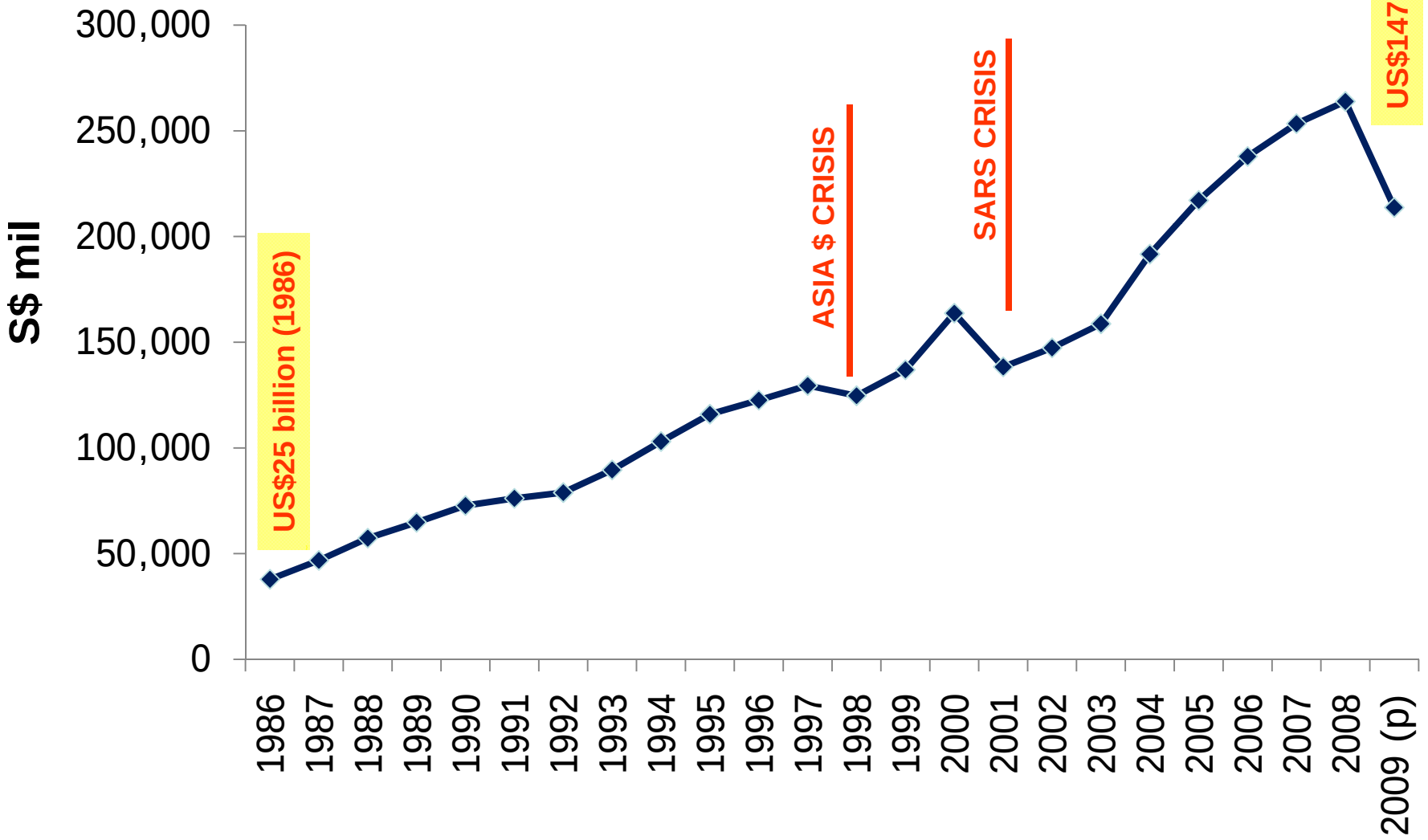


Manufacturing

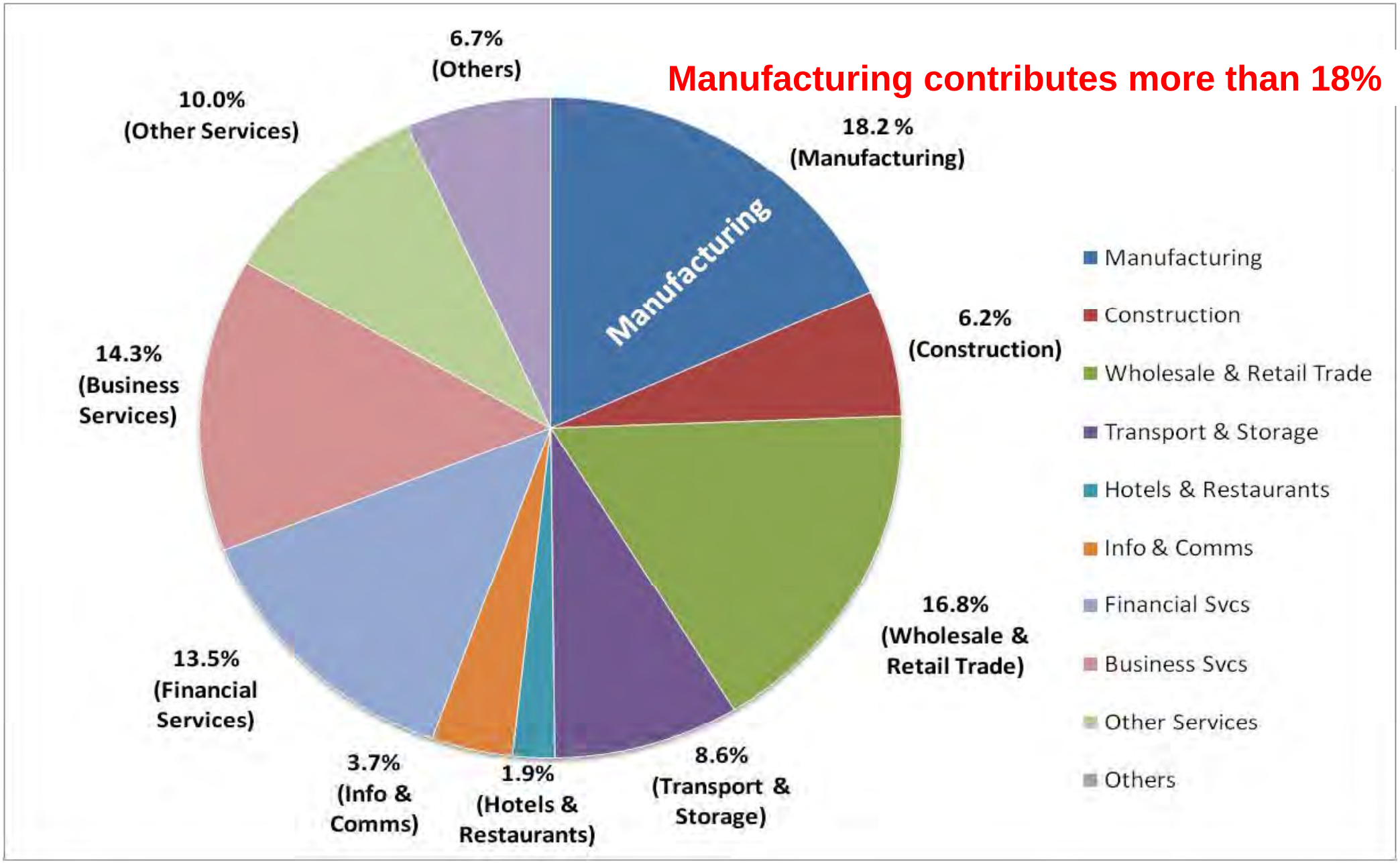
Total Manufacturing Output of 4 key clusters : US$115 billion (2009)



