

# India's effort at Building Excellence in Life Science



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# **India of today is an interesting mix of:-**

- **Fascinating opportunities**
- **Large challenges, unmet needs**

# **Last 60 years of Indian Science – A Historical Perspective**

**Strategic Science**



**Research Institute focus**



**Research in Universities**



**Decade of Innovation**



**Improving our research by global standards**



**Science driven entrepreneurship**

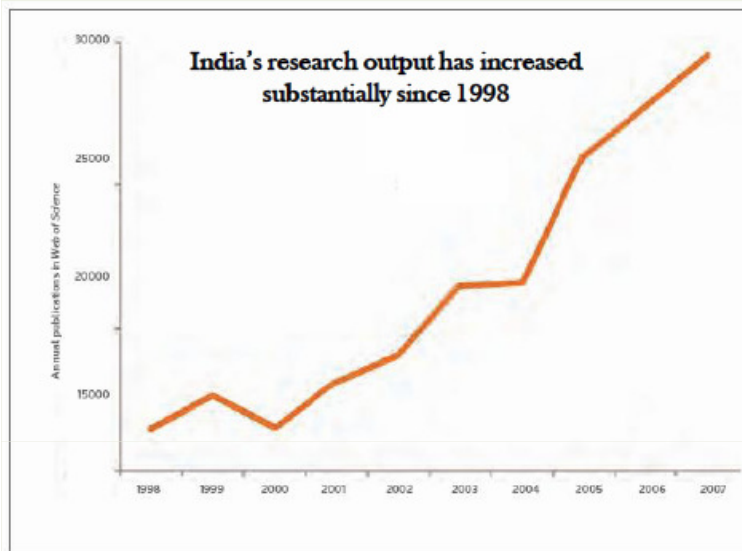
# Building strength in Contemporary Science

- **Genomics**
- **RNA biology**
- **Proteomics**
- **Metabolomics**
- **Computational biology**
- **Systems biology**
- **Synthetic biology**
- **Stem cell biology**
- **Novel animal models**
- **Nano-Biology and Medicine**

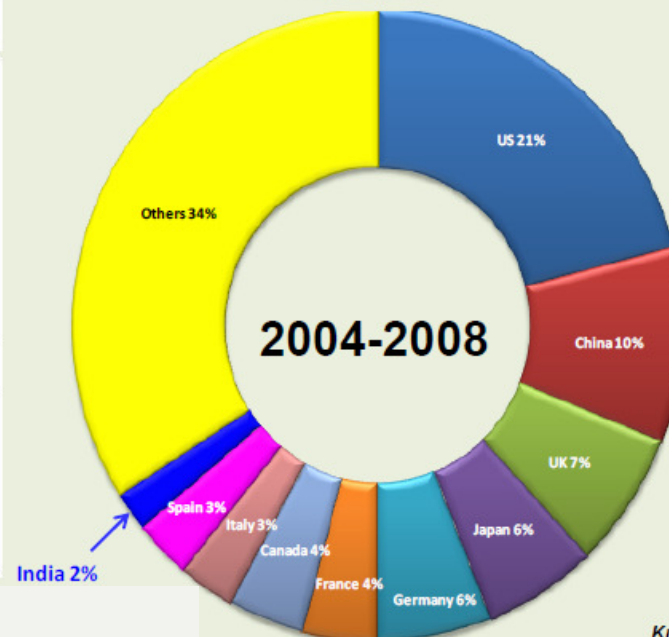
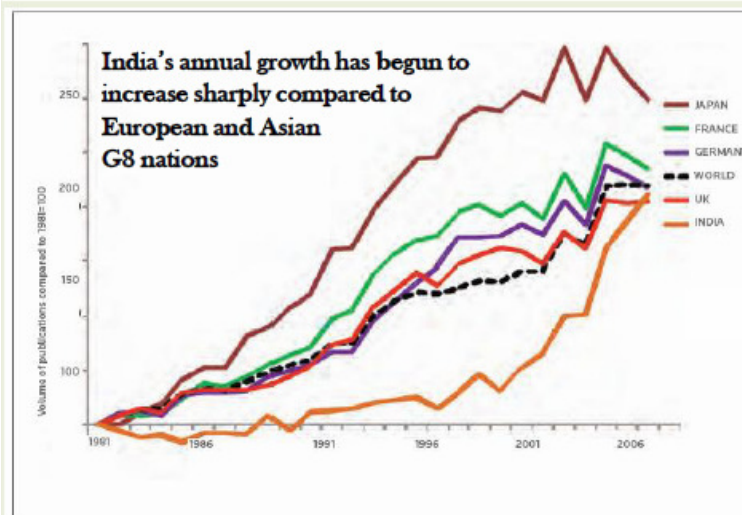
# **We are working on the Drivers of Innovation**

