TAKING PUBLICLY FUNDED R&D IN INDIA TO THE MARKETS : LESSONS FROM NCL

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ACTIV WORKSHOP
VENTURE CENTER, PUNE

September 27, 2010

1950 - 2010
Celebrating Sixty Years of Science

THE PURPOSE OF THIS LABORATORY IS TO ADVANCE KNOWLEDGE AND TO APPLY CHEMICAL SCIENCE FOR THE GOOD OF THE PEOPLE

J W McBain

NCL : A SNAP SHOT

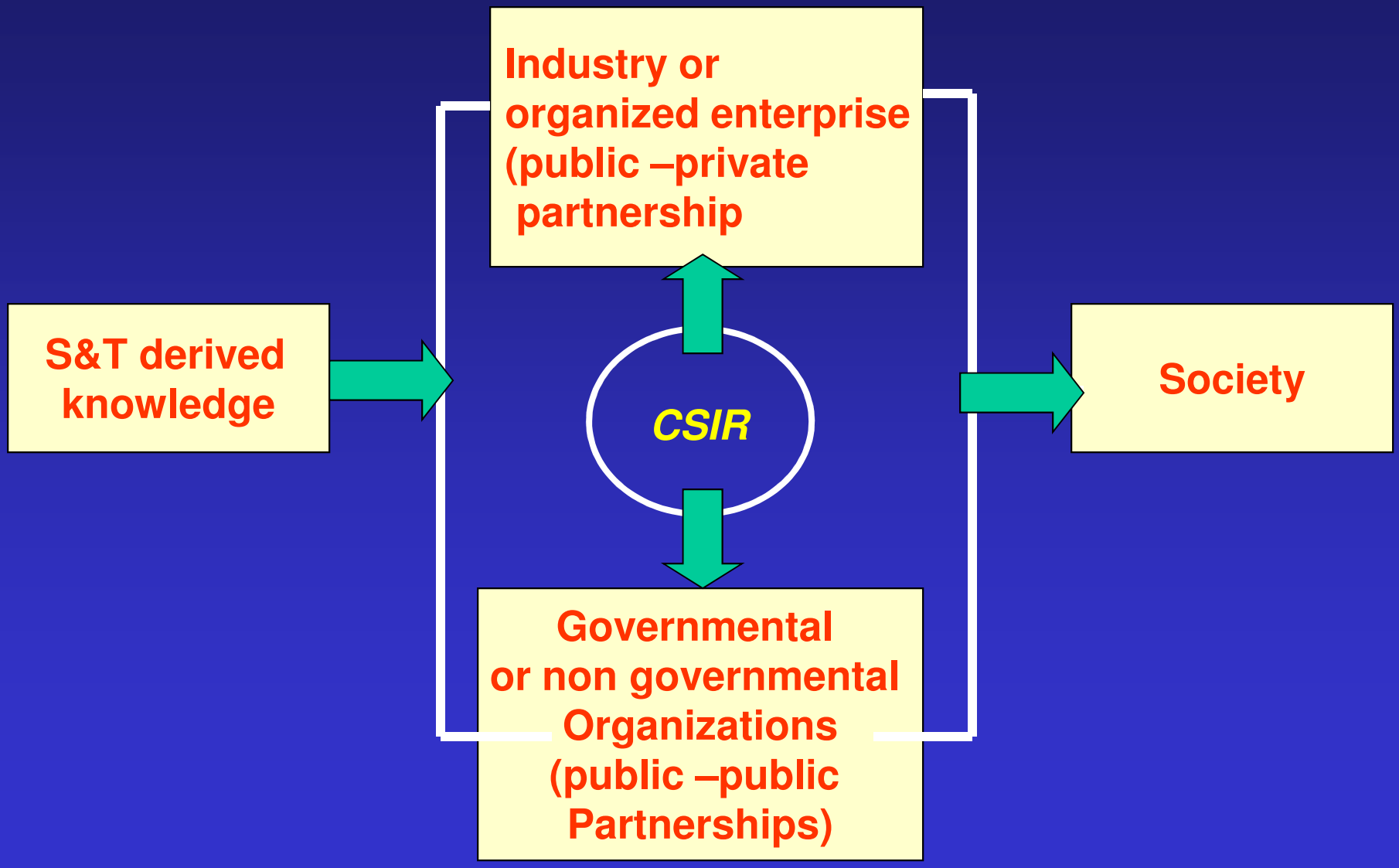
- Established : 1950
- Location : Pune, India
- Total personnel
  - Permanent Staff : 730
    - Scientific : 206
    - Technical : 330
    - Administrative : 194
  - Research Fellows (CSIR, UGC) : 440
  - Project Staff (M.Sc's) : 382
  - Post doctoral fellows : 24

One of the largest publicly funded research institution in India
One of the oldest research institutions of independent India

