

\* Examples in all 8's of S&T; esp if they are related of ~~R&D~~ ~~R&D~~ to social development

\*when in doubt write stuff about Indian Science congress, teaching at XYZ institute etc. + Random diagrams + scholarship after them

## 1. S RAMANUJAM

- Mathematician, went to England, died young, naturally gifted
- Identities, equations, mock theta functions, infinite series, Hardy-Ramanujan number (1729)
- "Man who knew infinity", recognition after death

## 2. CV Raman

Scattering, optics, IISc, RRT

- Physicist, light scattering, acoustics + optics, Raman effect, applications - spectroscopy, detection of all materials, chemicals
- 1st Science Nobel, Bharat Ratna, 1st Indian director of IISc ★
- Founded Indian Academy of Sciences and Raman Research Institute

## 3. PC Ray

Chemist + Social Worker + Bengal Pharma & Chem. Works;  $\text{NH}_4\text{NO}_3$

- Bengali chemist, associated with Sadharan Brahmo Samaj (social service work in education and famine relief)
- Mercurous nitrite + ammonium nitrite work, Intl' recog by royal societies
- Set up Bengal Chemical and Pharmaceutical Works in Calcutta, India's 1st pharmaceutical company - swadeshi

## 4.

SN Bose

CSIR, Nobel Nom., BOSONS  $\Rightarrow$  photons + B.E. condensate

- Math + physics, Nobel nomination, Padma Vibhushan, CSIR set up assistance, nominated rajya sabha
- BE statistics - Behaviour of indistinguishable bosons ie. photons etc. quantifies by quantum statistics
- BE Condensate - 5th state of matter ie. dense collection of bosons at  $\sim 0\text{K}$  exhibits particle-wave like behaviour

## 5.

Meghnad Saha

S.I.E  $\Rightarrow$   $T, P \propto I$  &  $\therefore$  great  $\therefore$  stars

- Astrophysicist, Parliamentarian, ★
- Saha ionization equation - relates ionization state of gas to temperature and pressure using quantum + mechanical statistics, hence used to study stars and predict temp and pressure

6. Hargobind Khorana

- a. Punjabi/American biochemist
- b. Nobel prize in physiology to show nucleic acid code (codon) codes for sequence of amino acid chains in protein
- c. Khorana scholarship by DBT for biotech

7. S Chandrasekhar

*1.44x limit - Black hole + viscosity & magnetism.*

- a. Physics Nobel, Punjab born Tamilian, Telescope after him by NASA
- b. Chandrasekhar limit i.e. 1.44x mass of sun after which star can become black hole aka stable white dwarf mass limit that doesn't collapse
- c. Maths + physics equations etc. eg. Chandrasekhar number, Chandrasekhar H-function (viscosity and magnetism)

8.

JC Bose

*Plant + Radio/Microwave*

- a. Biologist + Botanist + physicist + Science fiction
- b. Physics - Radio wave + microwave research paved way for communication tech
- c. Bio + Botany - Proved electro-chemical response to stimuli in plants and effects of microwave on cells and plants
- d. Bose Institute founded + Bengali science fiction writer

9.

APJ Kalam

*SLV-3*

*Agni, Aakash, Prithvi, Nag, Akash*

*IGMDP*

*Pokhran (DRDO)*

*Low cost Stent + Tablet + Prez*

- a. Missile man of India, work at DRDO + ISRO + Prez of India
- b. SLV-3 and Rohini satellite + IGMDP (missiles)
- c. Pokhran test under his DRDO directorship
- d. Social work - Kalam-Raju Stent (low cost) and Kalam-Raju Tablet (low cost tablet computer)

10.

Shanti Swaroop Bhatnagar

*Colloid Chem. ∴*

*Petroleum*

*+*

*Bagasse foodcake*

*+*

*Kerosene in India*

- a. Colloid chemist - better crude oil drilling using saline water and a viscous gum + converting bagasse into foodcake for cattle + work on kerosene etc.
- b. Father of research labs in India - 1st DG of CSIR, 1st chairman of UGC
- c. Padma Bhushan + SS Bhatnagar award in his honour

CSIR, UGC

11. H J Bhabha

- a. Nuclear physicist → quantum theory & cosmic radiation
- b. Alma mater → Elphinstone, Cambridge, also worked with Neils Bohr in Copenhagen



Policy + Institutes + UN Conf. + Use & Dev. of NUCLEAR

- c. Institutes → Cosmic Ray Research Institute at IISc Bangalore; Tata Institute of Fundamental Research, Bombay - director in 1945; Atomic Energy Establishment Trombay (now BARC) - founding director; 1st chairperson of India's Atomic Energy Commission
- d. Awards/ recognition → Father of Indian Nuclear Program; Scientific advisor to JLN & LBS; Led 1st UN conference on Peaceful Uses of Atomic Energy in Geneva; 3-stage nuclear prog; Padma Bhushan; Nobel nomination 1951, 1953-56

## 12. Mahalanobis

Statistics → method  
Survey for S.E. Dev.  
ISI

S.E. Dev. → 2nd Plan  
& Plan.