- **Real Public R&D expenditure**
- **R&D personnel per million persons**
- **Education share of GDP**
- **IP protection**
- **Cluster specific environment**
- **R&D funded by industry**
- **R&D performed by universities**
- **Global / National Model**

# India's Science Output is Improving

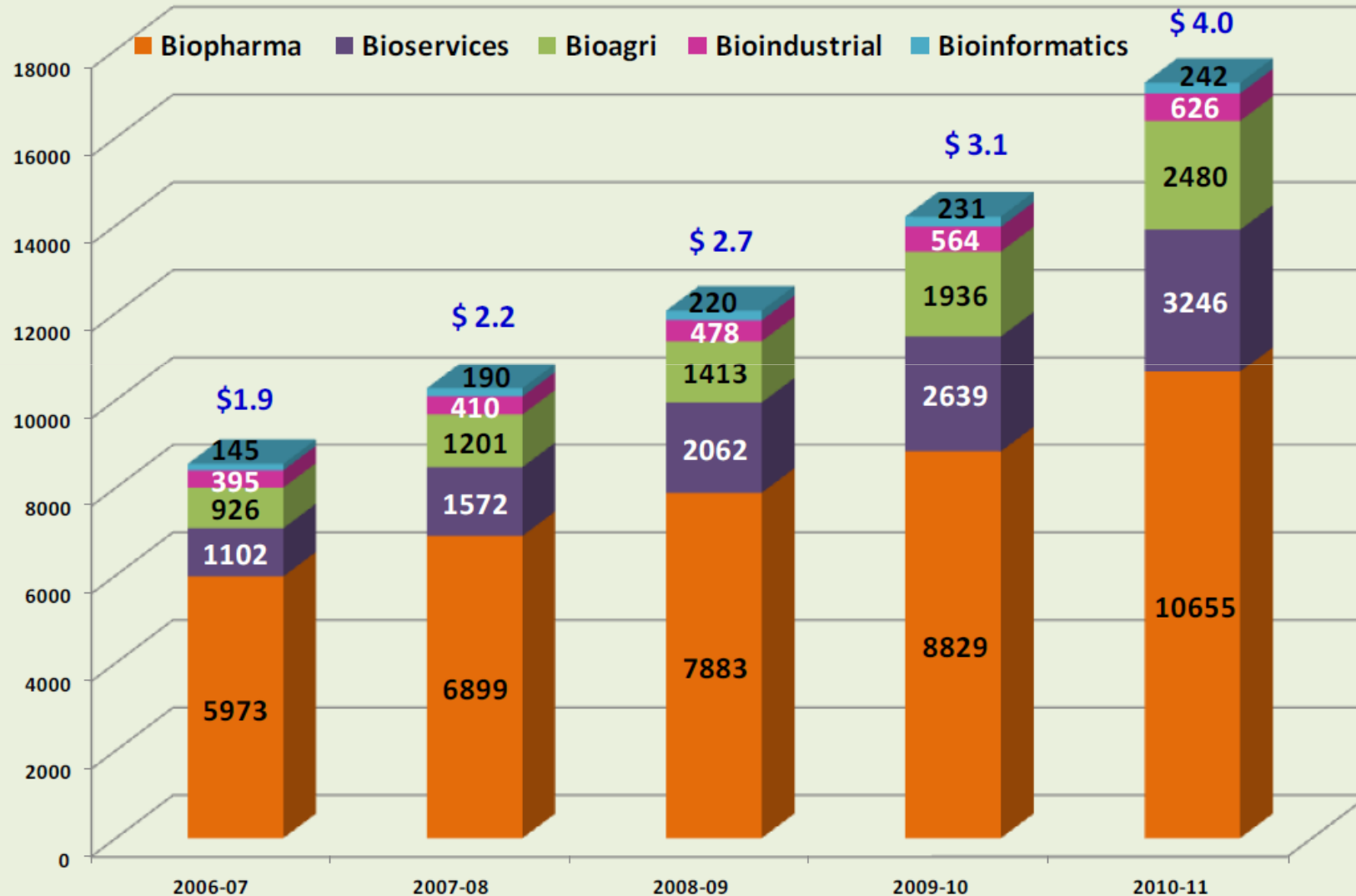


India has moved from 13<sup>th</sup> to 10<sup>th</sup> position among the top science publishing countries



