Research and innovation lie at the very heart of the Biopolis research hub in Singapore, which fosters public-private partnerships in the biomedical sciences.

Join researchers and multinational companies from 70 countries as they work together to shape the future of the biomedical science industry.
A Global R&D Hub to Live, Work, Learn & Play

World Class Science
The Biopolis is a leading hub for research and innovation in Asia.

Singapore was ranked first in Asia and overall third in the Global Innovation Index 2011 Ranking.
Source: INSEAD Business School

Gateway To Asia’s Markets
Singapore is a well-connected global city with access to 3.4 billion Asian consumers, representing a combined US$20.6 trillion market.
Ease of Doing Business
Singapore is committed to providing strong protection for intellectual property. Companies at the Biopolis receive strong scientific business support and development opportunities.


Multicultural Research Hub
The Biopolis is a vibrant hub where top scientists and young researchers from 70 countries are making discoveries side by side.

Infrastructure & Support
For biopharma companies aiming to establish themselves in Asia, there are facilities and services to support your needs at different stages of growth.
BIOPOLIS FACTS

4,000,000
SQUARE FOOT RESEARCH HUB

38
BIOMEDICAL COMPANIES

10
RESEARCH INSTITUTES & CONSORTIA

>2,500
RESEARCHERS

70
COUNTRIES OF ORIGIN
Ten years ago, the Biopolis was built to position Singapore as Asia’s Biomedical Hub.

Today, working closely with the wider BMS and research community, public sector agencies and our industry partners, the biomedical sciences sector has grown by five-fold to a 30 billion dollar industry, providing many high value jobs for Singaporeans and bringing both economic and health benefits to our society and beyond.

Mr. Lim Chuan Poh
Chairman
Agency for Science, Technology and Research
The Biomedical Research Council

Established in October 2000, the mission of the A*STAR Biomedical Research Council (BMRC) is to transform Singapore’s biomedical sciences cluster by drawing on its unique strengths and differentiating advantages to generate economic impact and innovative healthcare solutions.

Our ingredients for success: high impact science, translation to the patient, and relevance to industry.

Prof. Sir George Radda
Chairman, Biomedical Research Council
Founding Executive Director, Singapore Bioimaging Consortium

Dr. Benjamin Seet
Executive Director
Biomedical Research Council
Prof. Sir David Lane
A*STAR Chief Scientist
p53 Laboratory

Prof. Edward Holmes
BMRC Deputy Chairman

Prof. Frank Eisenhaber
Bioinformatics Institute

Prof. Lam Kong Peng
Bioprocessing
Technology Institute

Prof. David Townsend
Clinical Imaging Research Centre

Prof. Alex Matter
Experimental Therapeutics Centre

Prof. Ng Huck Hui
Genome Institute of Singapore

Prof. Jackie Y. Ying
Institute of Bioengineering and
Nanotechnology

Prof. Birgit Lane
Institute of Medical Biology

Prof. Hong Wanjin
Institute of Molecular and Cell
Biology

Prof. Laurent Rénia
Singapore Immunology Network

Prof. Sydney Brenner
Molecular Engineering Lab

Prof. Judith Swain
Singapore Institute for
Clinical Sciences

Prof. Michael Hayden
Translational Laboratory In
Genetic Medicine
IMCB: Institute of Molecular and Cell Biology (founded in 1987)
GIS: Genome Institute of Singapore (founded in 2000)
BII: Bioinformatics Institute (founded in 2001)
BTI: Bioprocessing Technology Institute (founded in 2003)
IBN: Institute of Bioengineering and Nanotechnology (founded in 2003)
SBIC: Singapore Bioimaging Consortium (founded in 2004)
ETC: Experimental Therapeutics Centre (founded in 2006)
SICS: Singapore Institute for Clinical Sciences (founded in 2007)
IMB: Institute of Medical Biology (founded in 2007)
SIgN: Singapore Immunology Network (founded in 2008)

A 4.5-day-old mouse embryo consisting of 128 cells from three different cell types.
Courtesy of Dr. Roy Teo (GIS)

A histological section of a mouse arterial bifurcation containing red blood cells.
Courtesy of Dr. Thomas Lufkin (GIS)
Our Core Research Strengths

Pharmaceuticals
Development of small molecule therapeutics

Biotechnology & Biologics
Development of protein-based therapeutics

Medical Technology
Medical devices, IT, diagnostics

Personal Care & Nutrition
Nutrition and skin biology research with a focus on the Asian phenotype
Prof. Wang Yue (IMCB)
President’s Science Award 2012