- a. Statistician → techniques for large scale sample surveys; devised a method - "fractile graphical analysis" to compare socio-eco condn; Mahalanobis distance
- b. Institutes → Indian Statistical Institute; shaped Planning Commission; Sankhya - Indian journal of statistics; Estbd National Sample Survey & CSO
- c. Awards/ recognition → Father of Modern Statistics in India; Padma Vibhushan

## 13. Visvesaraya

Dams → KRSD + Floodgate Tech + planning  
∴ Engg. Day → 15/9

- a. Engineer → invented automated doors that regulate water overflow from dams; patented floodgates
- b. Institutes → Krishna Raja Sagar Dam project Mysore
- c. Awards/ recognition → Engineer's day on b'day -15/9; Bharat Ratna

## 14. M S Swaminathan

KVK + GR + Comm... fought for farmers rights, ICAR DG  
HYV MS S Comm.

- a. Agriculture scientist → developed HYV along with Norman Borlaug
- b. Institutes → Director General of ICAR - expanded KVK
- c. Awards → Padma Shri & Padma Bhushan

## 15. Abhyankar

Algebraic Geo

- a. Mathematician - algebraic geometry
- b. Alma Mater - Harvard; also taught in Harvard, Cornell, Princeton, John Hopkins

## 16. V Sarabhai

ISRO, 1st Sat. → Aryabhata, IMA, Cable, PRL TV

- a. Astrophysicist →
- b. Space related → Formation of INCOSPAR, 1962 - 1st Chairman; Restructuring to ISRO in 1969; 1st rocket launch site in Thumba; major contribution to India's 1st satellite Aryabhata

- c. Other works → Founded Physical Research Laboratory, Ahmedabad in 1947; Brought cable television to India - establishment of Satellite Instructional Television Experiment (SITE) in 1975; Founding member IIM Ahmedabad

### 17. Salim Ali

- a. Ornithologist → "Bird man of India"  
 b. Institutes → key figure behind Bombay Natural History Society after 1947; created the Bharatpur Bird Sanctuary (Keoladeo NP); prevented destruction of Silent Valley NP  
 c. Awards → Padma Vibhushan

### 18. Satish Dhawan

- a. Aerospace engineer → "Father of fluid dynamics research in India"; research on boundary layer flows, 3-D boundary layers  
 b. Institutes → country's 1st supersonic wind tunnel in IISc; contributed in INSAT, IRS (remote sensing), PSLV

Dimension → GS 3 syllabus + Governance  
 For Answers  
 Env, Eco, Agri, Industries  
 ∴ (E, Transport, energy)  
 Disaster, Climate,  
 Internal Security  
 +  
 Health & Edu.  
 T, A, Outreach, Access,  
 Safety + Women

Issues ① Misuse ② ↑ pvt. domination ③ Ethics & safety  
 ④ Benefits rich only ⑤ Impact on Env.  
 ⑥ Impact on jobs ⑦ Govt. Regulations



- ① IT ② Space ③ Computers ④ Robotics ⑤ NanoTech
- ⑥ Biotech

75 Bn\$

Industry ; Bio pharma + Agri is 80% ; 7x in 10 yrs

## ① Biotech

**Def.** → Utilization of info. about living biological systems to manufacture products and improve conditions for humans and the environment.

Vaccine Dev.  
Cheap medicine prodn

eg Role of Insulin in sugar uptake ∴ Diabetes

② Antibody Antibiotic discovery ∴ Anti-Bacterial medicine

## Application

① Agri

① GM crops ∴ climate + food security + Hygiene  
② Nutrition ③ Livestock + Fisheries ④ Medicines etc from Plants

② Energy

→ Biofuels, NG Prod. eg. Biodiesel using Yast

③ Envr.

→ Bioremediation; Waste mgmt, NG. Prod. eg. A. Juri  
Biosensor to detect pollution

④ Medicine + Health

→ PHARMA, Cancer, Diagnostic, VACCINE  
Gene Therapy, 3 Percent Bales, med. device

⑤ Understanding Ourselves

→ Biology, Gene, Protein, GM  
Food → Lab Meat, Alcohol, Based

⑥ Daily items

→ Washing Powder, Alcohol, Ferment  
Lase 2000 + Dispute  
Authenticity analysis etc

## Words

- ① Gene Editing ② Bioinfo ③ Biosensors ④ Stem Cells
- ⑤ Diagnostics + Vaccine ⑥ DNA Fingerprinting
- ⑦ Biosafety

eg Outzapper  
LOTUS-HD Tech  
for use in water treatment  
IIT-D  
eg COVID Antibody

eg HGP etc.  
Indi-Gen.