SCIENCE → SOLUTIONS → MARKETS

- **Desirable**
- **Feasible**
- **Viable**

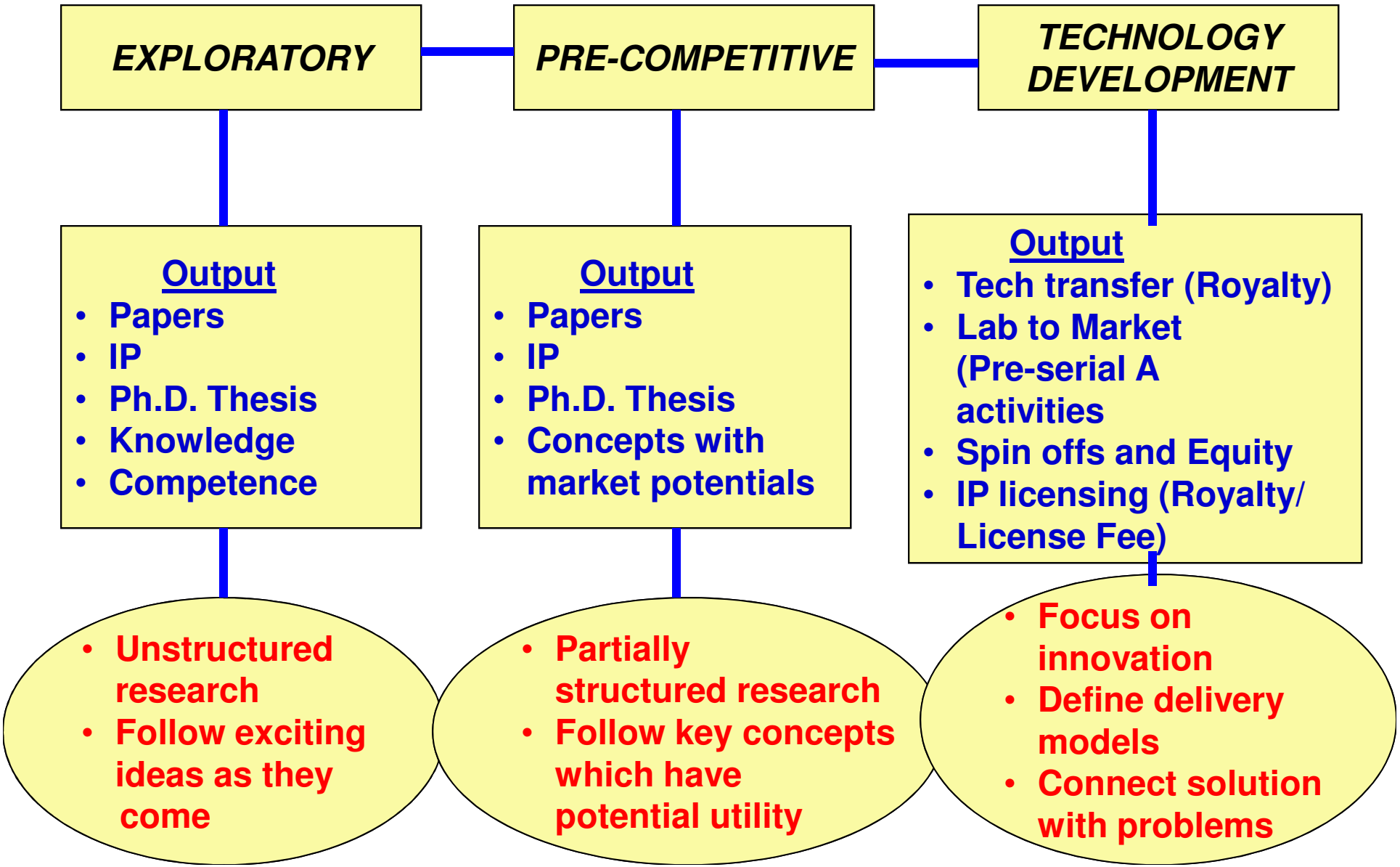
PARTNERSHIP IS ESSENTIAL FOR SCIENCE TO REACH THE STAKEHOLDERS



CREATING VALUE TO ITS CUSTOMERS

- **NCL' s portfolio of programs include process and product development, reaction engineering, pilot plant experiments, process design and engineering, process simulation and modeling, computational modeling, technical consulting and continuing education**
- **NCL has the capability to deliver solutions to customers across the full spectrum , from laboratory scale development to design and operation of batch and continuous pilot plants and preparation of basic engineering packages for chemicals , polymer and materials**
- **NCL is focused on creating value to customers through innovations, IP, development of non-infringing processes and science based understanding of complex phenomena**