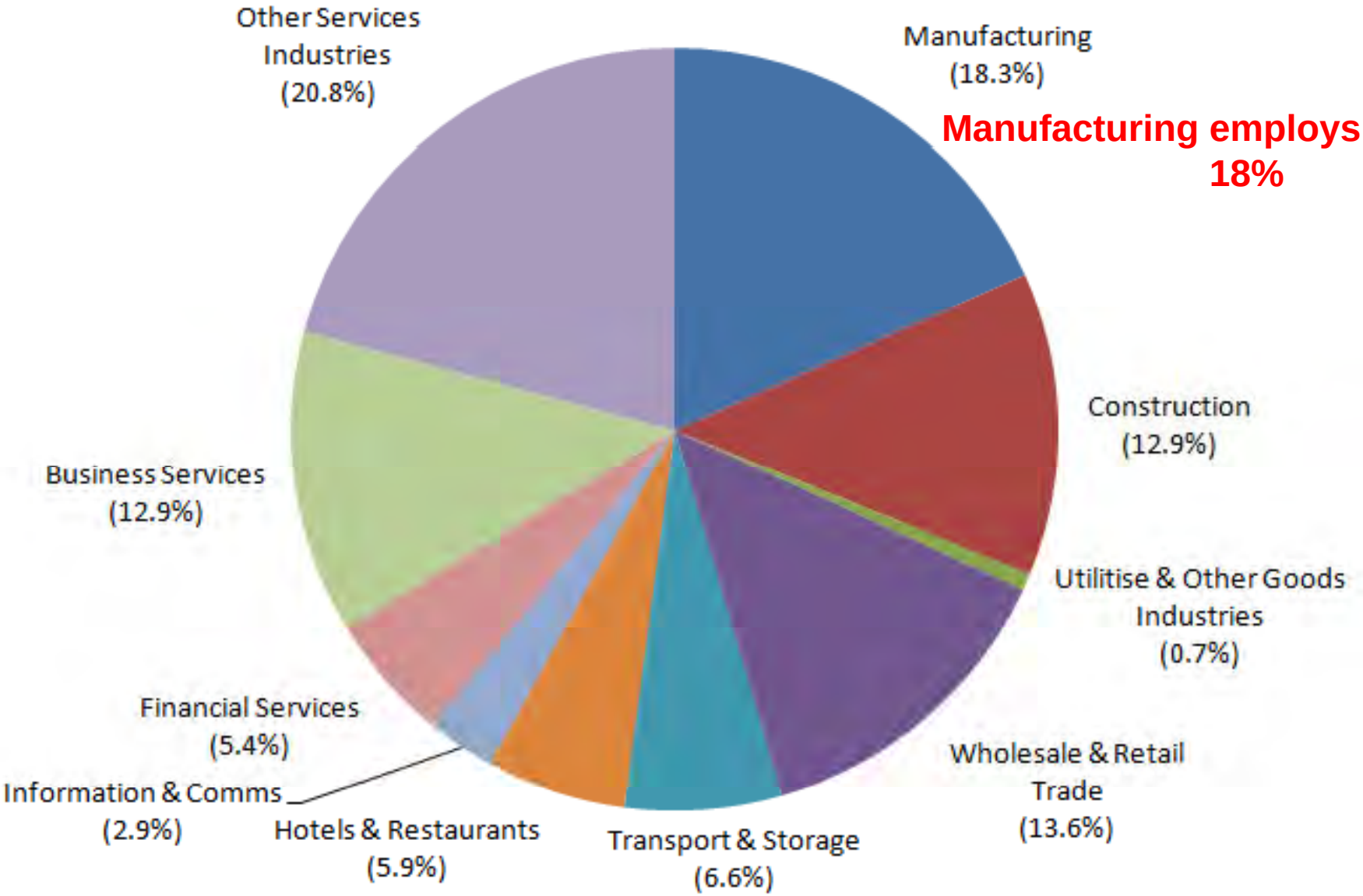
Total Manufacturing Output (1986 – 2009)



2009 GDP Pie (US$ 160 billion)



2009 Employment (2,952,500)*

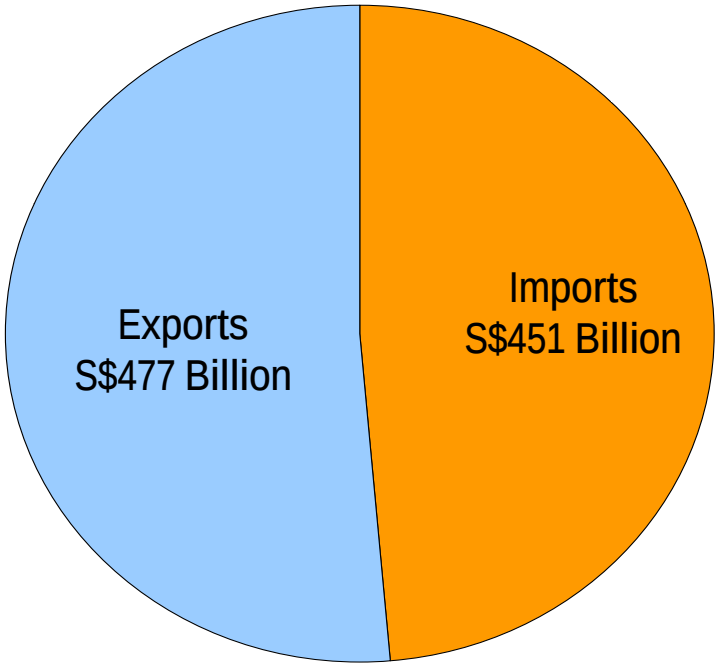


Manufacturing employs more than 18%

*As of 3rd Quarter 2009

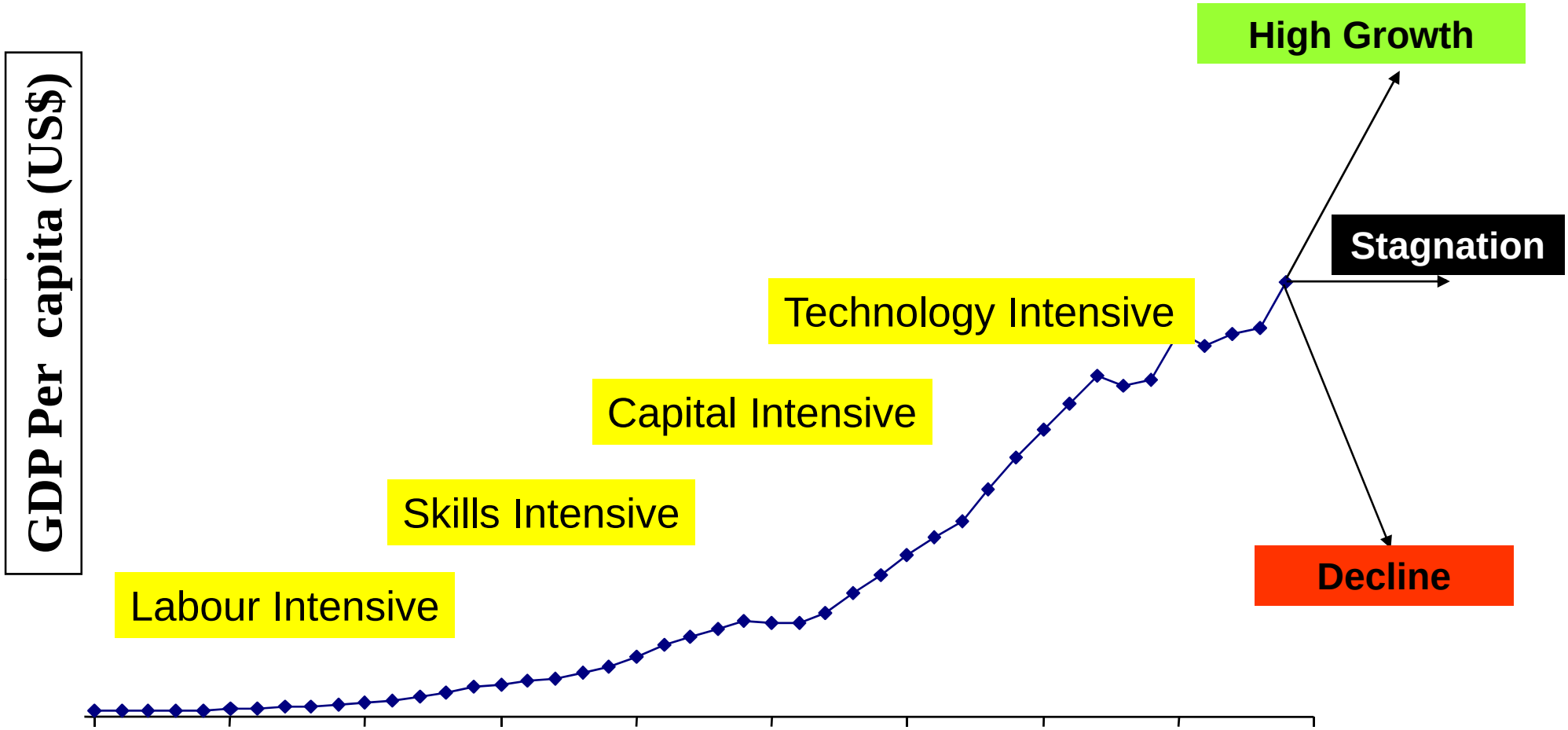
Singapore is highly trade-dependent:

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

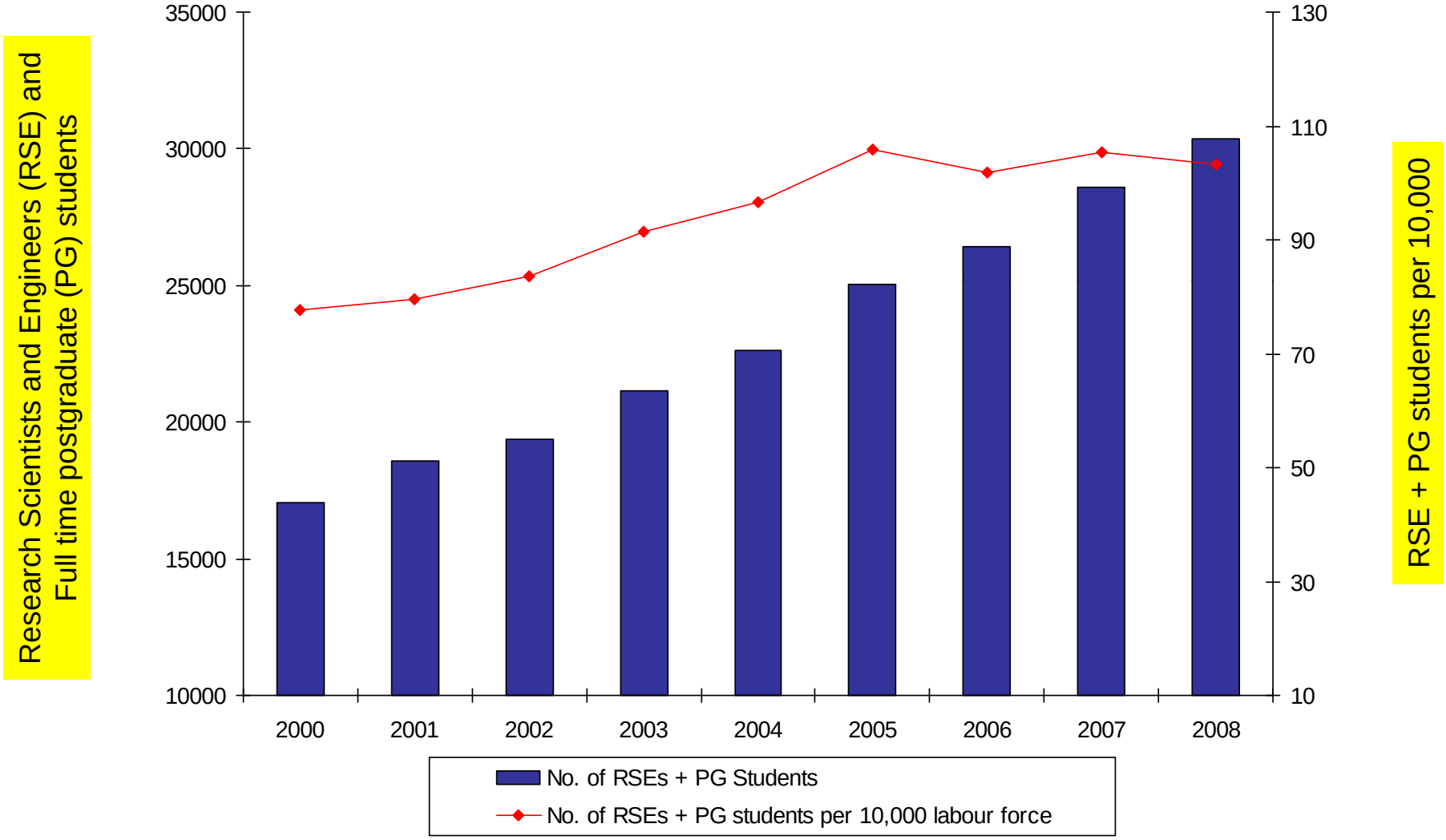
1986 – 2000:
Capability Building and Economic Diversification

2001 onwards:
Transforming to Knowledge-Based Economy

From Manufacturing to Knowledge-Based Economy

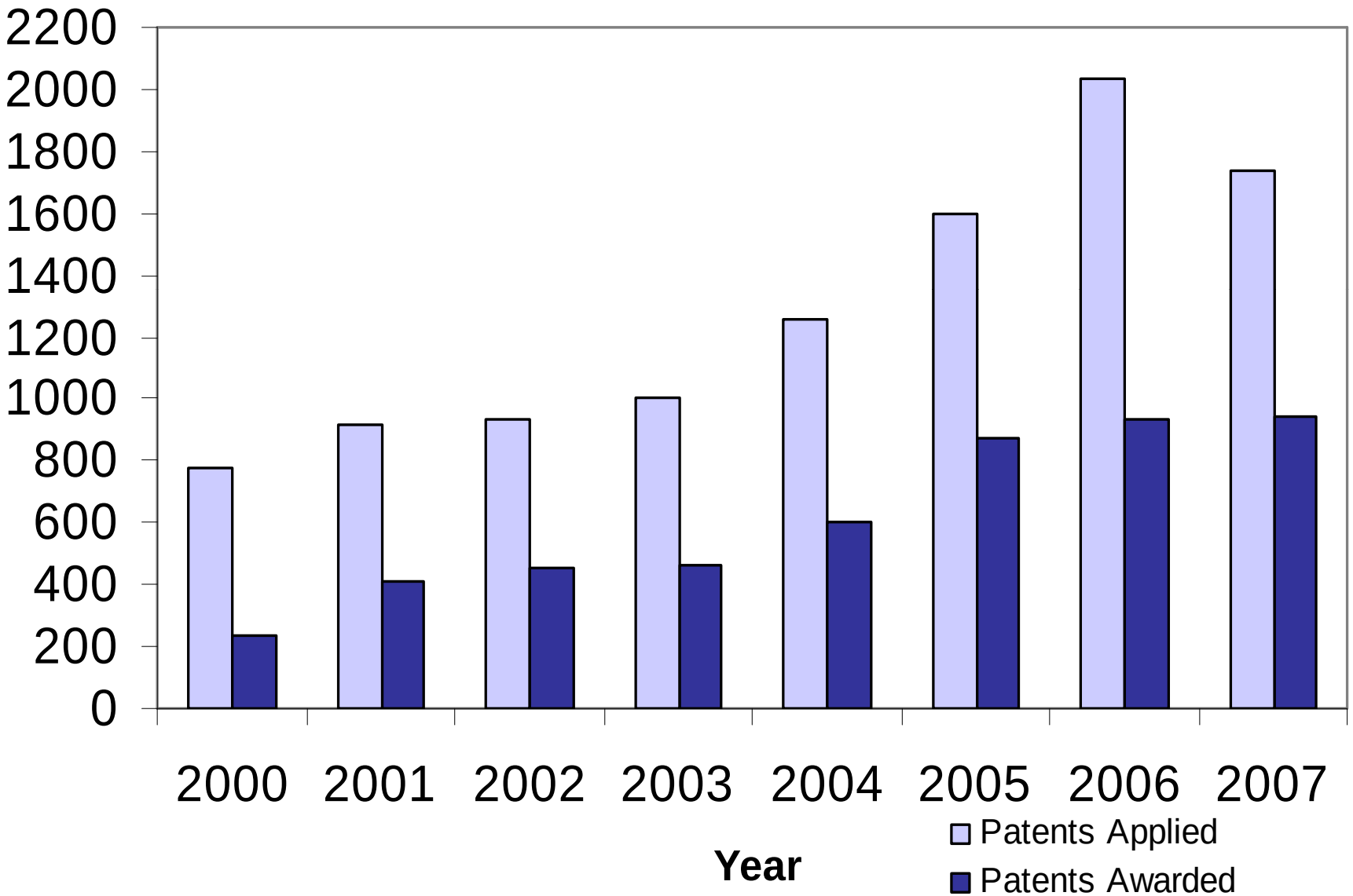
- An Economy based on cost efficiency is not sustainable in the long term
- Move up the Value chain with focus on high value-added activities
- Research → Development → Production → Marketing → Distribution → Servicing
- Graduate Education is a necessity for high value-added R&D-oriented industries

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

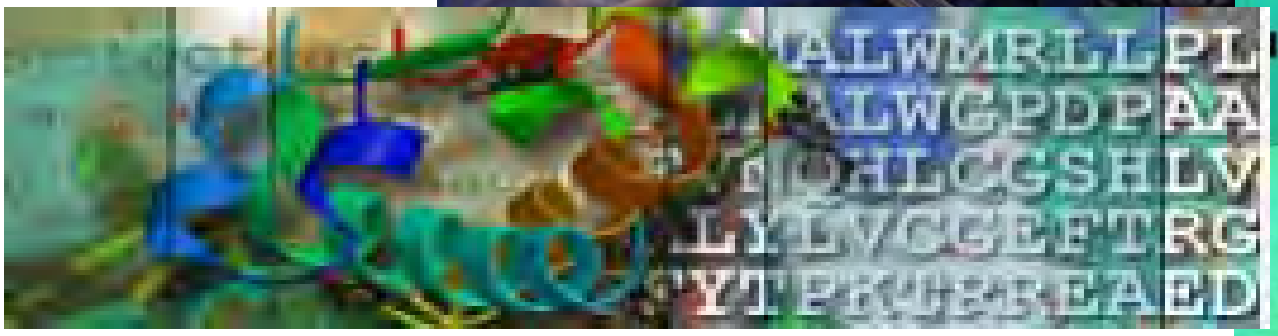


Source: Annual R&D Survey of Singapore

No. of Patents Applied / Awarded



Building up Biomedical Sciences



2001
A*STAR

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




Basic, Translational & Clinical Research → **Product & Process Development** → **Pilot & Commercial Manufacturing** → **Regional HQ & Shared Services** → **Healthcare Delivery**

A*STAR Biomedical Research Council

EDB SINGAPORE

MINISTRY OF HEALTH SINGAPORE

How It All Started….