## Issues

eg  
Surrogacy  
ART  
MTP

- ① Ethics
- ② Biosecurity
- ③ Antibiotic Resistance
- ④ Designer Babies
- ⑤ Regulatory Bodies
- ⑥ Legislation
- ⑦ Int'l Harmony on tech. dev.
- ⑧ Traditional Knowledge
- ⑨ R&D cost v. n
- ⑩ IPR (compulsory licensing) + P Reg. Thru TRIPS
- ⑪ UNESCO declaration on Genome, Rights etc

## Integration

- ① Bioinfo + AI
- ② 3D Bioprinting
- ③ Astrobiology
- ④ Nanobiotech
- ⑤ DNA Computers
- ⑥ Robotics - Use in Lab + Nano Bioreactors

## Case Studies + exs

Int. Govt.

Green Revolution

- ROTAVAC, COVAXIN etc.
- ① IARI created Climate Smart rice variety
  - ② Strem Bio is creating N.G. & fish feed from waste
  - ③ Mitra Biotech → Personalized Cancer Treatment
  - ④ Potaroo Vaccine in India
  - ⑤ Pocket Colposcope → Cervical Cancer
  - ⑥ Billion Success Story (WOMAN)
  - ⑦ TrueNat TB diagnostic
  - ⑧ Role of SII in Covid
  - ⑨ TB-RT PCR

## Govt. Prog

DBT

⑩ IARI, PISA, etc + KVK

- ① PM-JIVAN → VGF for 2G Bioethanol
- ② Nat'l Biopharma Mission → ↑ Academia - Industry Collab + ↑ Prod'n
- ③ Genome India Project → IISc
- ④ Biotech Parks
- ⑤ BIRAC
- ⑥ Nat'l Biotech Dev. Strategy for ↑ BT in Food, Health, Energy
- ⑦ GEAC
- ⑧ DNA (Regulation) Bill
- ⑨ Largest no. of USFDA approved sites outside USA

## Issues Cold

- ① ↓ marketability
- ② ↑ incubation Time
- ③ ↑ fresh exp.