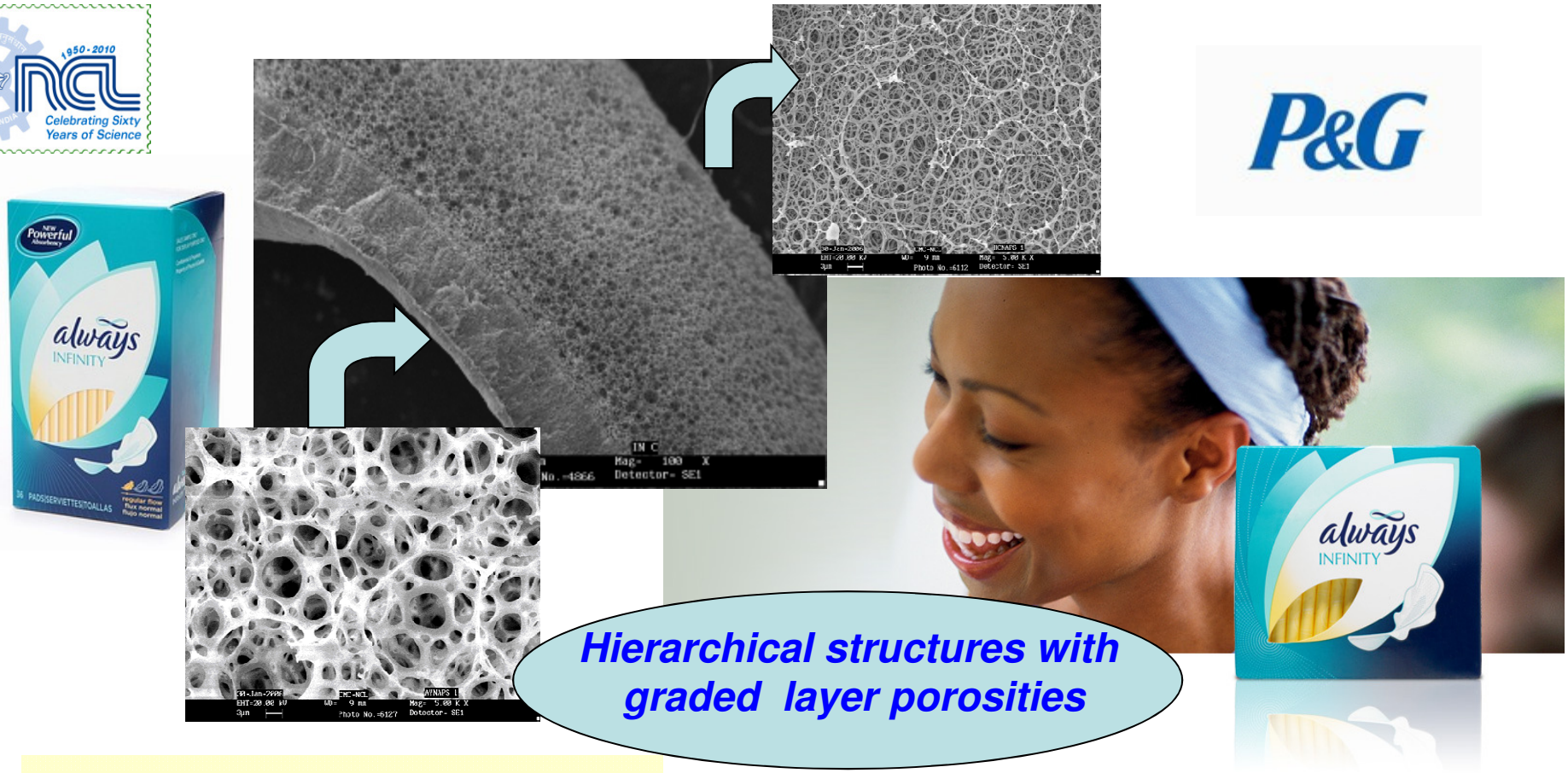
NATURE OF RESEARCH



TRANSLATIONAL MODELS PRACTISED AT NCL

- **Contract Research wherein value addition occurs outside of India**
- **Contract research wherein value additions occur within India**
- **Technology development through Public – Private Partnerships**
- **IP licensing followed by technology development**
- **Technology licensing followed by incubation of start up enterprises**

CONTRACT RESEARCH WHEREIN VALUE ADDITION OCCURS OUTSIDE OF INDIA

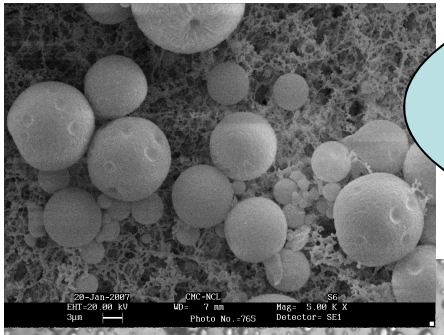


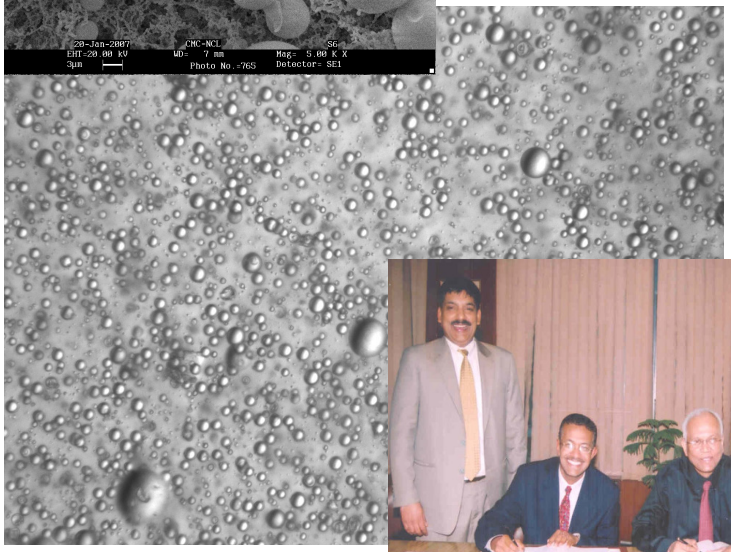
Hierarchical structures with graded layer porosities

Always, the world's leader in feminine protection, is dedicated to helping women embrace womanhood positively—from the very beginning of puberty through their adult lives.

The Always brand is behind some of the biggest innovations in feminine hygiene history, including the introduction of winged pads in 1985 and Ultra thin pads in 1990. Continuing its goal of improving women's lives across the world, ***Always recently introduced Always Infinity, a pad made with a new-to-the-world material that enables women to have the magical combination of absorbency, amazing softness, and flexibility all in one pad.***

Polymer microcapsules for fabric care





MASTER COLLABORATION AGREEMENT

BETWEEN

THE PROCTER & GAMBLE COMPANY

AND

COUNCIL OF SCIENTIFIC & INDUSTRIAL RESEARCH

Preamble

This Master Agreement for RESEARCH & COLLABORATION (or "MCA"), effective on the last date of execution of this MCA ("MCA EFFECTIVE DATE"), is by and between COUNCIL OF SCIENTIFIC & INDUSTRIAL RESEARCH, having a principal place of business at Anusandhan Bhawan, 2 Rafi Marg, New Delhi, 110 001 (hereinafter collectively referred to along with its AFFILIATES as "CSIR"), and The Procter & Gamble Company, (hereinafter collectively referred to along with its AFFILIATES as "P&G"), a corporation of Ohio, having a principal place of business at One Procter & Gamble Plaza, Cincinnati, Ohio 45202.

1 Background of the Agreement

P&G has unique skills, technology and know-how specific to the development and use of consumer product formulations desired by consumers, and has the ability to manufacture and sell such products globally.