# India Biotech Surges to \$ 4 Billion

Registers 21.5% growth during 2010-11

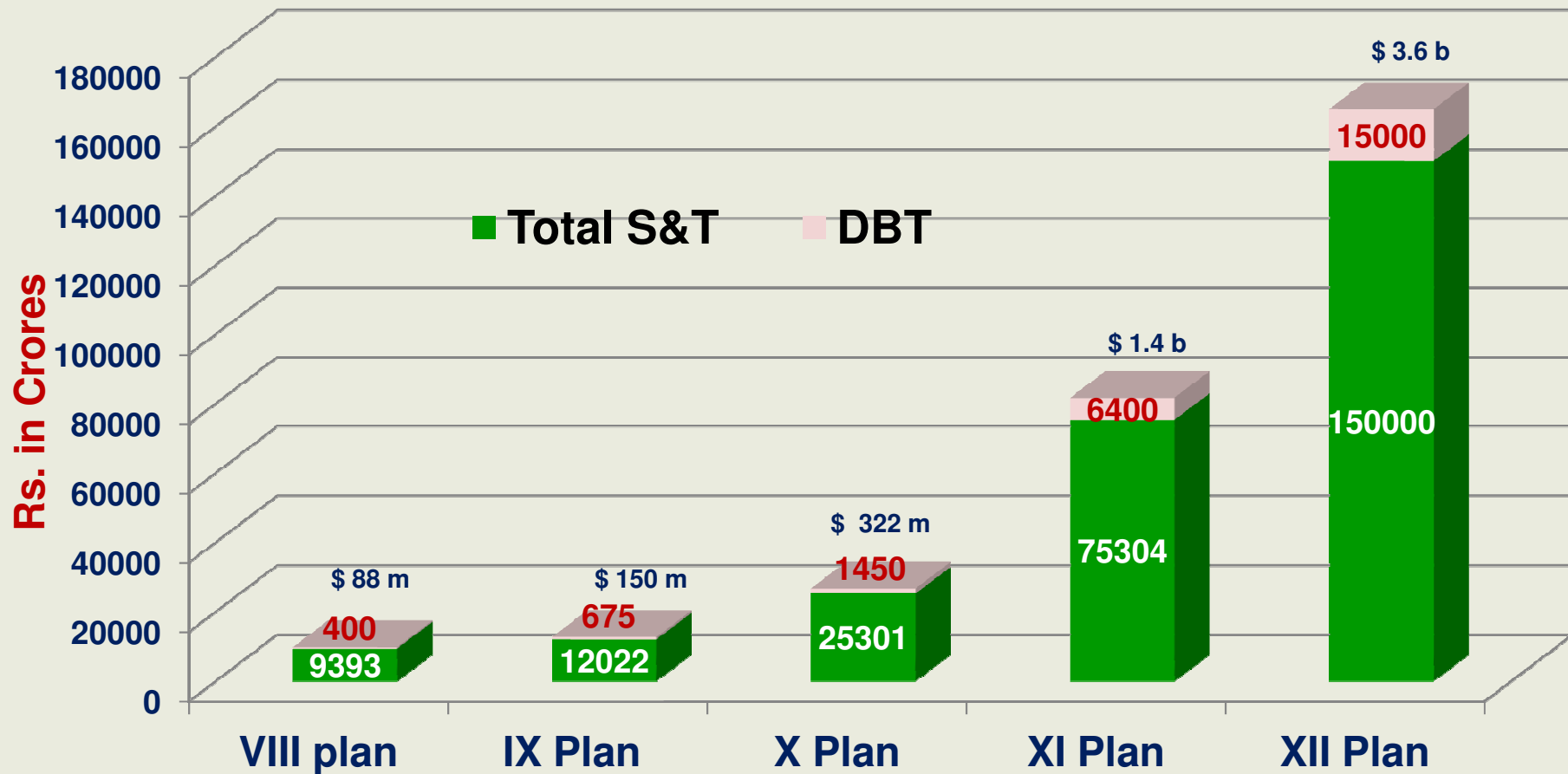


Expected to reach \$ 8-10 billion by 2015

Source: Biospectrum Vol.9, 2011

# From 8<sup>th</sup> to 11<sup>th</sup> Five Year Plan S&T Budget rose by times

## DBT's Budget Increase by 16 times

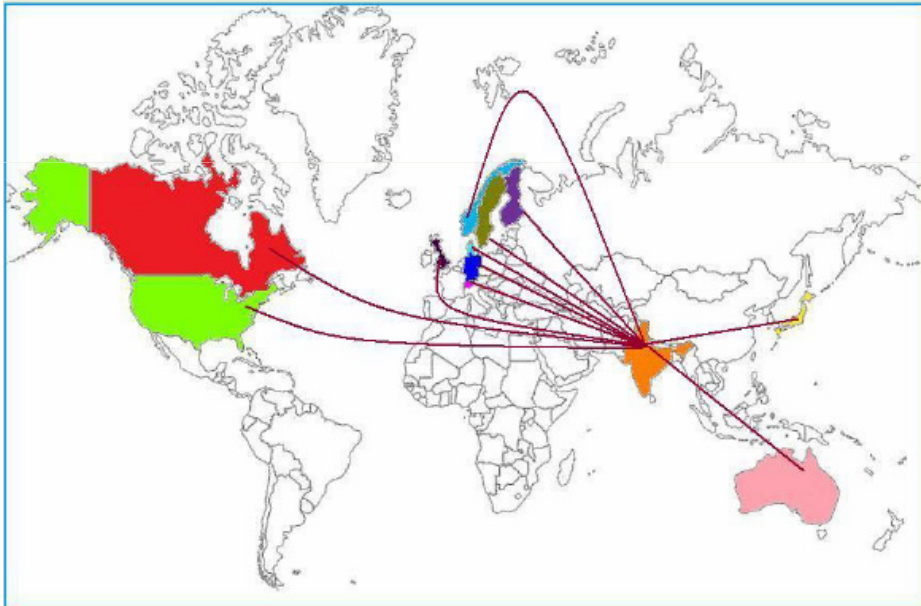




# Foundation of India's Bioeconomy

- **Innovation; affordable, accessible and impactful.**
- **Quality Bio-manufacturing key to affordability.**
- **Global alliances play a pivotal role in public health high impact technologies and product**

# International Collaboration for Affordable Innovation



## *Some examples:*

- ❖ Malaria Vaccine –  
ICGEB, DBT, MVI, BMGF, PATH
- ❖ Rotavirus Vaccine –  
AIIMS, DBT, BMGF, NIH, BBIL
- ❖ Stanford India Biodesign –  
DBT, AIIMS, IIT-Delhi, Stanford University
- ❖ R&D for Affordable Healthcare –  
DBT, The Wellcome Trust
- ❖ Grand Challenge –  
DBT, BMGF

# Economic Opportunities with High Social Relevance

- Biotherapeutics
- Vaccines and adjuvants – human and animal
- Diagnostics, biomarkers, biosensors
- Bioenergy
- Nano-biotechnology
- Transgenic/cis-genic crops and marker-assisted breeding
- Implants and devices
- Bio equipments
- Nutraceuticals & functional foods