Dr. Patricia Ng (SIgN)
UNESCO-L’Oréal International Fellowship 2012

Dr. Bruno Reversade (IMB)
EMBO Young Investigatorship Award 2012
KEY RESEARCH FIGURES

>700 PUBLICATIONS PER YEAR

300 IMPACT FACTOR > 5 PUBLICATIONS PER YEAR

81 INDUSTRY PROJECTS IN 2012

76 PATENTS FILED IN 2012

44 LICENSED PATENTS IN 2012

Dr. Jonathan Loh Yui-Han (IMCB)
TR35@Singapore Award 2012
Singapore Youth Award 2010
State-of-the-Art Lab Space
There are office and laboratory spaces available for rent, ranging from multi-tenant buildings to individual building plots.

Lab Equipment & Supplies
The Biopolis Shared Facilities provides lab support services such as histopathology, nuclear magnetic resonance, mass spectrometry, X-ray crystallography, flow cytometry and microarrays.

Pre-Clinical Facilities
Zebrafish, rodent, large animal and non-human primate facilities are available for both small and large animal studies, along with veterinary research support.

Bioimaging Facilities
Facilities range from pre-clinical imaging at the Translational Imaging Industrial Laboratory to advanced clinical imaging at the Clinical Imaging Research Centre and high resolution imaging at the Joint IMB-IMCB Electron Microscopy Suite.
Genomic Technologies
The Genome Institute of Singapore has strong research capabilities in functional genomics, optical mapping, single cell analytics, high throughput genotyping, deep sequencing and computational biology.

Biomarker Validation
The Advanced Molecular Pathology Laboratory is a collaboration between A*STAR and SingHealth to provide histopathology consultation and biomarker validation in pre-clinical and clinical samples.

Natural Products Library
The natural product collection comprises over 300,000 extracts derived from over 129,000 living microbial strains and 38,750 plant specimens for drug discovery and development.

Clinical Immune Monitoring
The Clinical Immunomonitoring Platform uses genomic, proteomic and proprietary cell-based assays for the comprehensive assessment of immune status during disease and therapy.
Every day, thousands of researchers come together at the Biopolis to make new discoveries and tackle complex biological problems in our core research areas of...
INNOVATIVE MEDICINES AND BIOLOGICS

Key Technologies

- Drug Discovery & Development
- Biomarkers & Stratified Medicine
Small Molecule Drug Discovery & Development

Drug Discovery & Development (D3) Programme
The D3 programme, headed by Prof. Alex Matter, facilitates preclinical development and early clinical trials up to Proof-of-Concept (PoC) in man.

A Vaccine Developed in Singapore in Clinical Trials
A H1N1 virus-like particle vaccine developed under the D3 programme entered into Phase I clinical trials in May 2013.

Scanning electron micrograph of the virus-like particle used in Singapore’s first H1N1 influenza vaccine.
**Biological Drug Discovery & Development**

**Therapeutic Antibody Drugs**
Researchers at the Biopolis have developed a pipeline of human therapeutic antibodies against more than 600 targets.

**Therapeutic antibody pipeline***

<table>
<thead>
<tr>
<th>Therapeutic Area</th>
<th>Discovery</th>
<th>Characterisation</th>
<th>Optimisation</th>
<th>In vivo efficacy</th>
<th>Pre-clinical</th>
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<tbody>
<tr>
<td>Oncology</td>
<td>Anti-PRL-3 (IMCB)</td>
<td></td>
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<tr>
<td>Inflammation</td>
<td>Anti-IL-1β (SIgN)</td>
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<tr>
<td>Inflammation</td>
<td>Anti-DKK-1 (SIgN)</td>
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<tr>
<td>Infectious Disease</td>
<td>Chikungunya Virus (SIgN)</td>
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<tr>
<td>Oncology</td>
<td>Cancer Stem Cells (BTI)</td>
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<tr>
<td>Glycobiology</td>
<td>Tumour Initiating Cells (SIgN)</td>
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<tr>
<td>Regenerative Medicine</td>
<td>Human Corneal Endothelial Cells (BTI)</td>
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<tr>
<td>Infectious Disease</td>
<td>H5N1 Influenza Virus (IMCB)</td>
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<tr>
<td>Oncology</td>
<td>Triple-Negative Breast Cancer (BTI)</td>
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<tr>
<td>Inflammation</td>
<td>Anti-Muramyl Peptides (IMCB)</td>
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<tr>
<td>Infectious Disease</td>
<td>Dengue Virus (SIgN)</td>
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<tr>
<td>Oncology</td>
<td>Anti-C-Kit (IMCB)</td>
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</table>

**Glycobiology**
GlycoSing, a new centre for glycobiotechnology and glycomics at the BTI, aims to establish high throughput technologies for characterising sugar moieties on biologic drugs and study the specific roles of glycosylation in diseases such as cancer and diabetes.