FOR: COUNCIL OF SCIENTIFIC & INDUSTRIAL RESEARCH

By: _____

Name: Dr. R. A. Mashelkar

Title: Director General, CSIR

Date: 3/30/2005

FOR: THE PROCTER & GAMBLE COMPANY

By: _____

Name: Larry Huston

Title: VP Innovation

Date: 3/23/2005

CONTRACT RESEARCH WHEREIN VALUE ADDITIONS OCCUR WITHIN INDIA

OPERATING PROCESS TECHNOLOGIES

THPE
Excel Ind. Ltd
(2002)

Research performed on demand for global companies; however, manufacturing established in India

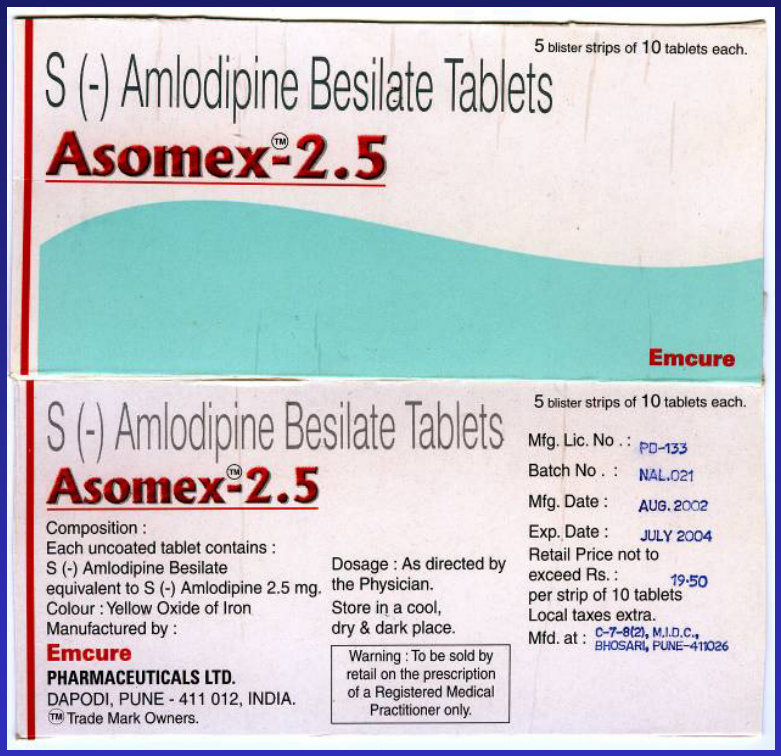
Celanese

Vinyl Carboxylates
Mehik Ltd
(2010)