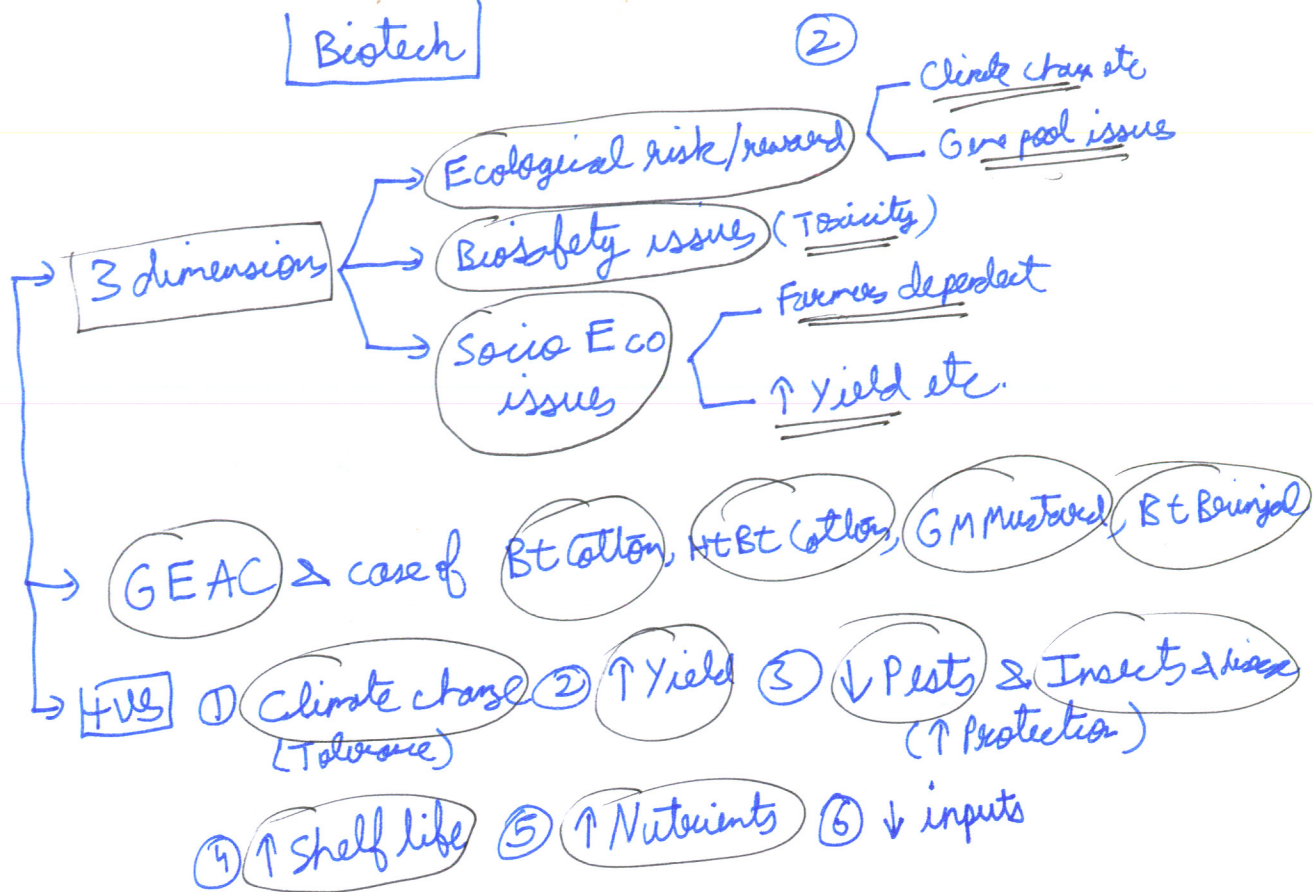
## Future

→ Optimistic + Ethical



# Biotech

## GM Crops





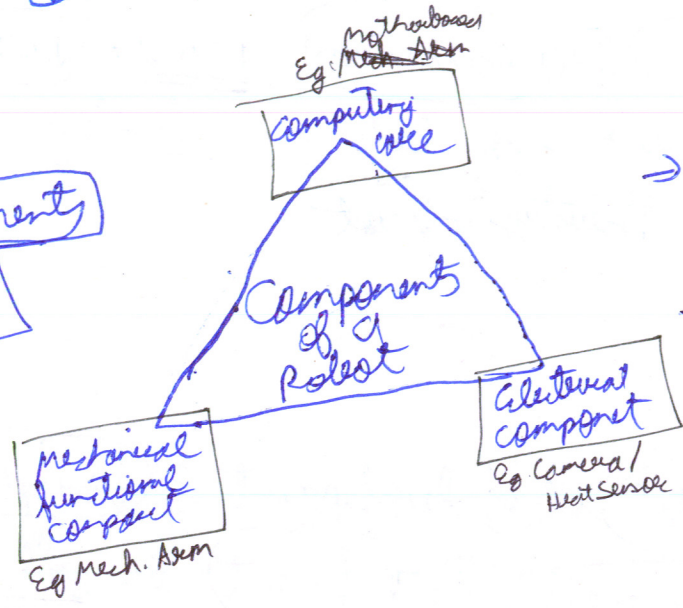


# Robotics

Def

Process of Mechanization where <sup>pre programmed</sup> machines perform tasks  
 eg Drones, ~~satellites~~ <sup>Humanoid robots</sup>, Health Surgery robots

Component  
Diagram



→ 1 to Sensors 2 and effectors

→ Environment

≡

Case Study  
 eg

- ① Vijayamitra for space station
- ② ↑ efficiency of Warehouses by using robots
- To manage inventory
- ★ ③ mobile disinfecting + cleaning robots in Hospital for COVID
- ④ Terminator movie
- ★ ⑤ Manual Scavengers Bardicoot
- ⑥ K-Pol Bot → Kerala Police Bot for Complaint registration at Thiruvanduram
- ⑦ LAWAS ⑧ ALEXA

Application

- ★ ① Industrial (↑ efficiency)
- ② medicine + Research eg Angiography (Robotic Camera)
- ③ Agriculture (Drones, seeding)
- ④ Defense (LAWAS)
- ⑤ Autonomous social App eg ① Risky Jobs are not done by robots eg mining etc
- ⑥ Humanoids ② Old Age assistance

⑦ Drone Delivery ⑧ Automated Weapons Systems

⑨ Domestic work (eg. Cleaning robot)

FVS → ① ↓ Human error ② ↑ Automation : ↑ Speed + ↓ Cost  
③ ↑ Safety to humans eg Defence, Industry  
④ ↑ Efficiency in Industry + ↓ cost