Prof. John Wong

A/Prof. Kong Hwai Loong

Prof. Tan Chorh Chuan

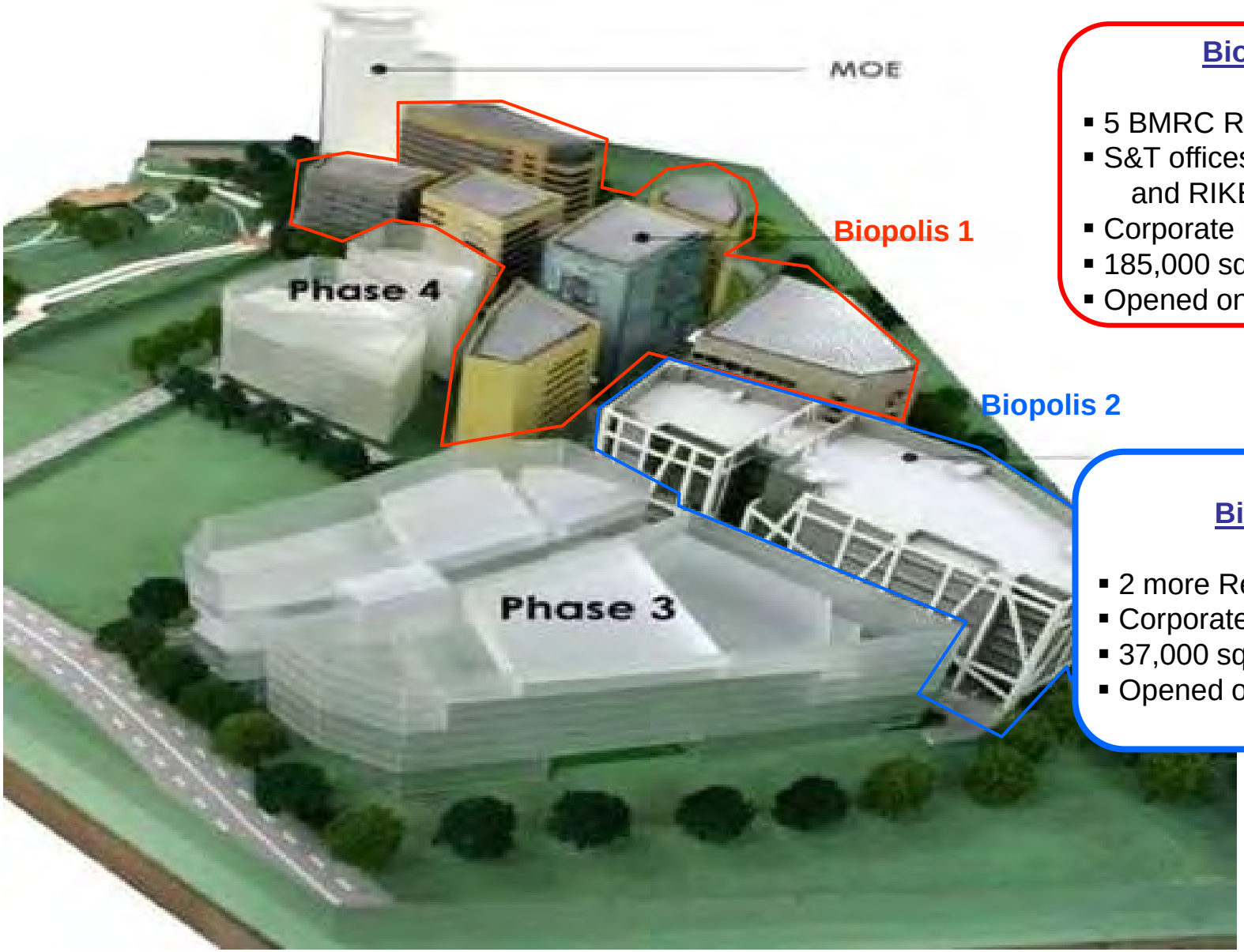
26thJune 2000

$1b push for life sciences

Aim is to attract top-notch R&D projects to S'pore; also in the works is new $60-m genomics programme

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

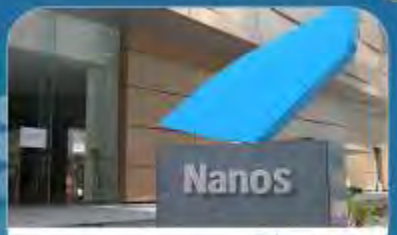

Helios

Chromos


Proteos

Research Community

BIOPOLIS



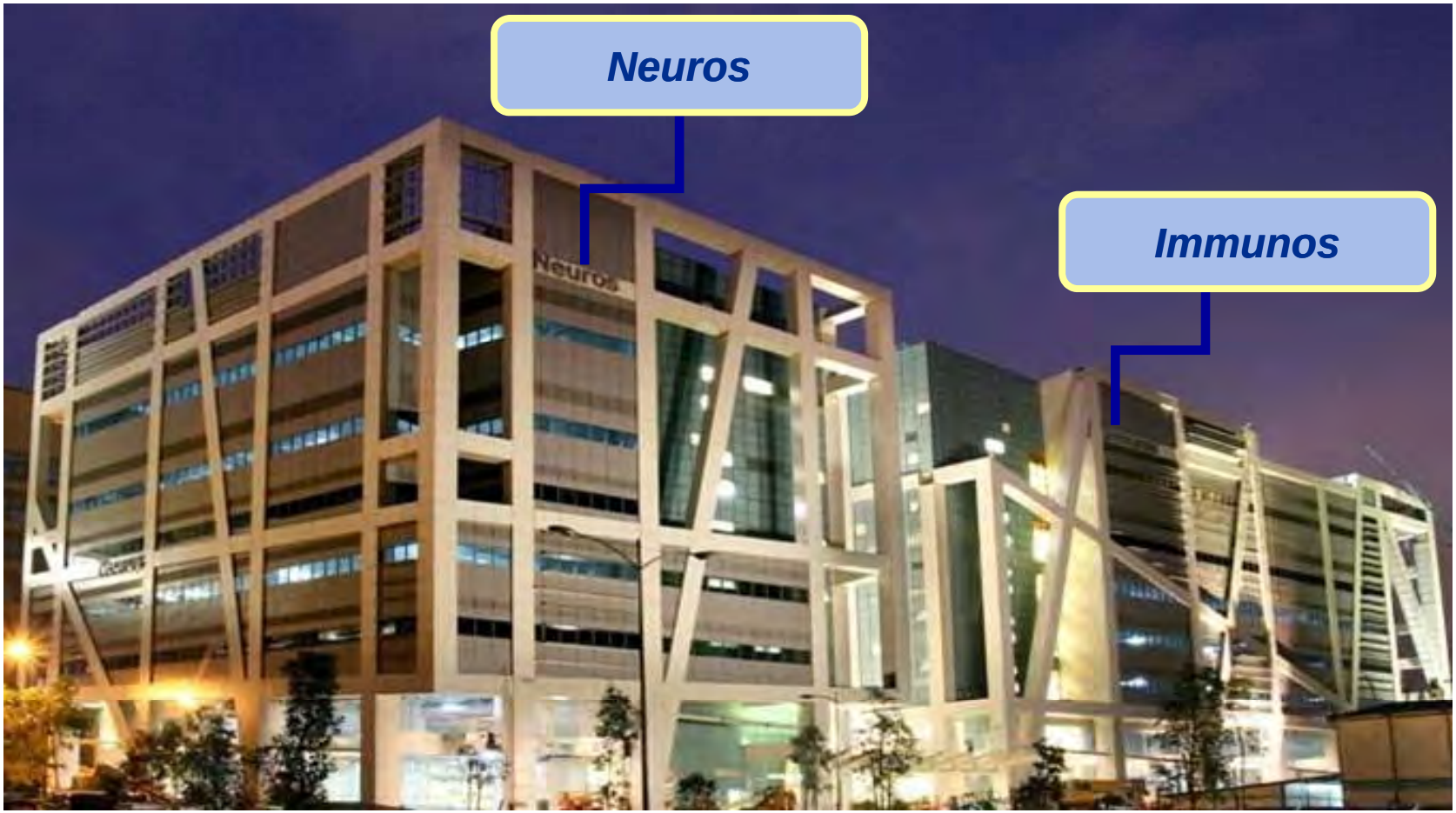
Nanos


Neuros & Immunos


Biopolis - The Biomedical Hub of Asia

Biopolis Phase 2

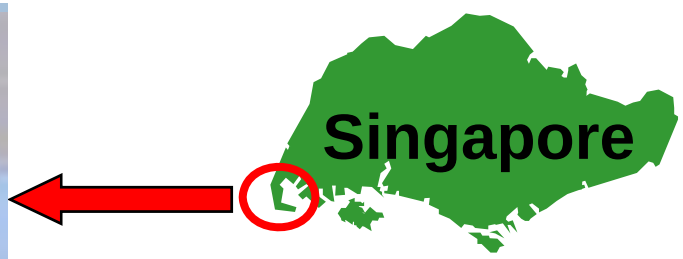
Enhancing Public-Private Sector Interactions