TECHNOLOGY DEVELOPMENT THROUGH PUBLIC – PRIVATE PARTNERSHIPS

PRODUCTS IN MARKET

2005

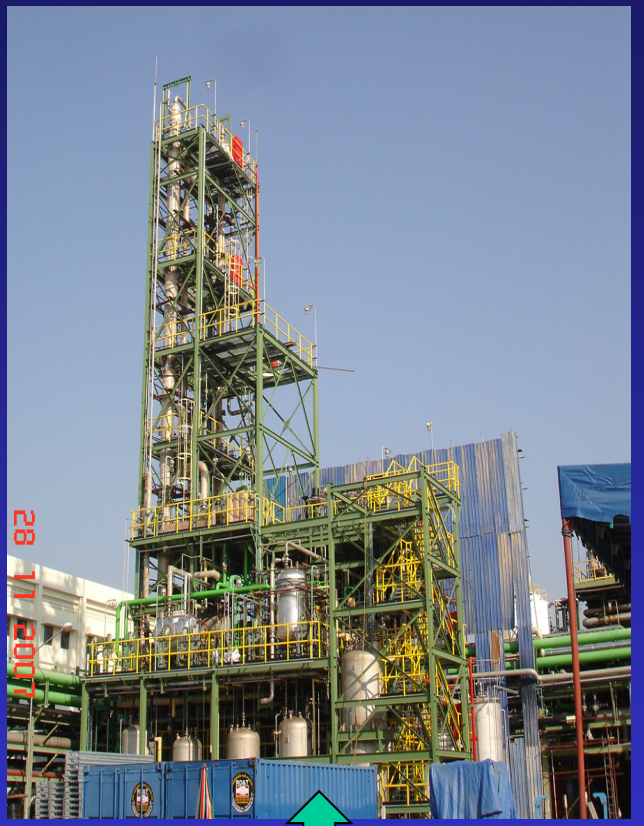


2003

EMCURE PHARMACEUTICALS , PUNE

PROCESS TECHNOLOGIES TRANSFERRED

GBL, 2007



GBL, 2010

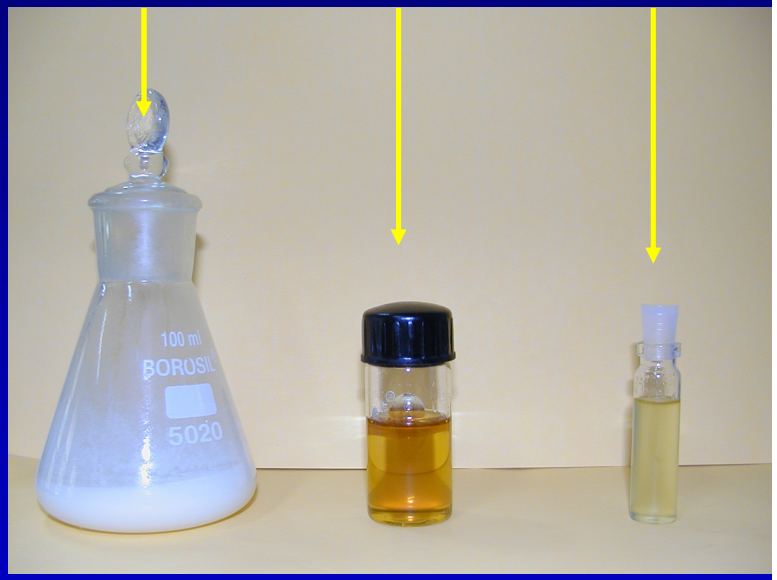
ABG, 2008

IP LICENSING FOLLOWED BY TECHNOLOGY DEVELOPMENT

SOLID CATALYSTS FOR BIODIESEL

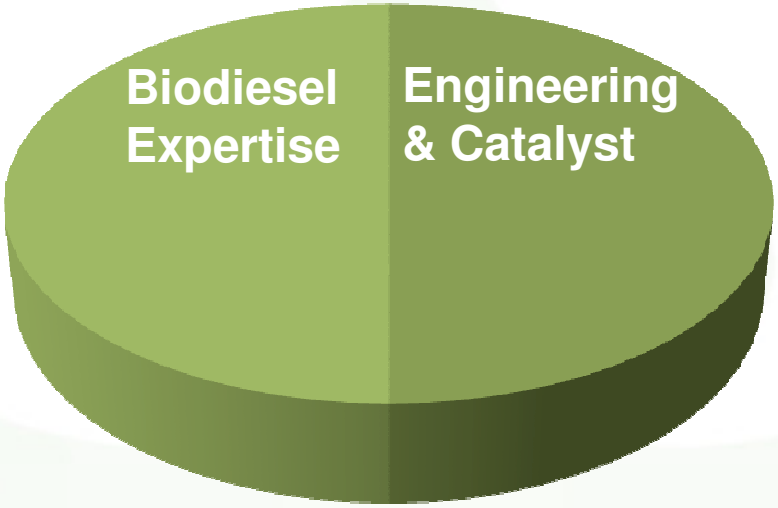
- A range of fresh, used, edible and non-edible oils can be used
- Non aqueous process; no aqueous effluent; anhydrous glycerol obtained as byproduct
- Transesterification with methanol as well as octanol
- No leaching of catalyst into the reaction mixture
- Catalyst is reusable and easily separable.
- Can tolerate high levels of free fatty acids
- Continuous, fixed bed process
- Biodiesel quality meets desired specifications for fuel applications

Veg. Oil Biodiesel Glycerol



Several issued and applied patents to NCL/CSIR have been licensed to Benefuel, USA

Management Expertise



Strategic Partners

- One of largest catalyst producers in world
- 5,000 person, publically traded company
- Global production capacity

- Market leader for crude oil dewatering using electrostatic separation
- Co-developed novel method for separating biodiesel & glycerin

- One of the world's largest catalytic research institutes
- Government backed institute with over 200+ PhD's
- Focus on catalysis since 1980

Ravi Randhava, PhD. – CTO
- Founder of Xytel – 700+ world wide process engineering company
- Focus on solid catalyst technology development

TECHNOLOGY LICENSING FOLLOWED BY INCUBATION OF START UP ENTERPRISES

UF MEMBRANE TECHNOLOGY : FROM CONCEPT TO MARKET

- **Discovery of a unique process to control membrane porosity**
  - **Reject smallest known pathogenic species (virus);**
  - **Still be able to operate at tap water pressure (0.4 bar)**
- **Prototype preparation, demonstration & performance evaluation**
  - **Designed various easy to use prototypes**
  - **Demonstration & rigorous performance evaluation**
- **Technology transfer**
  - **Technology licensed to Membrane Filters India Ltd., Pune, a start up enterprise incubated at NCL**
  - **Product in the market since 2007; Current sales turnover of the company ~ US$ 15 million**

POROUS POLYETHYLENE IMPLANTS – IN THE MARKET!

Start-up company
www.biopore.in

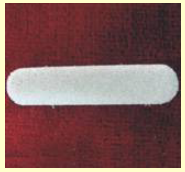

Sphere with suture tunnels


Orbital floor plate


Floor plate (part non-porous)