# Talent Gap

**Creating Scientific and innovation leaders is now recognized to be the foremost challenge**

# Building World Class Human Capital

- Linking under-graduate education and research – IISERs
- **New federal universities (15)**
- Re-engineering existing university departments
- **Extramural partnership centres of research institutions in university setting**
- **Biotechnology Overseas Associateships**
- **Catching them young: INSPIRE: 1 million fellowships**
- Finishing school in partnership with industry
- **Attracting scientists from overseas**
  - Wellcome Trust/DBT India Alliance – 70 Post-doctoral fellowships/yr
  - Ramanujan Fellowships
  - Ramalingaswami Re-entry Fellowships

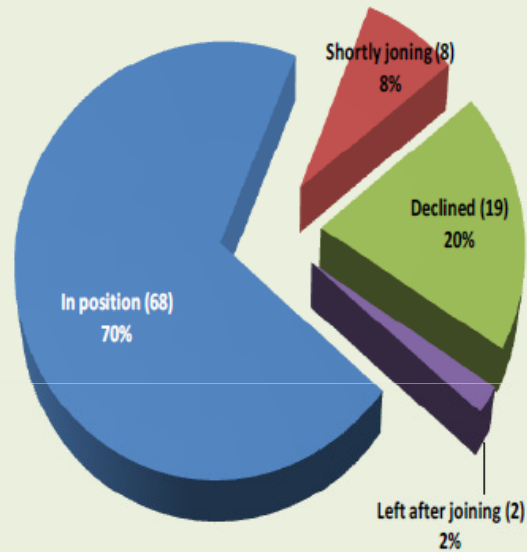




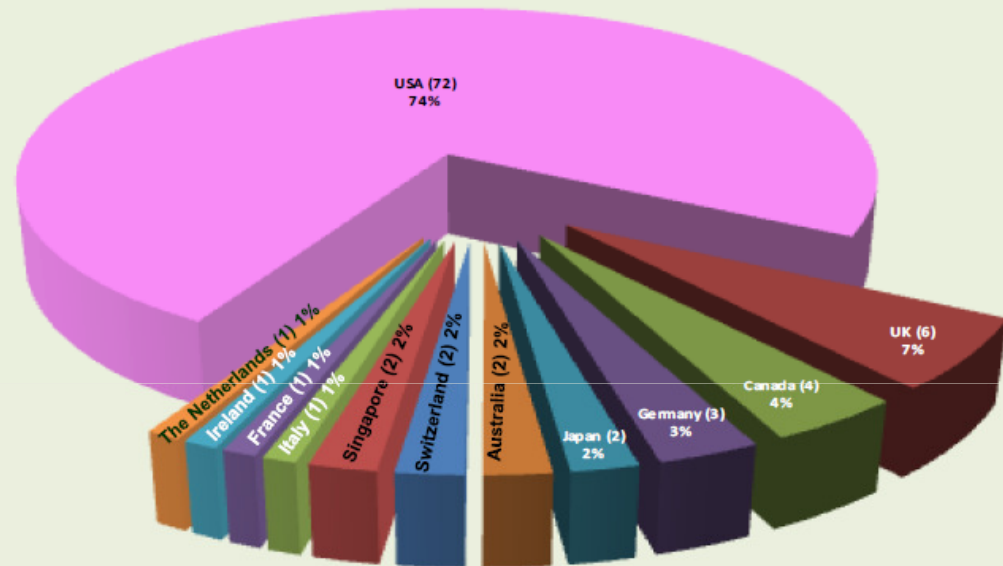
# Ramalingaswami Re-entry Fellowships

## Attracting Overseas Indians Back

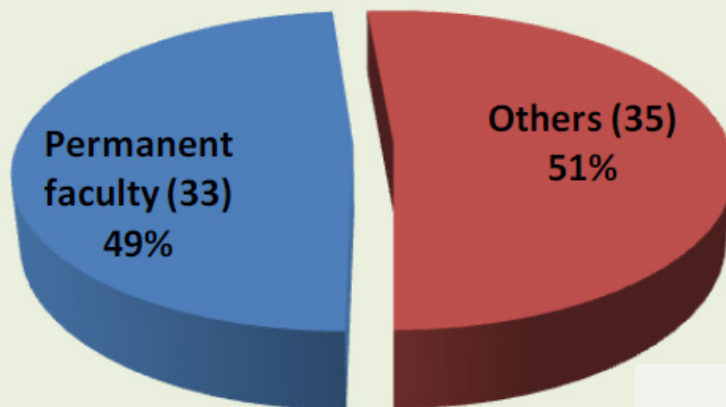
Current Status#



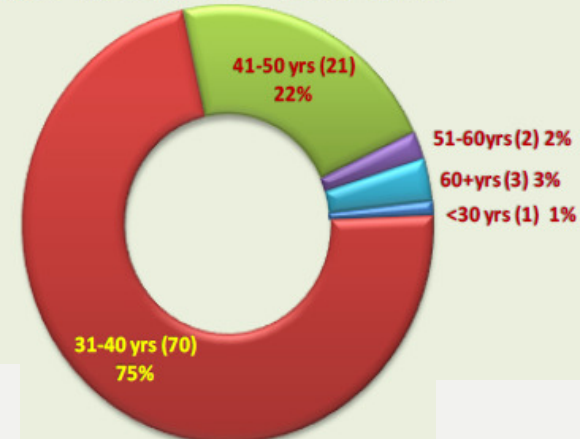
Where are awardees coming from? #



49% fellows have become permanent faculty\*



Age Group of Awardees#



\* Data based on 68 fellows currently in position



## **DBT/WELLCOME TRUST INDIA FELLOWSHIPS**

### **Linking talent to opportunity**

- **DBT and Wellcome Trust (WT) have jointly launched 'WT/ DBT India Fellowships' in 2008**
- **Each partner contributes £ 8 million per year**
- **70 Post-doctoral Fellowships offered annually in 3 categories (Early stage, Intermediate and Senior); international selection panel**
- ***Wellcome Trust/DBT India Alliance* - set up as public charitable trust to deliver the programme**
- **52 Fellowships awarded so far**

# Creating a New Breed of Institutions

## Department of Biotechnology

- Translational Health Science and Technology Institute, Faridabad
- Regional Centre for Biotechnology, Faridabad
- National Agri-Food Biotechnology Institute, Mohali
- Institute of Stem Cell Science and Regenerative Medicine, Bangalore
- National Institute of Biomedical Genomics, Kalyani
- Centre for Cellular and Molecular Platforms, Bangalore
- Animal Biotechnology, Hyderabad
- **Molecular Medicine Centres (3)**
- **Institute of Silk and Biomaterials**
- **Marine Biotechnology**