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

Biopolis Phase 3

Ready Land & Infrastructure

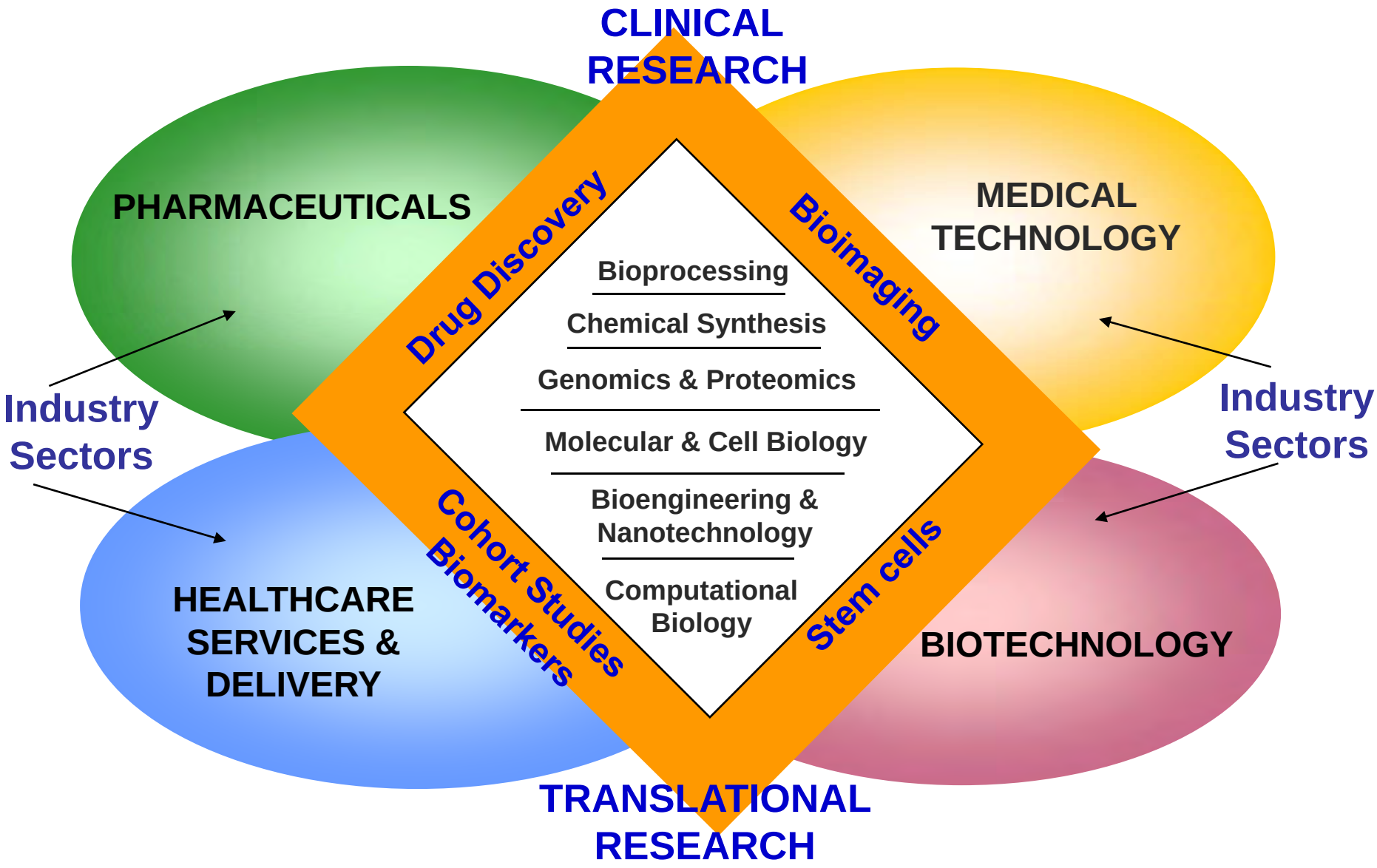


Tuas Biomedical Park

- **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



Bio*One SINGAPORE

EDB SINGAPORE

Co-investment, VC funding

RISC grants, infrastructure, tax breaks

INDUSTRY

Pharma | MEaT | Biotech | Clinical Trials

Overseas Clinical Trials

MTI

Drug discovery & devt
Med tech / devices
Biologics (cells / vaccines)

Singapore Clinical Trials

A*STAR Biomedical Research Council

MOH

MINISTRY OF HEALTH SINGAPORE

Mission-oriented BENCH

Research Institutes

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

Research Consortia

- SBIC
- SSCC
- SIgN
- 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 Enginering 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

SIgN = Singapore Immunology Network
SSCC = Singapore Stem Cell Consortium
STN = Singapore Tissue Network
SCS = Singapore Cancer Syndicate
SCCS = Singapore Consortium of Cohort Studies
DPF = Data Privacy Framework
BMS IF = Biomedical International Fellowship
CSI = Clincian Scientist Investigatorship
IRBs = Institutional Review Boards

BMRC Research Institutes

Phase 1 (2000-2005)

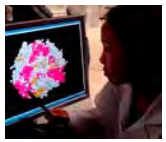
Phase 2 (2006-2010)

Institute of Molecular & Cell Biology

Before 2000

Genome Institute of Singapore

2000



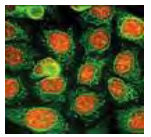
Bioinformatics Institute

2001

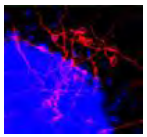
Institute of Bioengineering & Nanotechnology