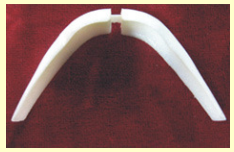

Orbital rim


Malar implant


Nasal augmentation sheet


Mandibular implant


Nasal dorsum


Chin implant


Pterional implant


Mastoid

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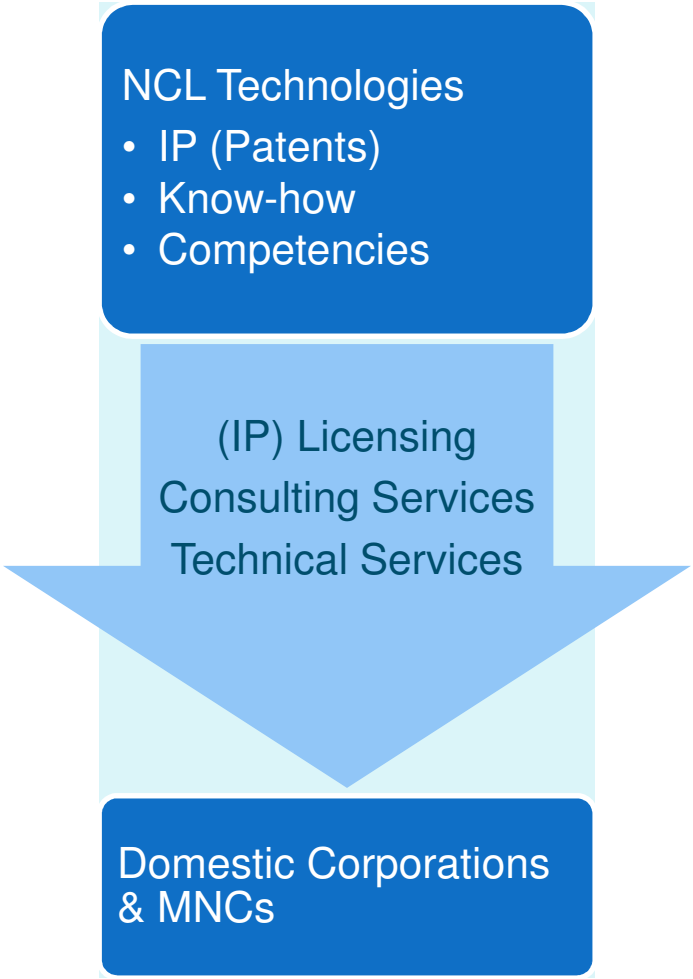
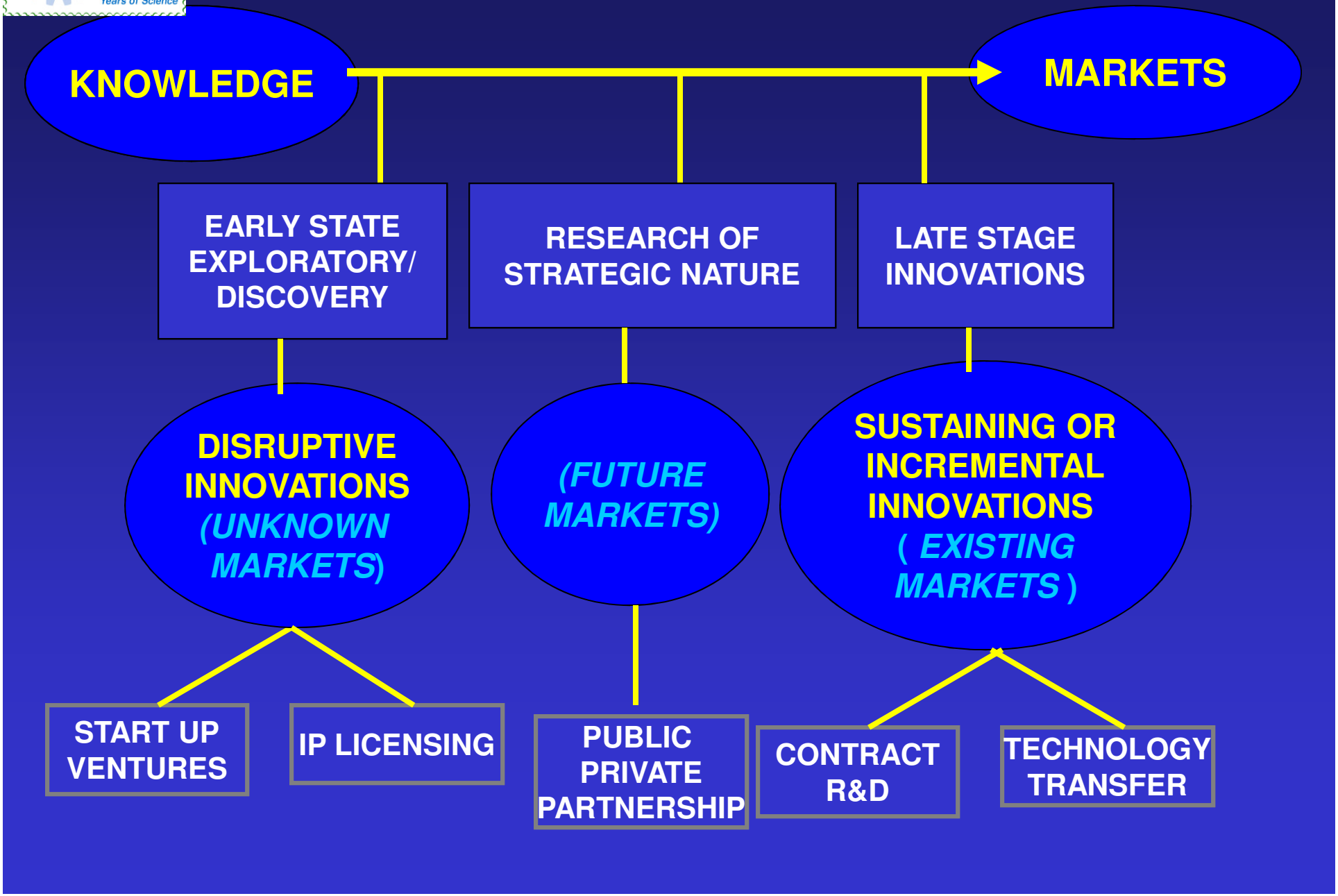
Technology Commercialization v1.0