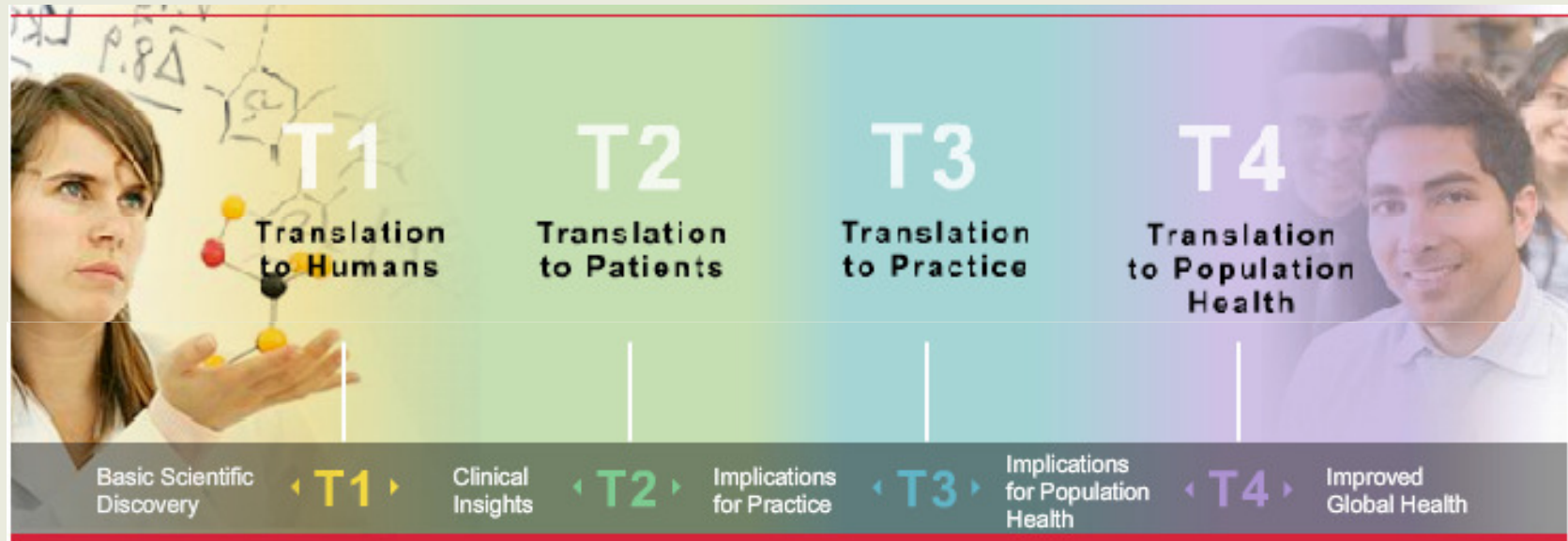
## Other organizations

- Nanoscience Institute, Mohali
- National Institute of Pharmaceutical Education & Research (4)
- Indian Science Institute of Science Education and Research (5)
- New Indian Institute(s) of Technology (4)
- New National Universities (30)





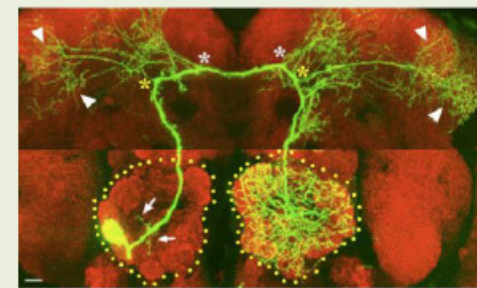
# Clinical and Translational Science is important to convert knowledge to solutions



**Diverse Talent Pool and Innovation mega-communities along can deliver the promise.**

# Beefing up Biotech Infrastructure

- Biotech incubators, parks (10)
- **GMP scale-up facilities for pilot production**
- Repositories of biologicals of agriculturally and therapeutically useful organisms, plasmids etc.
- **Large animal houses**
- Testing facilities for GMOs and LMOs
- **Testing facilities for GM crops and GM foods**
- DNA and stem cell banking facilities
- **Biosafety Level III, IV labs**
- Molecular and chemical libraries



# Biopartnerships with Industry

## Early Stage to Commercialization

- Up to 30% of DBT's budget to be invested in P-P-P schemes
- **Small Business Innovation Research Initiative for SMEs**
- **Biotechnology Industry Partnership Program for generating IP in frontier areas**
- **Biotechnology Industry Research Assistance Council cleared by Cabinet**
- **Protection and Utilization of Public-funded IPR Bill**
- **New Millennium Indian Technology Leadership Initiative**
- **Technology Development Board**
- **Pharma Fund**



# Promoting Innovation Ecosystem



- **New Drug Authority**
- **Biotechnology Regulatory Authority of India**
- **National Science Board –**  
From Manufacturing & services → Discovery → Innovation
- **IP Governance and Technology Regime**
- **International Collaboration for co-discovery and promoting innovation**