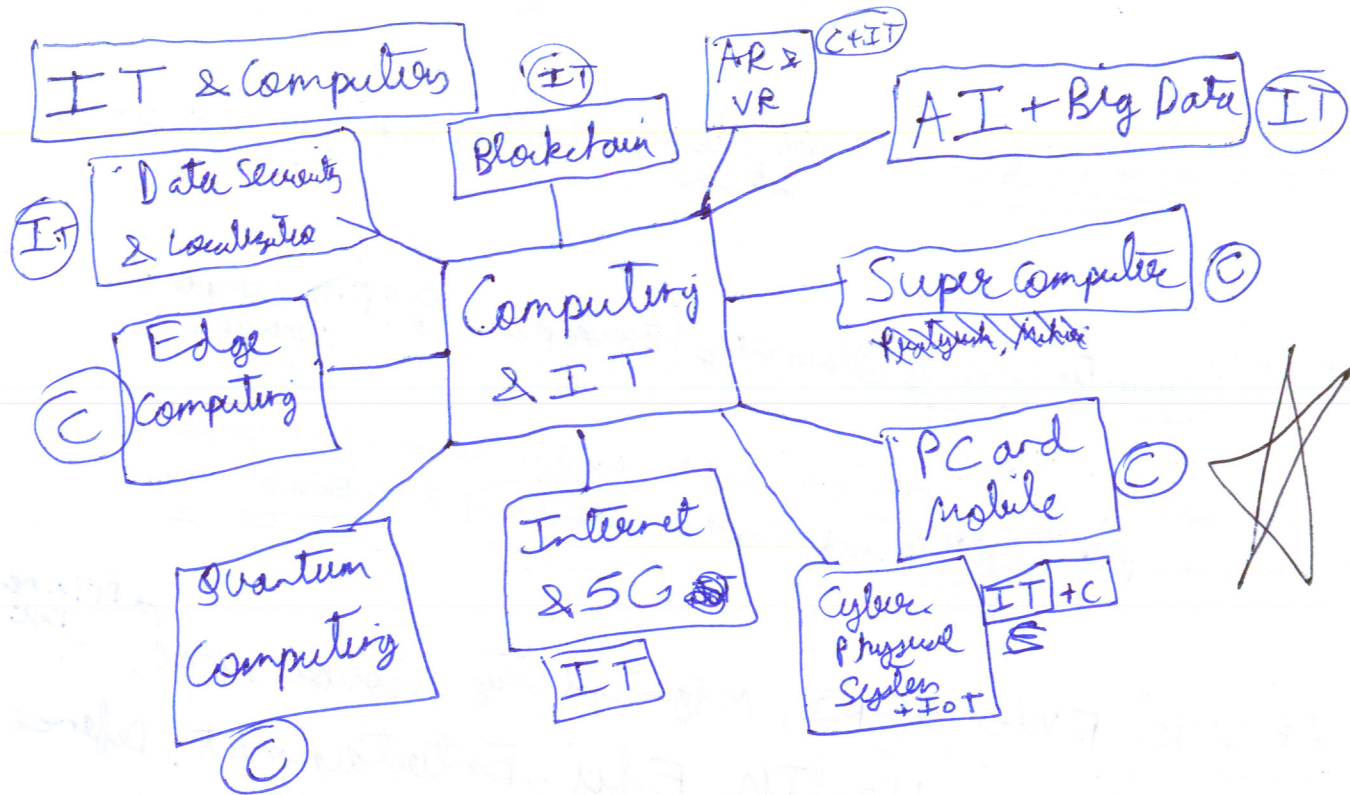
Issues ① ↑ R&D ② Capital cost of development ③ ↓ Adoption Rate  
④ ↑ Cost of deployment ⑤ Threat to jobs  
⑥ Threat to humanity ⑦ No Human Feelings

India → ① Test beds in IITs, IISc ② Notan Paddy Committee <sup>PAO & STech.</sup>  
③ All India Council for Robotics & Automation