LINKING KNOWLEDGE TO MARKETS

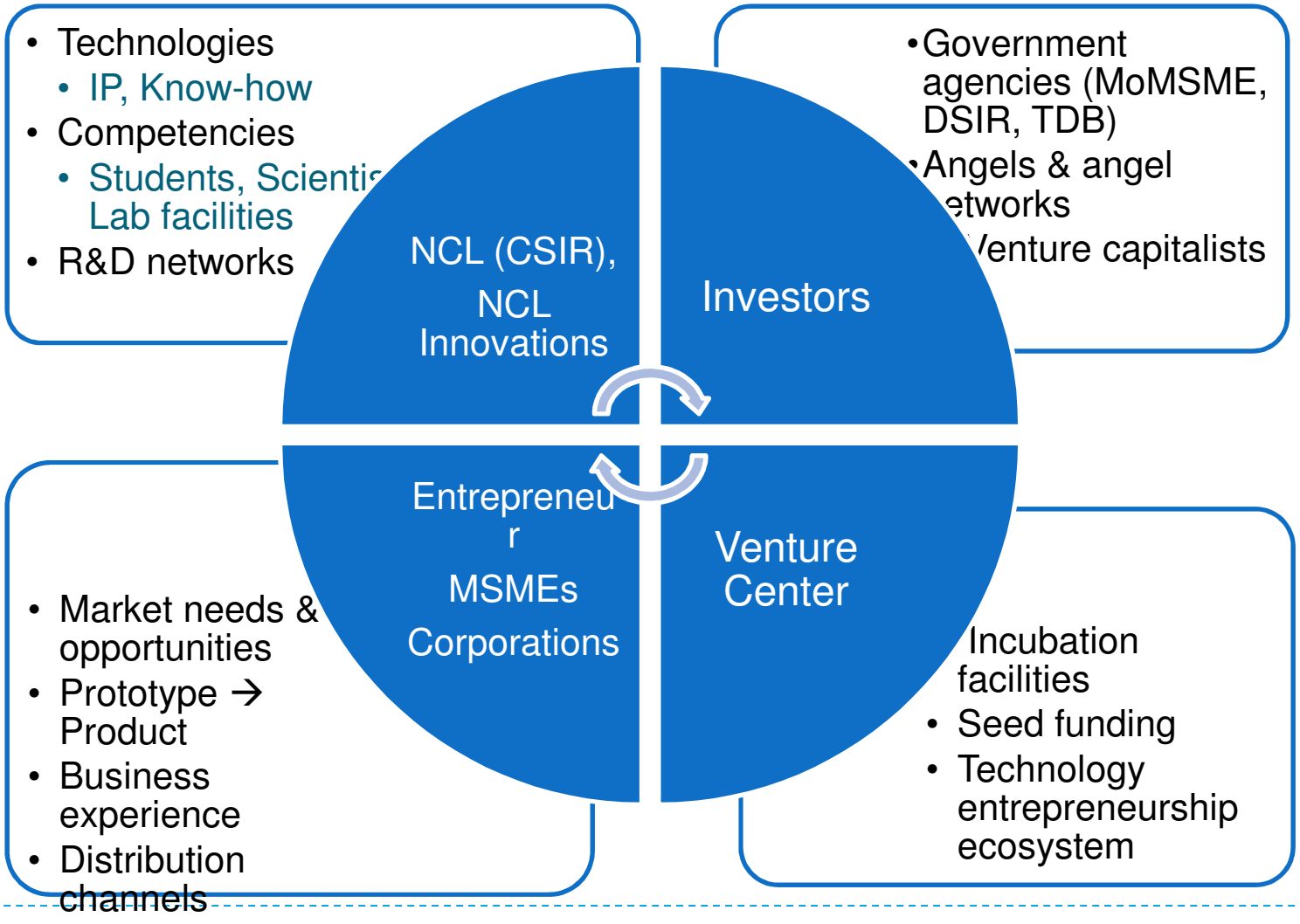


TODAYS SCIENCE SEEDING TOMORROW`S TECHNOLOGIES

- Advanced and functional materials including nanomaterials
- Nano-structured materials and catalysis for energy conversion and storage (electrochemical, solar)
- Novel hybrid materials for harvesting solar energy
- Environmentally friendly polymers
- Biomaterials, tissue engineering and bio-conjugates for therapeutics
- Catalysis, chemical engineering and computational science to leverage clean technologies
- Establishing sustainable and /or renewable feedstocks for chemical manufacturing
- Harnessing modern biology to create a more sustainable chemical industry
- Selective separation processes for a diverse range of applications

SIGNIFICANT OPPORTUNITIES FOR DISRUPTIVE INNOVATION EXISTS. HOWEVER, TODAY'S CHEMICAL SCIENCE WILL REQUIRE A COMPLETELY DIFFERENT TRANSLATIONAL MODEL TO CONVERT KNOWLEDGE TO WEALTH

Technology Commercialization v2.0



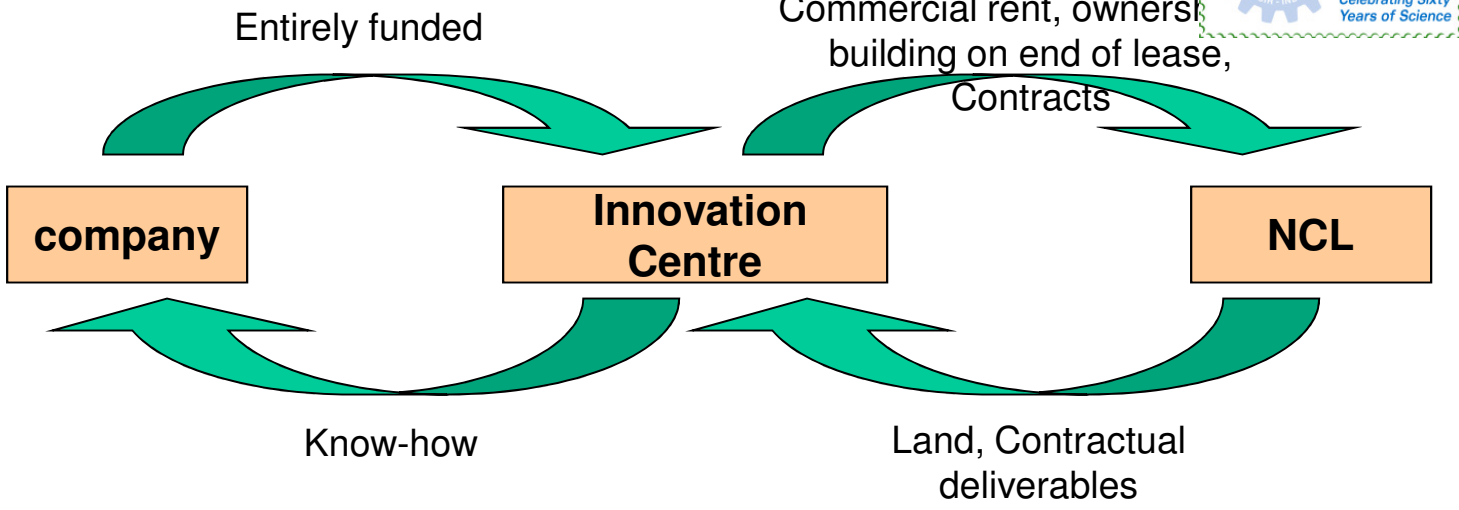
PUBLIC-PRIVATE PARTNERSHIP : CONSORTIUM MODEL

- **Areas of common interest to a few companies – access to generic knowledge**
- **Consortium agreements with service modules**
- **Project Advisory Boards with company participation**
- **Benefit sharing and possibility of bilateral projects**
- **Ownership of IP and proprietary knowledge vests with NCL/CSIR**
- **Rights of first refusal to consortium partners**