Bioprocessing Technology Institute*

2003



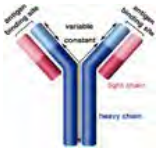
Singapore Bioimaging Consortium



Singapore Stem Cell Consortium

2005

Singapore Institute for Clinical Sciences



Singapore Immunology Network

2006

Experimental Therapeutics Centre

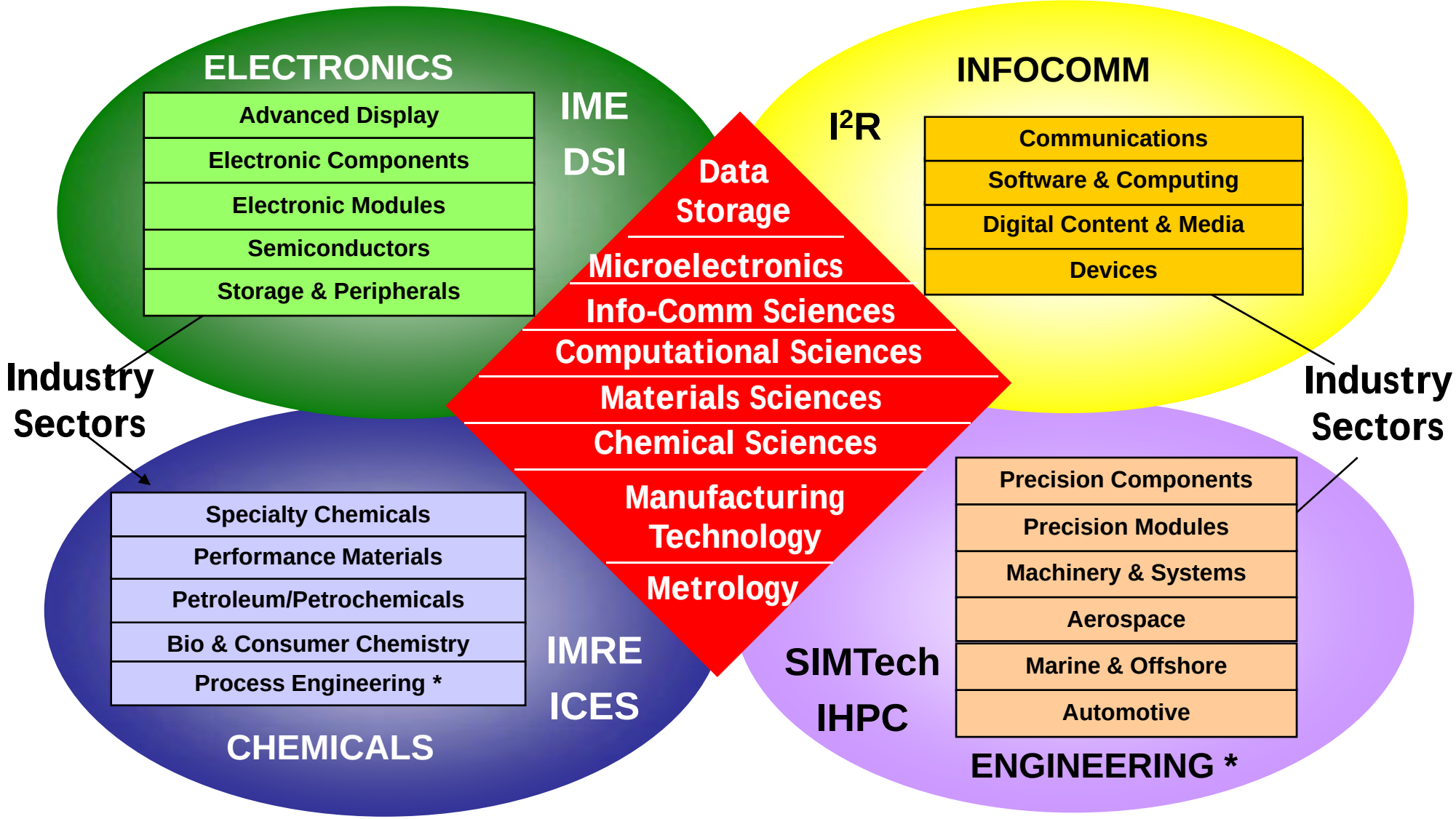
Institute of Medical Biology^

2007

*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

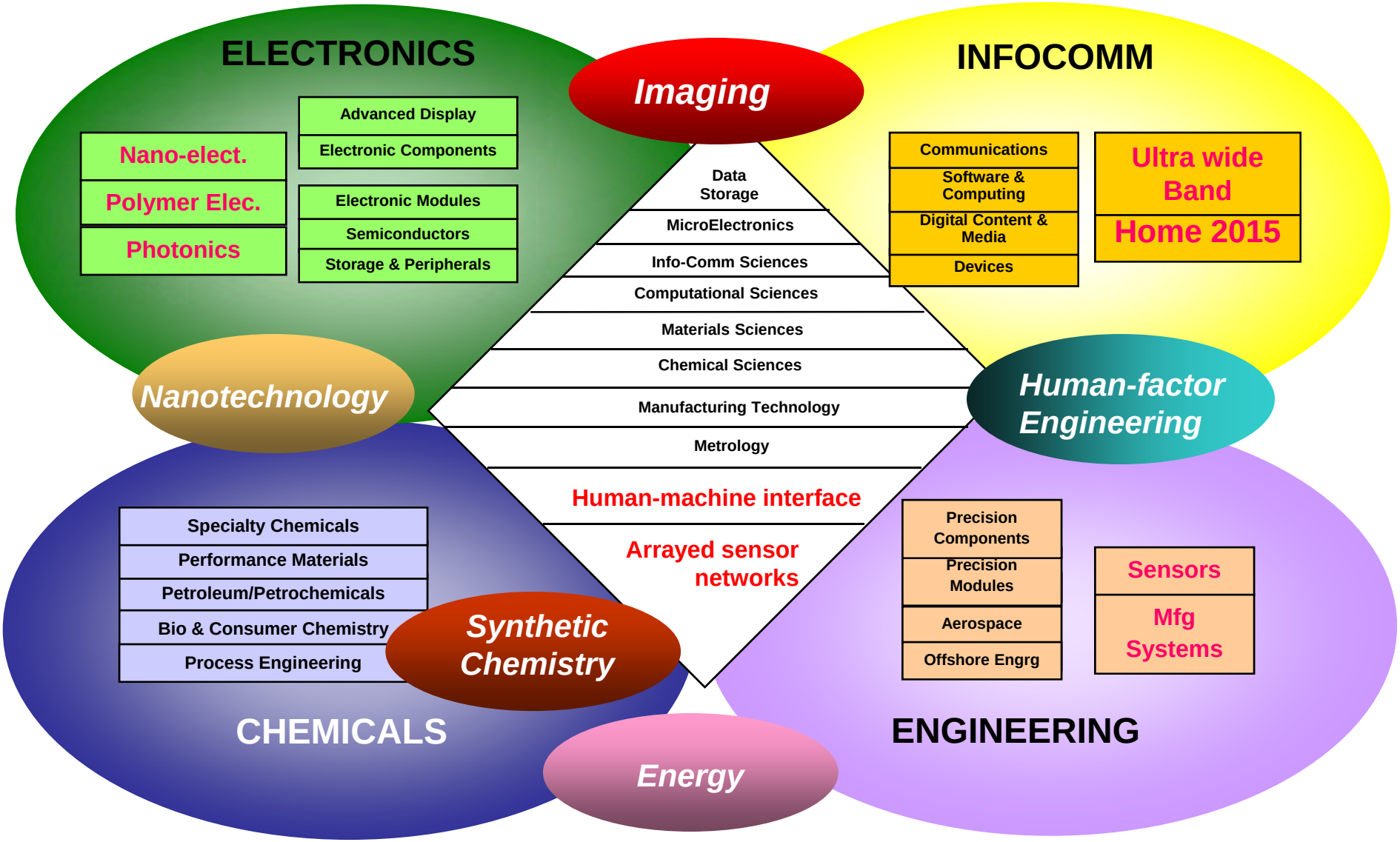
Science and Engineering Research Council



Alignment of SERC RIs to meet Industry Needs

History | KBE | Biomed | **S&E** | Talent | Enterprise

Developing New Competencies



SERC Research Institutes and Centres

Institute of Microelectronics (IME)

Institute of High Performance Computing (IHPC)

Institute for Infocomm Research (I^2R)

National Metrology Centre (NMC)

Singapore Institute of Manufacturing Technology (SIMTech)

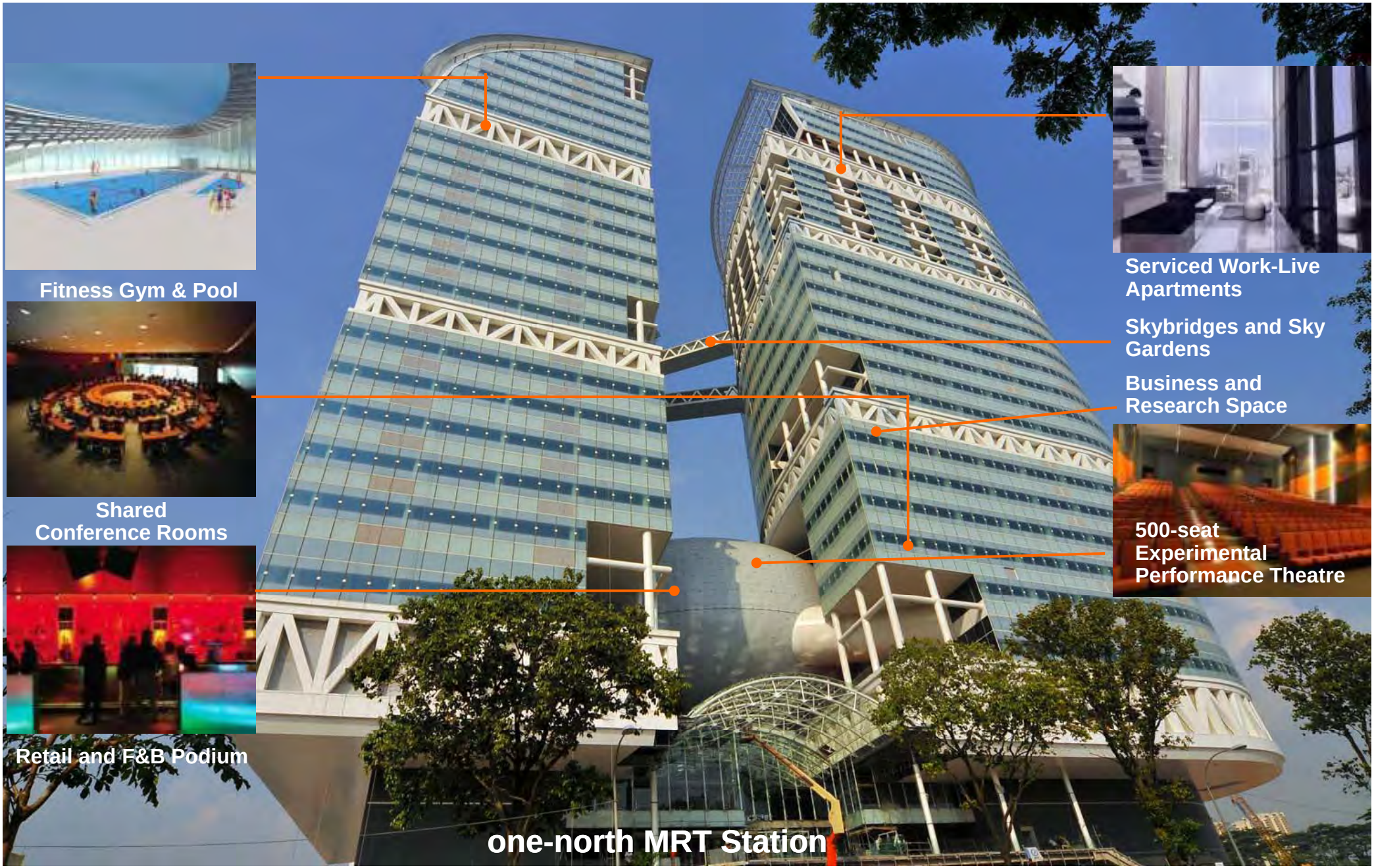
Data Storage Institute (DSI)

Institute of Materials Research & Engineering (IMRE)

Institute for Chemical & Engineering Sciences (ICES)