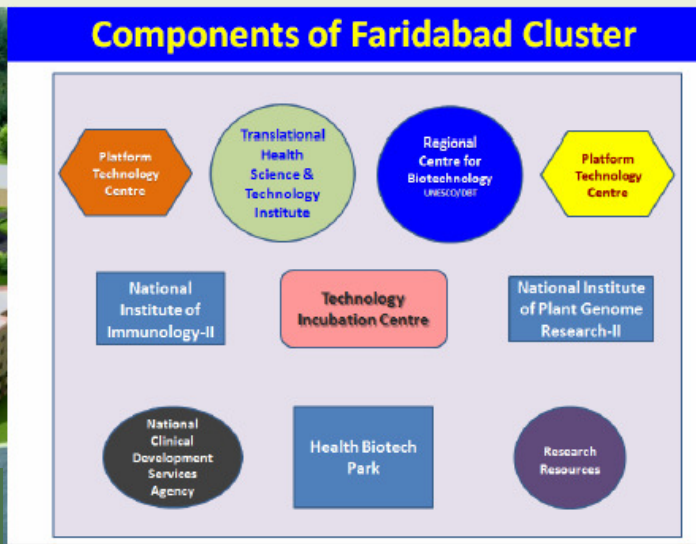
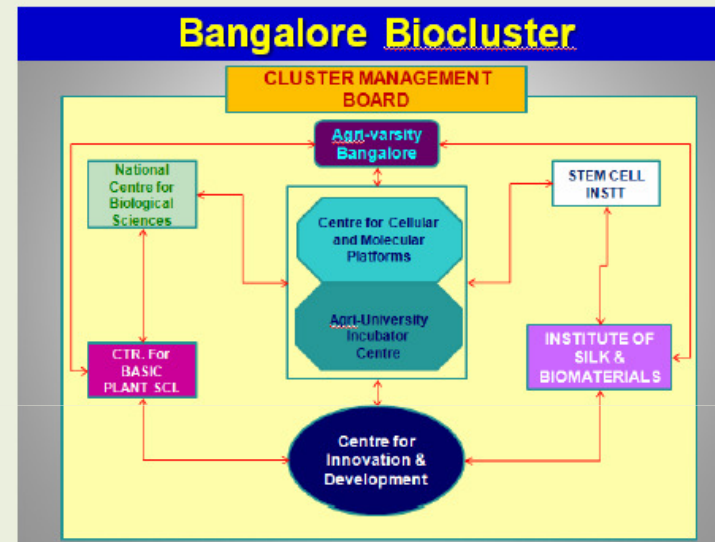
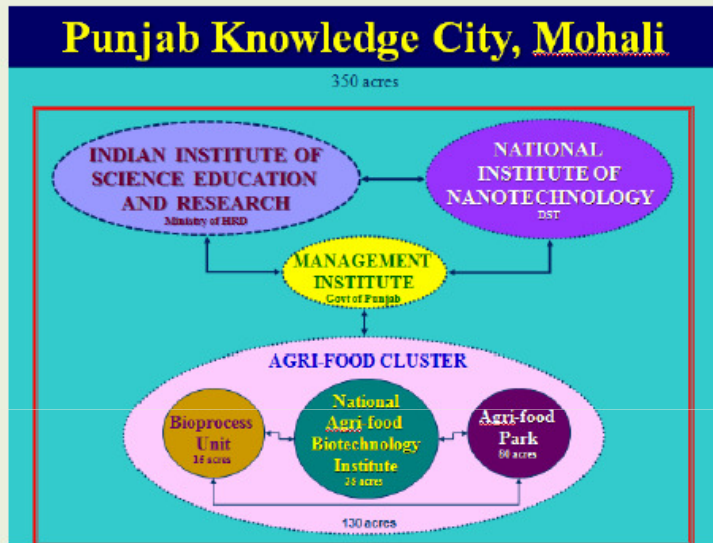


# Connecting People, Domains and Resources for Innovation

- Inter-institutional Centres
- Biopartnership Centres
- Glue Grants
- Connecting Engineering Schools with Medical, Veterinary, Food and Agricultural Schools
- Linking Molecular Biology and Agricultural Schools
- National Biodesign Alliance



# Science Clusters: Strength of Synergy



# New Global Partnerships

**Indo-Swiss**

**Stanford Biodesign**

**Indo-UK**

**Indo-US**

**Collaboration with IAVI, GATES**

**Foundation, MVI, PATH,**

**WellcomeTrust**

**International partnerships HST,**

**Indo-Australia**

**Indo-Canada**

**Indo-Denmark**

**Indo-EU**

**Indo-Finland**

**Indo-German**

**Indo-Japan**

**Indo-Norway**

**Thanks**