**Novel Protein Purification Techniques**
The BTI-led New Technology for Purification of Biopharmaceuticals aims to develop novel technologies for the purification of recombinant proteins and vaccines at a faster rate, reduced cost and greater purity.

**Chugai Pharmabody Research**
In 2012, Chugai Pharmaceutical Co., Ltd. opened a S$200 million laboratory at the Biopolis to screen for therapeutic antibody drug candidates.

"Chugai chose to set up a second research lab (in the Biopolis) because we felt we could carry out our project most swiftly here, hire many talented scientists, and also expect strong support from the Singapore government."

---

**Mr. Koichi Matsubara**
Chief Executive Officer
Chugai Pharmabody Research Pte Ltd
Biomarkers & Stratified Medicine

Polaris
POLARIS is a large clinical -omics project involving A*STAR researchers and colleagues at the National Cancer Centre and NUHS.

The POLARIS team, led by Prof. Patrick Tan, Senior Group Leader at GIS, aims to establish clinically-certified laboratories for OMICS assays, with an initial focus on common Asian diseases such as lung cancer.

Companion Diagnostics Project
The ETC- and D3-based Companion Diagnostics project aims to develop prognostic and predictive biomarkers for targeted treatment. It leverages on Singapore’s strength in gastric, liver and haematopoietic cancers.

Biomarkers for four drug candidates being tested and validated for use:

<table>
<thead>
<tr>
<th>Target</th>
<th>Stage</th>
<th>Disease</th>
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<tbody>
<tr>
<td>SMYD</td>
<td>Assay Development</td>
<td>Hepatocellular Carcinoma</td>
</tr>
<tr>
<td>Wnt/porcupine</td>
<td>Lead Optimisation</td>
<td>Gastric Cancer</td>
</tr>
<tr>
<td>Mnk1/2</td>
<td>Lead Optimisation</td>
<td>Blast Crisis Chronic Myeloid Leukemia</td>
</tr>
<tr>
<td>c-Met</td>
<td>Phase 1 ready</td>
<td>Gastric Cancer</td>
</tr>
</tbody>
</table>

Rare Genetic Diseases
Dr. Bruno Reversade, IMB colleagues and industry partners are studying rare genetic diseases to find new diagnostic biomarkers and therapeutic targets for common diseases.

“Stratified medicine: Matching the right patient to the right treatment”

An immunofluorescence image of fat cells during adipocyte differentiation, showing large lipid droplets (green) and the microtubule cytoskeleton (red). 

Courtesy of Dr. Yang Wulin (SBIC)
MEDICAL TECHNOLOGIES

Key Technologies

- Cell-Based Diagnostics
- Drug Screening & Development
- Cancer Detection
- Infectious Disease Diagnostics
Cell-Based Diagnostics

Circulating Tumour Cells
Researchers at IBN and GIS are developing devices to capture and isolate circulating cancer cells for single-cell genomics analysis.

Single Cell Genomics
In April 2013, GIS and Fluidigm Corporation established the GIS-Fluidigm Single-Cell Omics Centre to study single cells for applications in disease diagnostics and treatment.

Drug Screening & Development

Drug Screening Technologies
Curiox Biosystems was spun off from IBN in 2008. The company has a range of patented miniaturised bioassay technologies.

Cancer Detection

Non-Invasive Study of Liver Fibrosis
HistolIndex Pte Ltd, a spin-off from IBN in 2010, has developed a non-invasive method to identify and analyse liver disease without a biopsy.

The Angiogenic Tree depicts the close relationship between endothelial cells (tree trunk) and monocytes (leaves) during angiogenesis, which is the process of new blood vessel formation.

