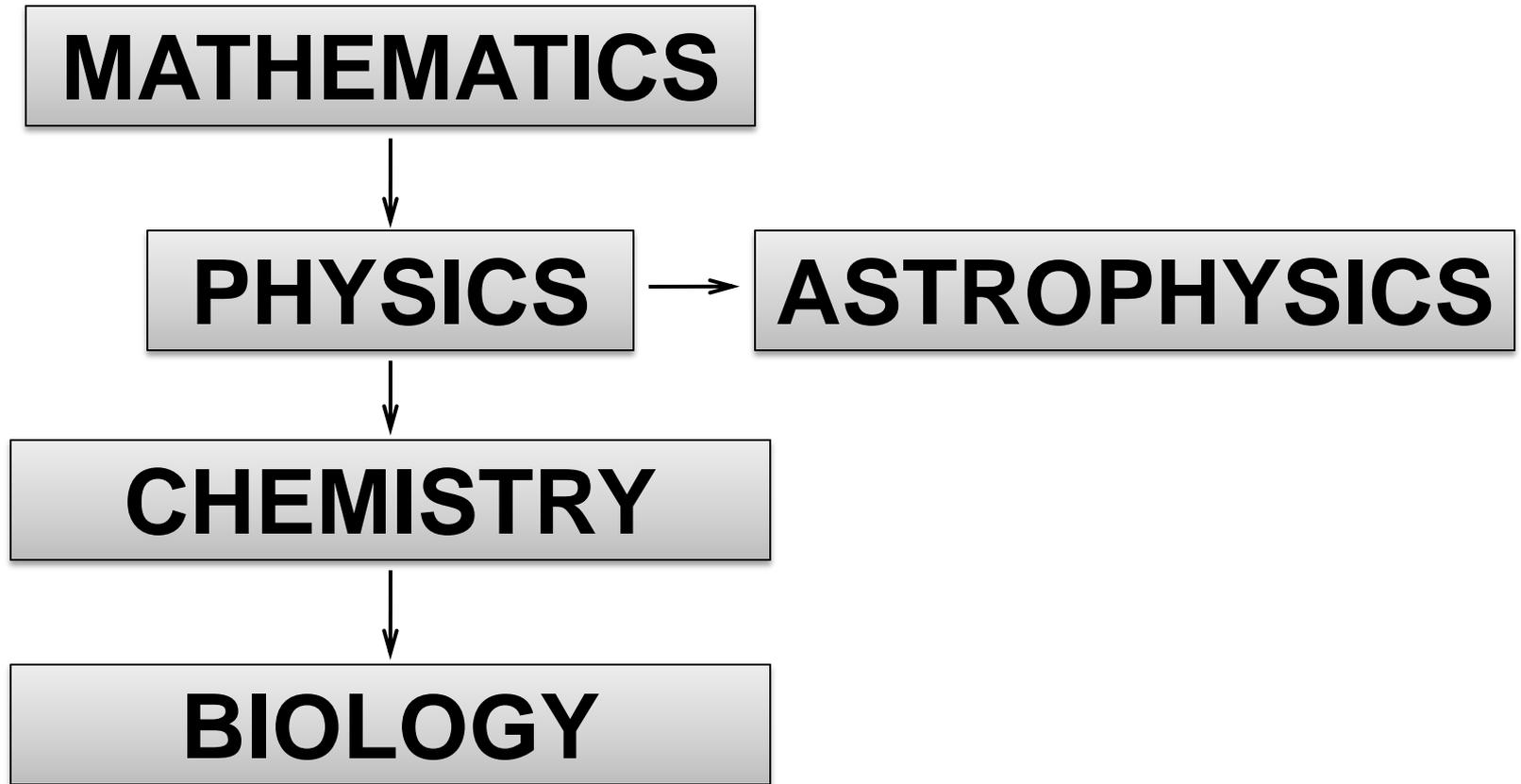
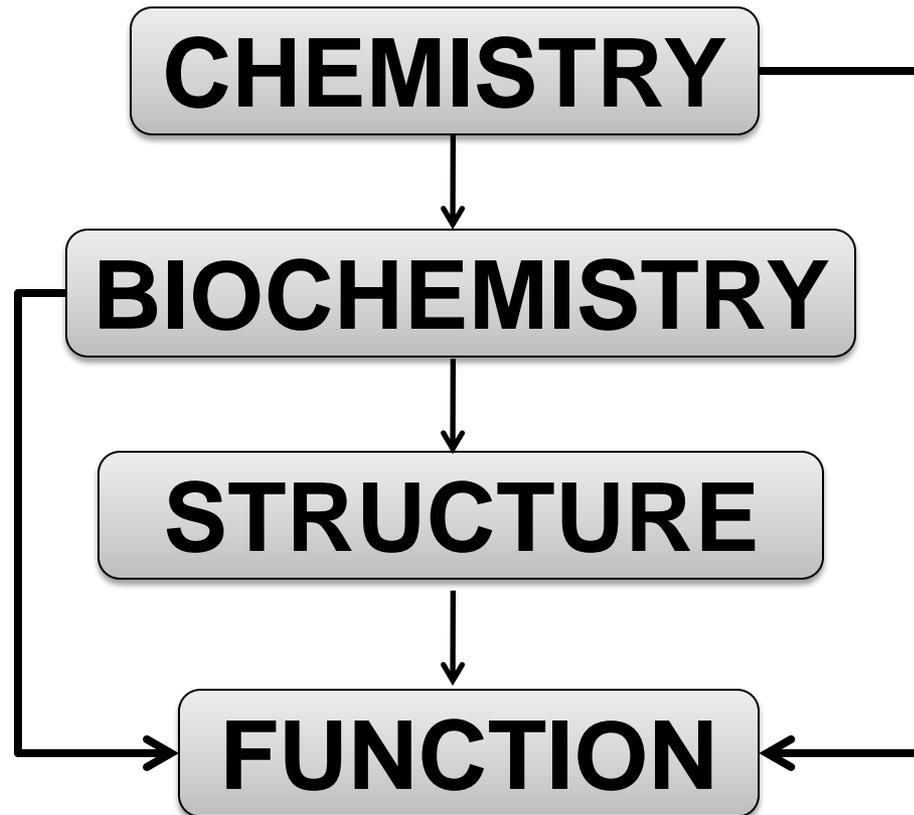