Interdisciplinary ① 5G ② Nano ③ AI+ML ④ Biotech ⑤ Space

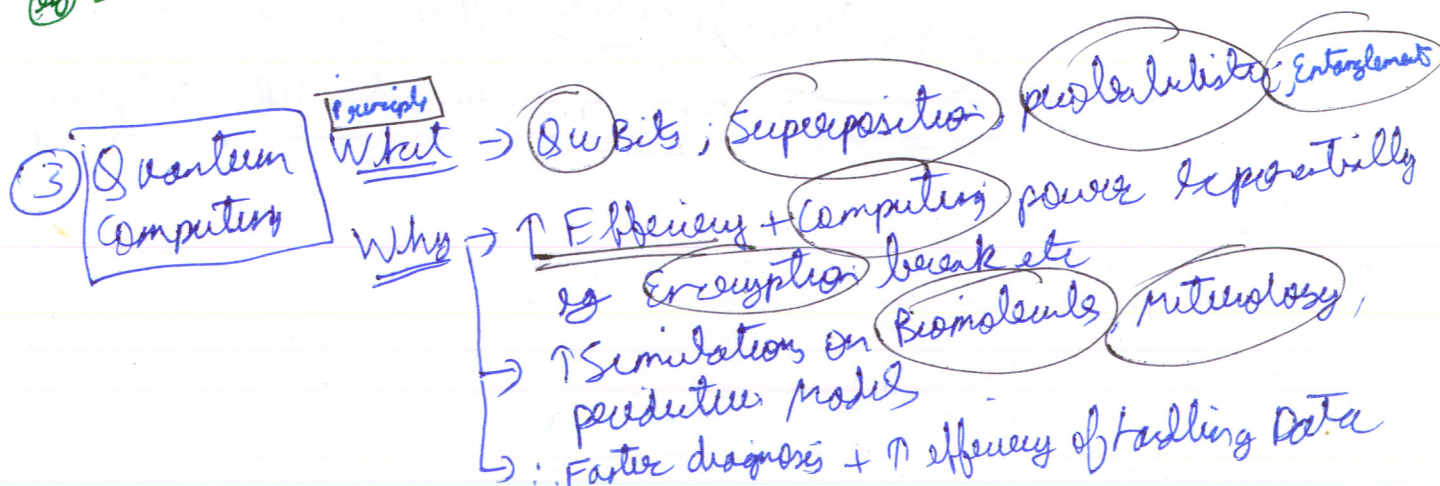
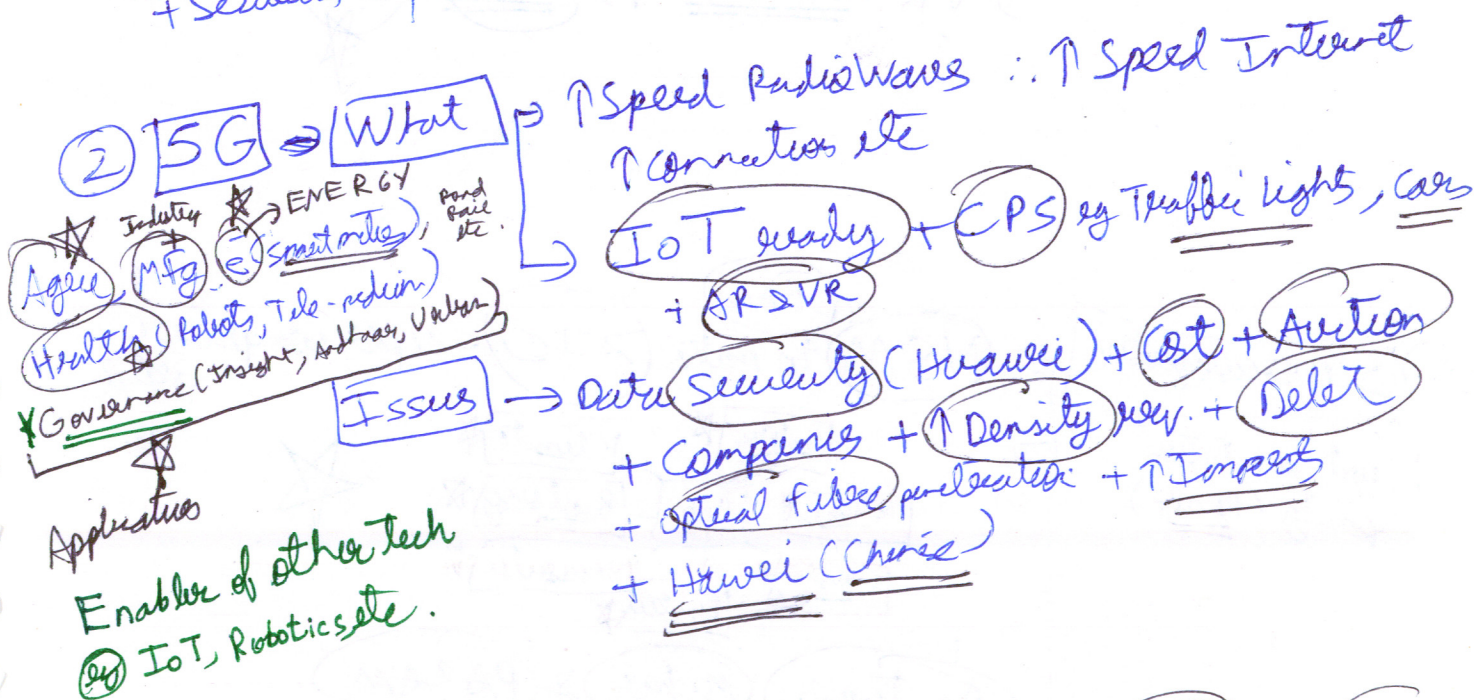
Overall Concerns with Robotics & AI ① ↑ Inequality ② due to disruption of labour market  
③ ↑ Social Tensions ④ Privacy Issues  
⑤ Surveillance state ⑥ Tech. Supremacy can lead to Threat to Nat'l Security