Organizational models

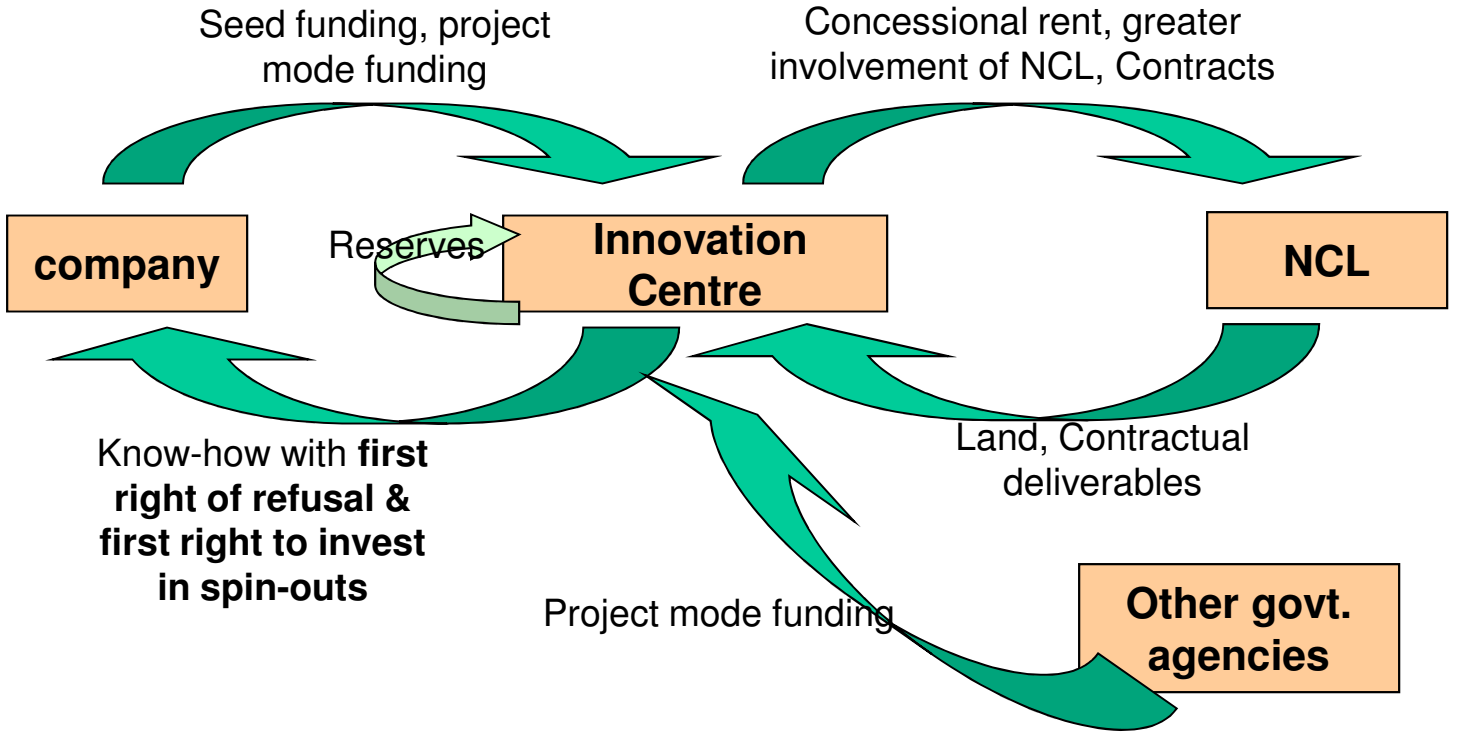
Fully owned subsidiary of company or Division of company

- Arms length relationship with NCL
- Shorter-term arrangement



JV between company-NCL **Section 25 company**

- NCL presence of Board of Directors, Management Team and Scientific Advisory Board
- Longer term arrangement



1950-2010
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NCL Innovation Park … the transformed campus

The planned home for technology innovations and PPPs

VENTURE CENTER

www.venturecenter.co.in

Seeding Tomorrow's Enterprises Today

To become the hub for nucleating innovation focused entities of Indian companies, and thus give birth to innovation-focused companies in the chemical and allied disciplines for India

WHY SHOULD SCIENTISTS IN PUBLICLY FUNDED INSTITUTIONS BE INTERESTED IN TRANSLATING SCIENCE INTO PRODUCTS AND SERVICES

- **Institutional compulsions and demands**
- **Challenge of bringing good science to the market**
- **Creating wealth for the society and to themselves**
- **Altruism or doing good for the society which nurtured them; desire to act as agents of change in society**
- **Self actualization and growth motivation (highest in the hierarchy of human needs according to Abraham Maslow)**

At the end of the day, every scientist has this yearning for having been useful

BARRIERS TO KNOWLEDGE DRIVEN INNOVATIONS

- **Cultural barriers (knowledge is free, making personal wealth out of knowledge is not right, separating the goddess of knowledge from the goddess of wealth in the Indian pantheon of gods)**
- **Immaturity of markets and risk averse**
- **Inability to connect basic discoveries with potential applications**
- **Weak innovation eco systems (mentoring, venture and angel funds, knowledge clusters)**
- **Poor competence and lack of work experience in science – business interface**
- **Peer recognition systems heavily biased in terms of abstract academic research; not enough incentives for individuals who wish to translate science into products and services**

SOME USEFUL LESSONS LEARNT

- Invest in good basic / curiosity driven research leading to IPR / high quality publications
  - Intuition driven
  - New opportunities for generic patent

- Choose products / processes for development where the entry barrier is likely to be low
  - Difficult to license technologies
  - Single technology supplier items
  - Products having large transportation cost
  - Formulated or structured products

SOME USEFUL LESSONS LEARNT

- **Learn to walk the last mile; science brings quick personal recognitions, whereas , technology take long time before the rewards become apparent**
- **Putting the team together and energising the team**
- **Patience , perseverance and failure tolerant**
- **Who gets the glory and who gets the blame**
- **The role of a champion; the leader as a champion**
- **Going beyond the written contract; in the end it is the people who deliver not a piece of paper !**
- **Passion to succeed; Are you ready to stake your reputation?**

Science is an individual effort; technology is a collective endevour

LEADERSHIP ROLE IN INNOVATION PROCESS

- **Leadership that is failure tolerant; views failure as complement to success, not opposite**
- **Leadership that is fully engaged in the innovation process; close monitoring of activity is a powerful motivator for enhancing innovation**
- **Leadership that is focused on increasing the organization's intellectual capital**
- **Leadership that is collaborative, not controlling**
- **Leadership that is less evaluative, more interpretative**
- **Leadership that encourages communication; creates avenues for ideas to "bubble up"**

In times of change learners inherit the earth, while the learned find themselves beautifully equipped to deal with a world that no longer exists

Eric Hoffer

1950 - 2010

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THANK YOU