**SOCIAL, LEGAL, MORAL, ETHICAL,  
POLITICAL AND ECONOMIC  
IMPLICATIONS OF BIOTECHNOLOGY**

**P.M. BHARGAVA**



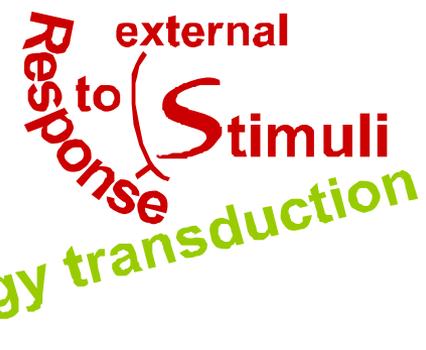
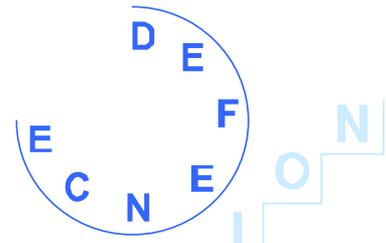


# Functions in Biological Systems

Capacity to Change the Environment

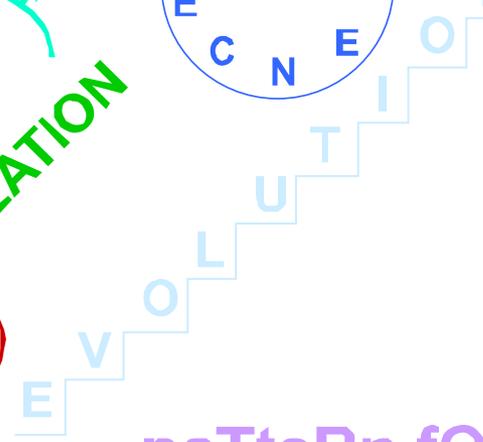


ORGANISATION



Morphogenesis and Differentiation

REGULATION



energy transduction

ORDER ← DISORDER

DISEASE

AGING



paTteRn fOrmAtiOn

GROWTH

L → D → C → O → M → O → T → I → O → N

COMMUNICATION

SOCIAL BEHAVIOUR

CHANGE

INSTINCT

RECOGNITION

RHYTHMS

SIMILARITIES & DISIMILARITIES

eating and drinking

Compartmentalisation of function at various levels

THOUGHT: Reception, Storage, Collation & Recall of Information

**MODERN BIOLOGY: ~ 1953**



**BIOTECHNOLOGY: ~ 1970**

# **AREAS IN BIOTECHNOLOGY – 1**

- **Genetic Engineering (Plants, Animals, Humans)**
- **Immunotechnologies (MABs)**
- **Tissue Culture (Plant cells – Thai experience; Animals cells – arteries, skin)**
- **DNA Technologies (DNA FP; Diagnosis; Molecular markers)**
- **Xenoloanplantation**
- **Stem Cell Techniques**
- **Enzyme Engineering & Technologies**
- **Plant-based Drugs**

# **AREAS IN BIOTECHNOLOGY – 2**

- **Peptide Synthesis**
- **Cloning**
- **Assisted Reproductive Technologies**
- **New Drug-Delivery Systems (Liposomes; Electrical patches)**
- **Exploiting Biological Rhythms**
- **Nutraceuticals & Probiotics**
- **Rational Drug Design**
- **New Useful Materials and Products (Spider silk; Bacterial ropes)**
- **Marine Biotechnology**

# AREAS IN BIOTECHNOLOGY – 3

- **DNA and other Vaccines**
- **Biosensors**
- **Difficult Chemical Transformations**
- **Increasing Photosynthetic Efficiency**
- **Bioremediation**
- **Informatics**
- **Processing Low-grade Ore**
- **New Diagnostic Tools**
- **Nano-biotechnology**

# **AREAS IN BIOTECHNOLOGY – 4**

- **Cryobiology (suspended animation)**
- **Biological Warfare (ethnic weapons)**
- **Biofuels**
- **Smell technologies**

# AREAS OF CONCERN – 1

- **Genetic Engineering : Plants**  
**Designer babies**
- **Tissue Culture : Source (e.g. Hela cells)**  
**Products**

**DNA Fingerprinting**

**Genetic Susceptibility to Disease**

**Xenotransplantation**

# **AREAS OF CONCERN – 2**

**Stem Cell Techniques**

**Plant-based Drug Formulations**

**Cloning**

**Assisted Reproductive Technologies:**

**Germ cell donation**

**Surrogacy**

**Hybrids (human-chimpanzee)**

# **AREAS OF CONCERN – 3**

**Vaccines : HIV, HPV trials**

**Malpractices in Diagnostic Labs**

**Misuse of Drugs**

**Cryobiology**

**Biological Warfare**

**Biofuels**

# **FUTURE**

**Smell**

**Life span**

**Home diagnostic kits**

**New viral diseases**