① Data Localization + Security → Done Notes

② ~~Blockchain~~

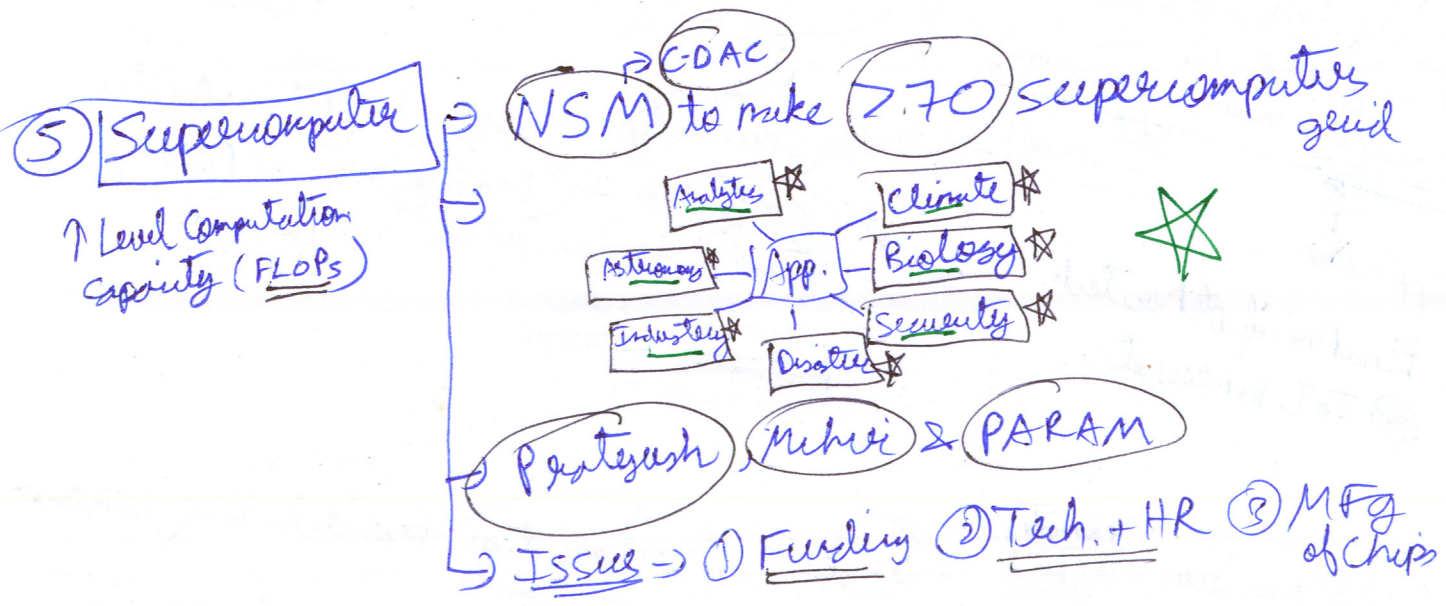


Govt Policy → QUEST-SDST ② Nat'l Mission on Quantum Tech & Applications (Budget 2020)  
 ③ Q-Sim

Free → ① Security ② Equity ③ Currently ↑ Error prone ④ ↑ Pvt. Companies ∴ misuse

Eg. → ① Google → Quantum Supremacy i.e. Calculation impossible for conventional computer  
 ② China QUESS satellite used Quantum entanglement to distribute keys

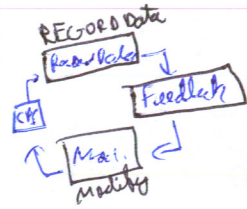
④ AR & VR FW → AGRI, Mfg + Industry, Governance, Health, Edu., Entertainment, Defence → Driving Tax  
Eg. → Google Translate App (AR); Gaming (Pokemon Go)  
 → VR War training, Health, Edu., Skill Dev.





# ⑥ CPS

- Cyber physical System
- Deployment of Computer Systems in everyday physical objects
- eg Smart Grid, Transportation, Utility Infra, Sensors on river/ocean bed, Industrial Safety Systems
- "Nat" Mission on Interdisciplinary CPS to ↑ HP, Tsk etc.
- eg ① Sensors ② Feedback loops ③ Modeling
- Infra, Cost, Human error in Analysis (eg Indonesian EQ)



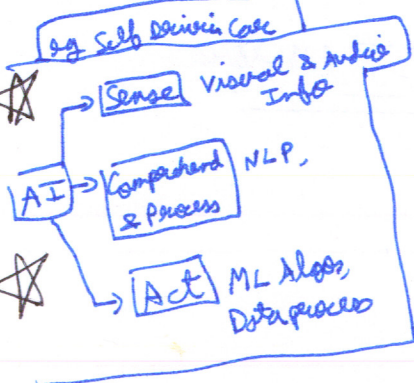
## ⑦ AI

→ Enable for other tech.

What?

### Interdisciplinary

- ① Robotics
- ② Protein
- ③ Health
- ④ Agri
- ⑤ Edu.
- ⑥ Urban
- ⑦ Eco
- ⑧ Precision Agri
- ⑨ Governance



- eg GST Data, IT Data, Water Use, E use, Traffic

eg New Zealand killer

Ability of Machine to perform cognitive tasks displaying human like thinking, learning, problem solving etc.

eg Self driving cars, Project Insight, LAWS, Precision agri

ML, Deep Learning, Neural Network, Data mining, NLP

Overcome physical limitations & ↓ labour

① Intelligent automation based on data ML eg Google AI can detect Skin Cancer

② Labour & Capital Augmentation eg Predicting Disasters based on Weather Data + Predict Cropping pattern to ↑ Efficiency

③ Social inclusivity: ↓ Dist. eg if everyone has access to AI medicine

## ④ Use of Big Data

eg GST Data, IT Data, Water Use, E use, Traffic

⑤ Security Surveillance of Online Activity + FACIAL Recog + Automated Weapons

→ "Effective Governance"



## Applications

- ① Healthcare ② Edu. (Chalking etc.) ③ Agri (Robots, Prediction)
- ④ Mfg & Industry ⑤ Energy (Smart grids) ⑥ Fin. Services (Fraud, Banks)
- ⑦ Law Enforcement (Facial recog) ⑧ Gov. (Insight)

## Issues → ① Ethics & AI + Future (Terminator movie)

- ② Quality of Research ③ Future of Jobs
  - ④ Equity based approach ⑤ Pvt. Companies Control Tech.
  - ⑥ Quality & Standards of Datasets ⑦ Legislation + Regulations
  - ⑧ Deepfakes ⑨ Bias ⑩ Accountability of Action ⑪ Personal
  - ⑫ MISUSE
- ⑪. Discrimination