1989 1991 1996 1997 2002 2008

Fusionopolis Phase 1 Facilities



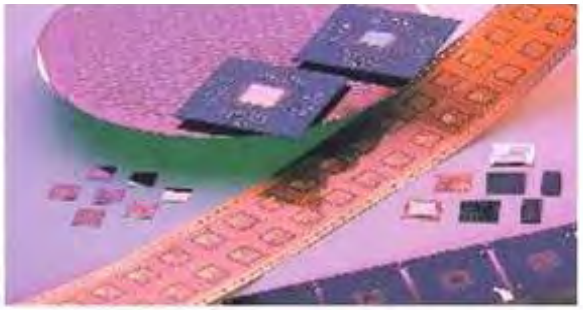
Fusionopolis Phase 2A

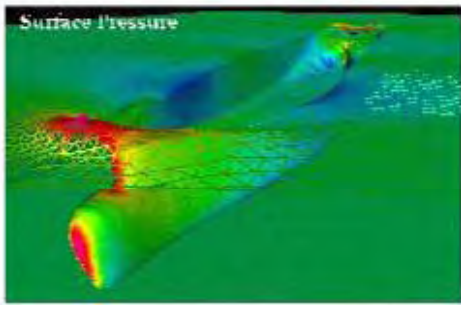
SPRING Singapore @Fusionopolis

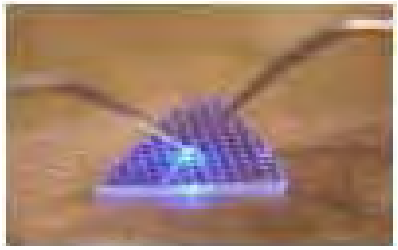

one-north Residences

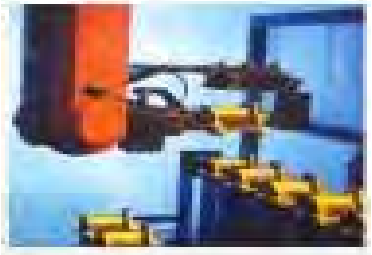

one-north Residences

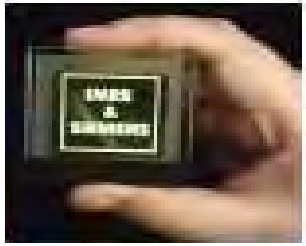
Fusion of Science and Engineering



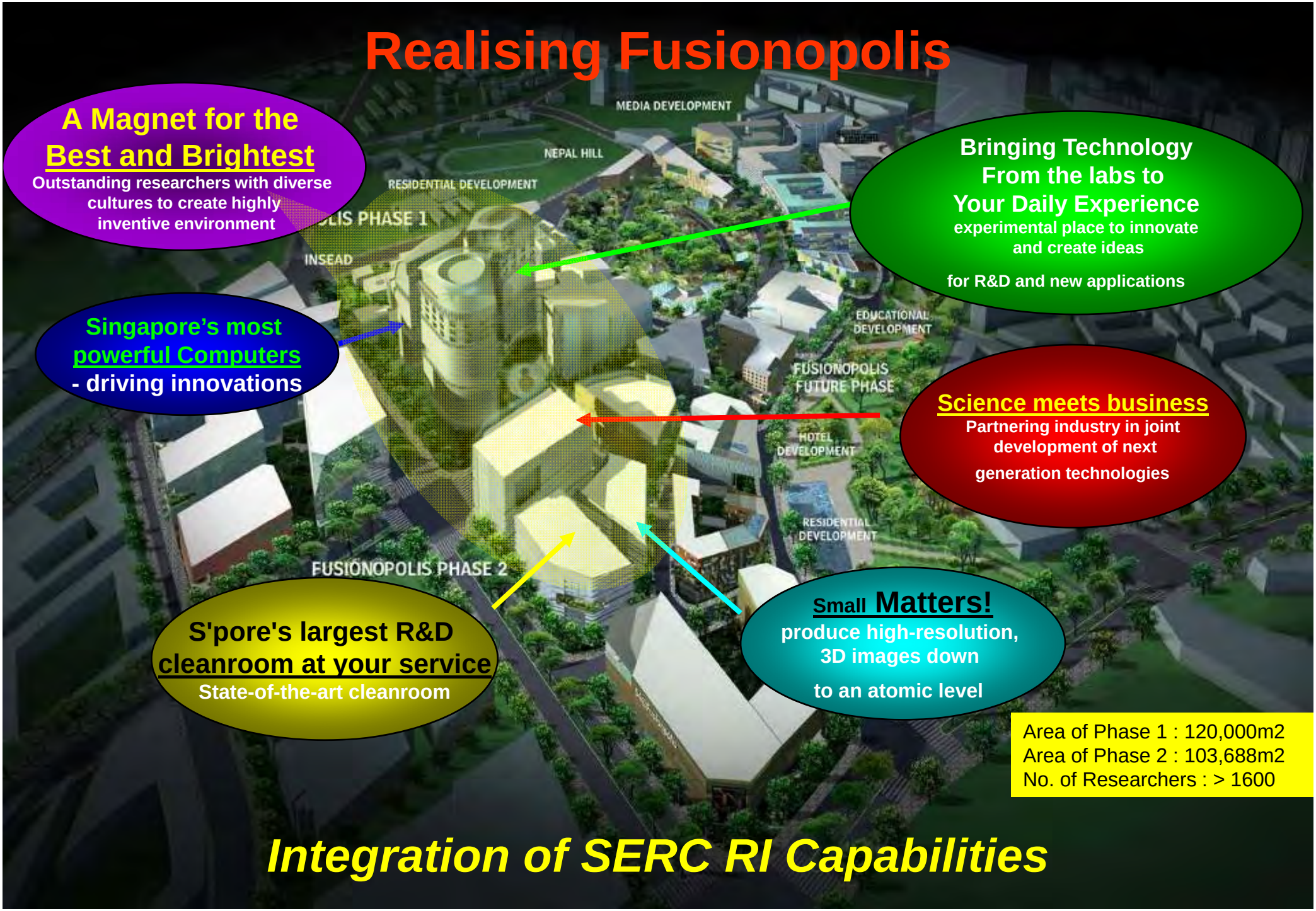








Realising Fusionopolis



A Magnet for the Best and Brightest
Outstanding researchers with diverse cultures to create highly inventive environment

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

Singapore's most powerful Computers
- driving innovations

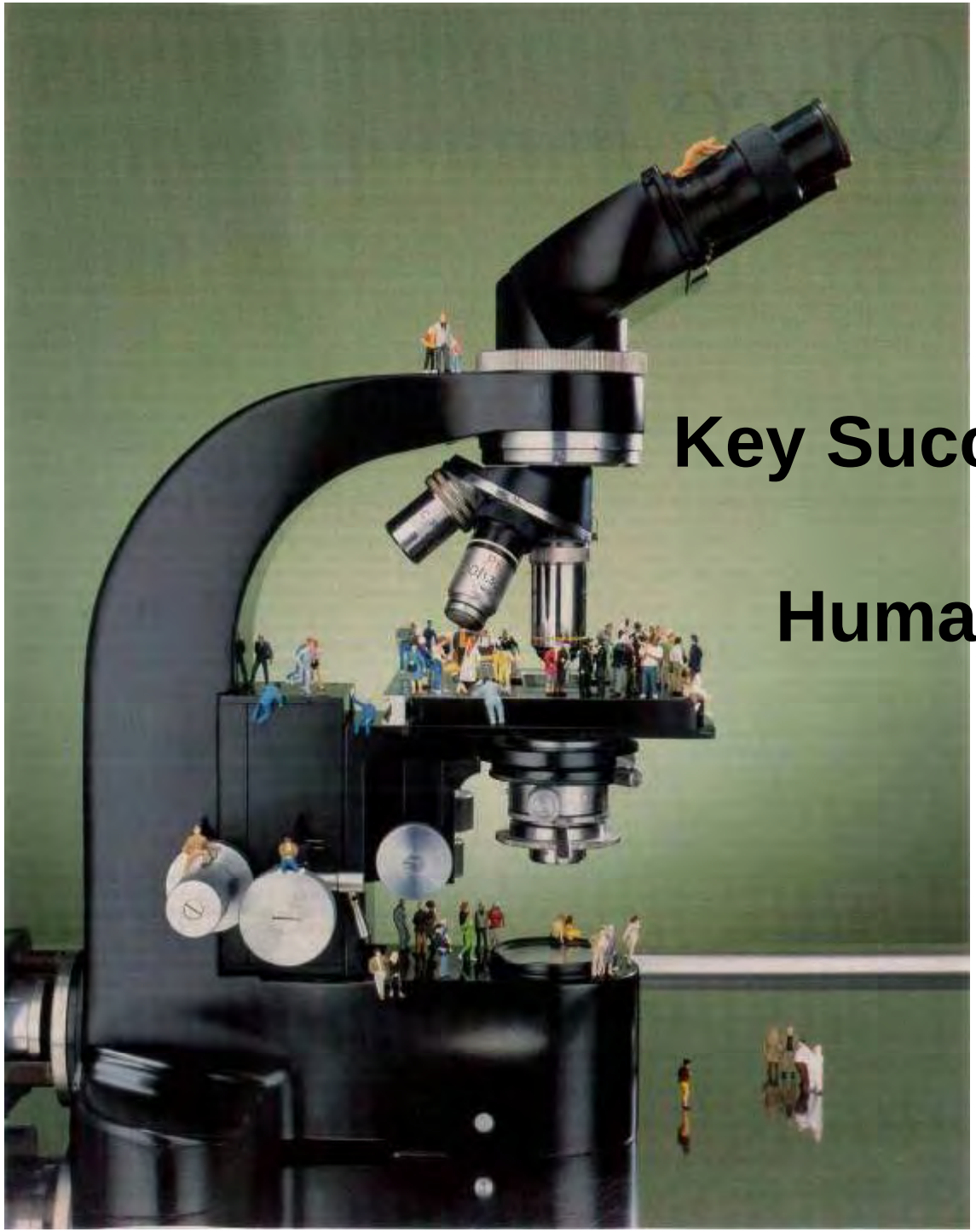
Science meets business
Partnering industry in joint development of next generation technologies