*Courtesy of Dr. Irina Shalova, Dr. Manesh Chittezhath and Asst. Prof. Subhra K Biswas (SIgN).*
Infectious Disease Diagnostics

Lab-on-a-Chip Detects 13 Tropical Diseases
In 2013, Veredus Laboratories and A*STAR launched a lab-on-a-chip device that can identify 13 different major tropical diseases from a single blood sample.

Speedy H5N1 Bird Flu Test
In 2012, researchers at ETC and clinicians from Tan Tock Seng Hospital developed a diagnostic kit that detects all known strains of the H5N1 avian virus in a single test.

Fighting Superbugs with Polymeric Nanoparticles
In 2011, Dr. Yang Yiyan (IBN) and colleagues at IBN and the IBM Research-Almaden developed biodegradable polymer nanoparticles that selectively kill drug-resistant superbugs without destroying healthy red blood cells.


This technology was featured by Scientific American as one of the 10 world changing ideas in 2011.
IBN’s MicroKit
IBN researchers have developed the MicroKit, a portable device that can diagnose infectious diseases such as the H1N1 swine flu.

The MicroKit won the Silver award at the Wall Street Journal Asia’s 2011 Asian Innovation Awards.

Mutations in the Flu Virus
The FluSurver research tool, which is part of the World Health Organisation influenza surveillance network, was developed by BII to help clinician scientists and researchers rapidly screen patient-specific viral genomes for mutations that potentially induce drug resistance, antigenic shifts and other clinically relevant features.

Collaborations in Medtech

Singapore–Stanford Biodesign
The Singapore-Stanford Biodesign Programme is a partnership between A*STAR, the Economic Development Board and Stanford University that trains the next generation of Asian Medtech innovators.

A*STAR-CIMIT Collaboration
A*STAR, the Eastern Health Alliance and the Boston-based Centre for Integration of Medicine and Innovative Technology collaborate on medical technology projects between Singapore and Boston.
PERSONAL CARE AND NUTRITION

Key Technologies

- Asian Skin
- Maternal & Infant Nutrition
- Obesity & Type II Diabetes
Asian Skin

CRUSAR
The Clinical Research Unit for Skin Allergy & Regeneration at the IMB supports clinical studies on skin disorders and ethnic skin phenotyping.

Skin Research Institute of Singapore
Established by IMB, the National Skin Centre, and the Lee Kong Chian School of Medicine, the new skin research institute conducts basic and translational skin research with a focus on regional skin challenges and Asian skin.

Our Industry Partners

P&G

Proctor & Gamble Innovation Centre
In October 2013, P&G opened a $250 million facility at the Biopolis to develop personal care innovations for the Asian market.

L’Oreal

L’Oreal Advanced Research Unit
The IMB-based L’Oreal Advanced Research Unit conducts studies on Asian skin. IMB and the L’Oreal unit collaborate on research projects to understand skin biology and physiology, which will generate new insights for health and wellness products.

“The Biopolis to P&G is: Innovation, research capabilities, partnership and talent.”

Mr. Joseph Listro
Vice President, Research & Development, Global Prestige, Salon Professional & Asia Innovation Procter & Gamble
Maternal & Infant Nutrition

GUSTO Clinical Study
The Growing Up in Singapore Towards healthy Outcomes Study at SICS and local hospitals investigates how maternal diet and lifestyle during pregnancy influences child development in their first 18 months. GUSTO has attracted research collaboration from industry partners such as Abbott and Danone.

EpiGen Consortium
The EpiGen Consortium is an alliance of the world’s leading epigenetics and metabolic programming researchers from six research centres in Singapore, the UK and New Zealand.

Our Industry Partners

Nestlé Research Centre
Nestlé is expanding its R&D centre in Singapore, 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
In 2009, Abbott opened an 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
The Nutricia Research centre in Singapore is the 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.
Obesity & Type II Diabetes

SAMS Clinical Study
The Singapore Adult Metabolism Study is a clinical study conducted by SICS and local institutions that analyses ethnic differences among Indian, Chinese, and Malay populations in metabolic diseases.

SINMeD
The Singapore Institute for Nutritional Sciences, Metabolic Diseases, and Human Development is a joint centre between SICS and the Yong Loo Lin School of Medicine that studies metabolic diseases in Asian populations.

Clinical Nutrition Research Centre (CNRC)
The CNRC, led by SICS and the National University Health System, conducts nutritional sciences research and studies the development of obesity and diabetes in Asian populations.

“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
World Class Scientific Talent
At the Biopolis, senior researchers collaborate closely with young, emerging talent nurtured by the A*STAR Graduate Academy.

Open Innovation
The Biopolis forges an open innovation partnership between academia and industry.

Clinical Partnerships
Our close ties with clinician scientists at major hospitals help facilitate clinical studies on the Asian phenotype.

Interdisciplinary Research
Biomedical scientists work closely with engineers at the nearby Fusionopolis. The A*STAR Joint Council Office promotes interdisciplinary research across the Science and Engineering Research Council and Biomedical Research Council.

Scientific Business Support
Exploit Technologies Pte Ltd and the Industry Development Group match-make researchers with industry and facilitate business development opportunities.
THE BIOPOLIS THRIVES DUE TO A STRONG R&D ECOSYSTEM IN SINGAPORE

<table>
<thead>
<tr>
<th>KEY BMS R&amp;D FIGURES FOR 2011</th>
<th>KEY BMS MANUFACTURING FIGURES FOR 2011</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>932 million</strong> DOLLARS IN PUBLIC EXPENDITURE ON R&amp;D</td>
<td><strong>27.1 billion</strong> DOLLARS IN MANUFACTURING OUTPUT</td>
</tr>
<tr>
<td><strong>574 million</strong> DOLLARS IN BUSINESS EXPENDITURE ON R&amp;D</td>
<td><strong>4.7</strong> PERCENT GDP</td>
</tr>
<tr>
<td><strong>5,427</strong> R&amp;D JOBS</td>
<td><strong>15,183</strong> MANUFACTURING JOBS</td>
</tr>
</tbody>
</table>

Ref: 2011 National Survey of R&D
BMS R&D Job Creation

Jobs created

Private sector researchers
Public sector researchers

Ref: 2011 National Survey of R&D

BMS R&D Expenditure

$ (m)

Business expenditure on R&D
Public expenditure on R&D

BMS Manufacturing Output & Job Creation

$ (m)

BMS manufacturing output
BMS manufacturing jobs

Ref: 2011 National Survey of R&D
THE BIOPOLIS LIES AT THE HEART OF AN INTERCONNECTED ACADEMIC AND CLINICAL COMMUNITY
8 minutes to National Research Foundation (NRF) & CREATE Campus

20 minutes to Tan Tock Seng Hospital (TTSH) & Lee Kong Chian School of Medicine (LKCmedicine)

2 minutes to Ministry of Education (MOE)

15 minutes to Singapore General Hospital (SGH) & Duke-NUS Graduate Medical School

5 minutes to National University of Singapore (NUS), National University Health System (NUHS) & Yong Loo Lin School of Medicine (YLLSoM)

25 minutes to Nanyang Technological University (NTU)

8 minutes to Science Park

30 minutes to Tuas Biomedical Park

5 minutes to Fusionopolis

8 minutes to National Research Foundation (NRF) & CREATE Campus
RESEARCH AT THE BIOPOLIS SYNERGISSES WITH A WIDER BMS COMMUNITY IN SINGAPORE

Government Agencies
- Economic Development Board (EDB)
- Health Promotion Board (HPB)
- Health Sciences Authority (HSA)
- Intellectual Property Office of Singapore (IPOS)
- JTC Corporation (JTC)
- Ministry of Health (MOH)
- National Medical Research Council (NMRC)
- National Research Foundation (NRF)
- The Standards, Productivity & Innovation Board, Singapore (SPRING)

Academic Institutions
- Duke-NUS Graduate Medical School (Duke-NUS)
- Lee Kong Chian School of Medicine (LKCMedicine)
- Nanyang Technological University (NTU)
- National University of Singapore (NUS)
- Singapore University of Technology & Design (SUTD)
- Yong Loo Lin School of Medicine (YLLSoM)

Healthcare Groups
- Alexandra Health (AH)
- Eastern Health Alliance (EH Alliance)
- Jurong Health Alliance (JH Alliance)
- National Healthcare Group (NHG)
- National University Health System (NUHS)
- Singapore Health Services (SingHealth)
OUR APPROACH IS PARTNERSHIP

Imagine having an idea that you believe will change the world…

Then finding a trusted partner who can help you reach your goal.

Multinational companies in a range of businesses have invested in flexible R&D partnerships and set up thriving research units or research collaborations at the Biopolis.

Live, work, learn & play with us at the Biopolis.