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

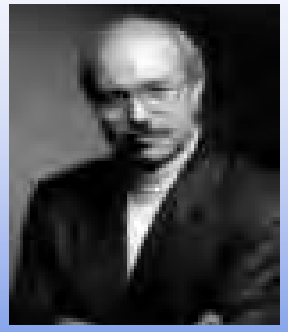
Area of Phase 1 : 120,000m2
Area of Phase 2 : 103,688m2
No. of Researchers : > 1600

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 Peter Gluckman


Dr Davor Solter


Dr Philippe Kourilsky


Dr Alan Colman


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

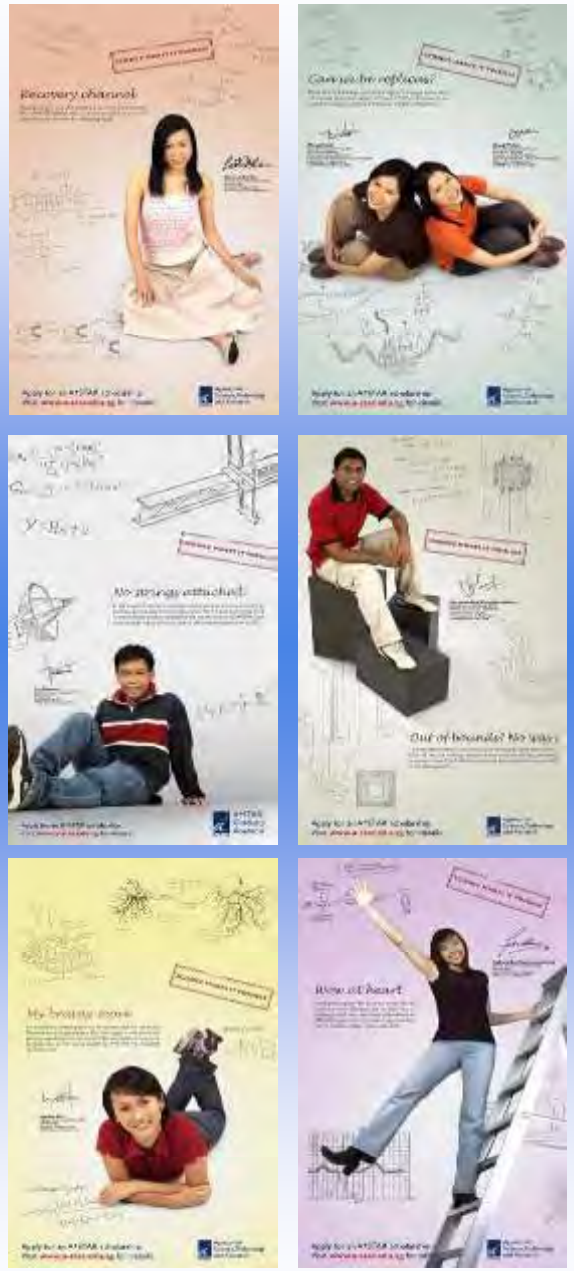

Dr Jean Paul Thiery


Dr Colin Blakemore


Dr Frank Eisenhaber


Dr Alex Matter

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



Human Capital – Train 1,000 PhD Guppies

Nurturing & Developing Human Capital (Guppies)

Talent Pipeline

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

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

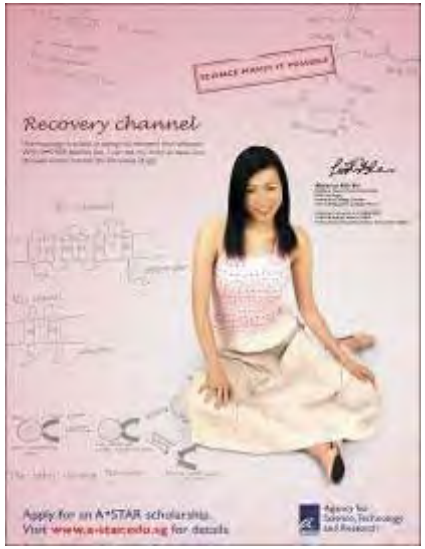
NSS(PhD) AGS SINGA

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

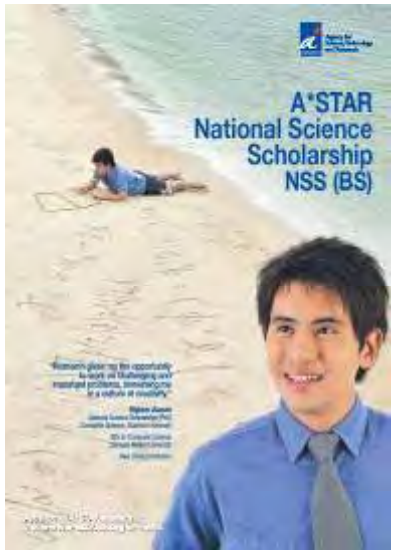
Stanford
Biochemistry

Duke
Medicine / PhD

Cambridge, London
Medicine / PhD

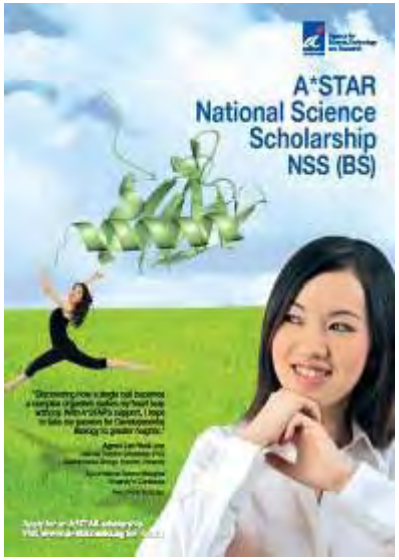
Carnegie-Mellon
Computer Science

Human Capital: Singapore Guppies



Stanford
Computer
Science,
PhD

Carnegie
Mellon
Computer
Science,
BSc

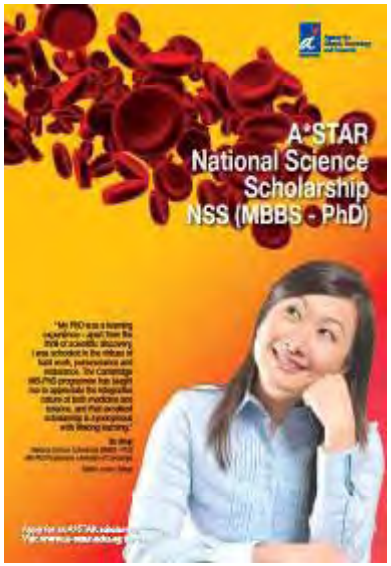


Stanford
Developmental
Biology
PhD

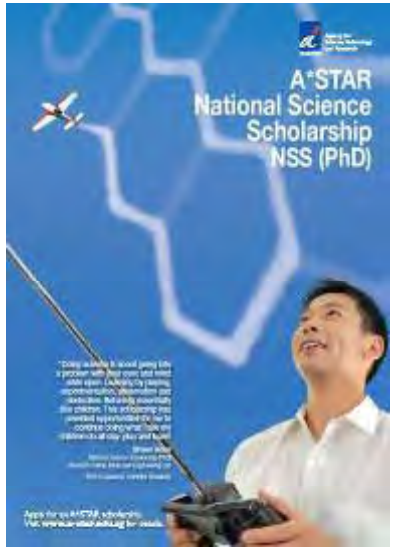
Cambridge
Natural Science
Biology
BSc

NUS
Biomedical
Sciences
PhD

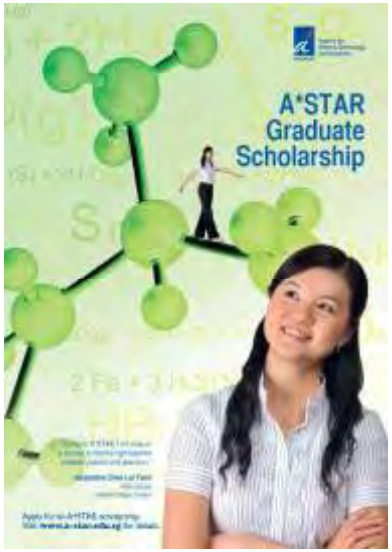
NTU
Biological
Sciences
BSc



Cambridge, London
Medicine/PhD



Stanford
Genetics
PhD



Imperial College London
Cancer Biology
PhD

Harvard
Stem cells
Post-Doc