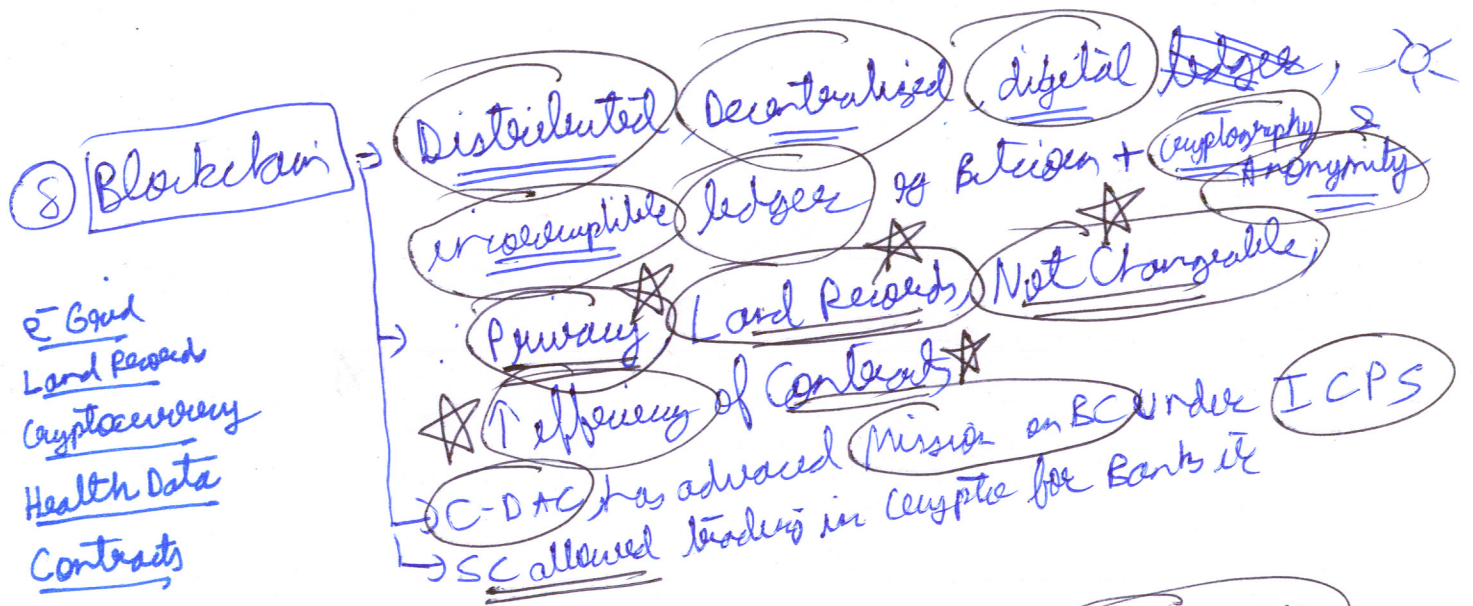
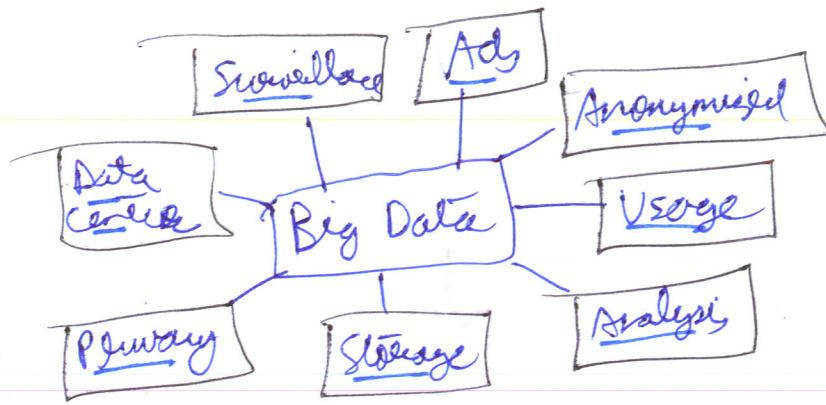
## Case Studies + exp

- Writing books, Painting
- NITI Aayog + IBM to create all India weather prediction for Agri Sol<sup>n</sup> & ↑ productivity
- OECD principles on intelligent automation + AI
- IIT Delhi prog to use Big data for pathology process
- IBM Watson, Apple Watch, Tesla Cars

## Govt. Prog.

- ① Digital India ② NKN ③ NPSAP
- ④ NIC - Center of Excellence on AI
- ⑤ Data Localization + NPDP
- ⑥ Project Insight to find IT leaders





[Veg] → ① Personal ② Interoperability & Scalability ③ Data Portability  
 ④ Service Key ⑤ 51% Attack ⑥ Unchangeable

[Hve] → ① Smart Contracts ② Transfer of money / Funds  
 ③ Land records ④ ↑ Transparency ⑤ ↑ Cybersecurity  
 ⑥ Record Logistics & movement of Assets ⑦ Repaid Data of Health Data  
 ⑧ Managing Crime Records, vehicle registration etc.

Overall Issues → ① Big Tech Dominate ② Ethics ③ Privacy  
 ④ Antitrust of Google ⑤ Store data + sell  
 ⑥ MISUSE



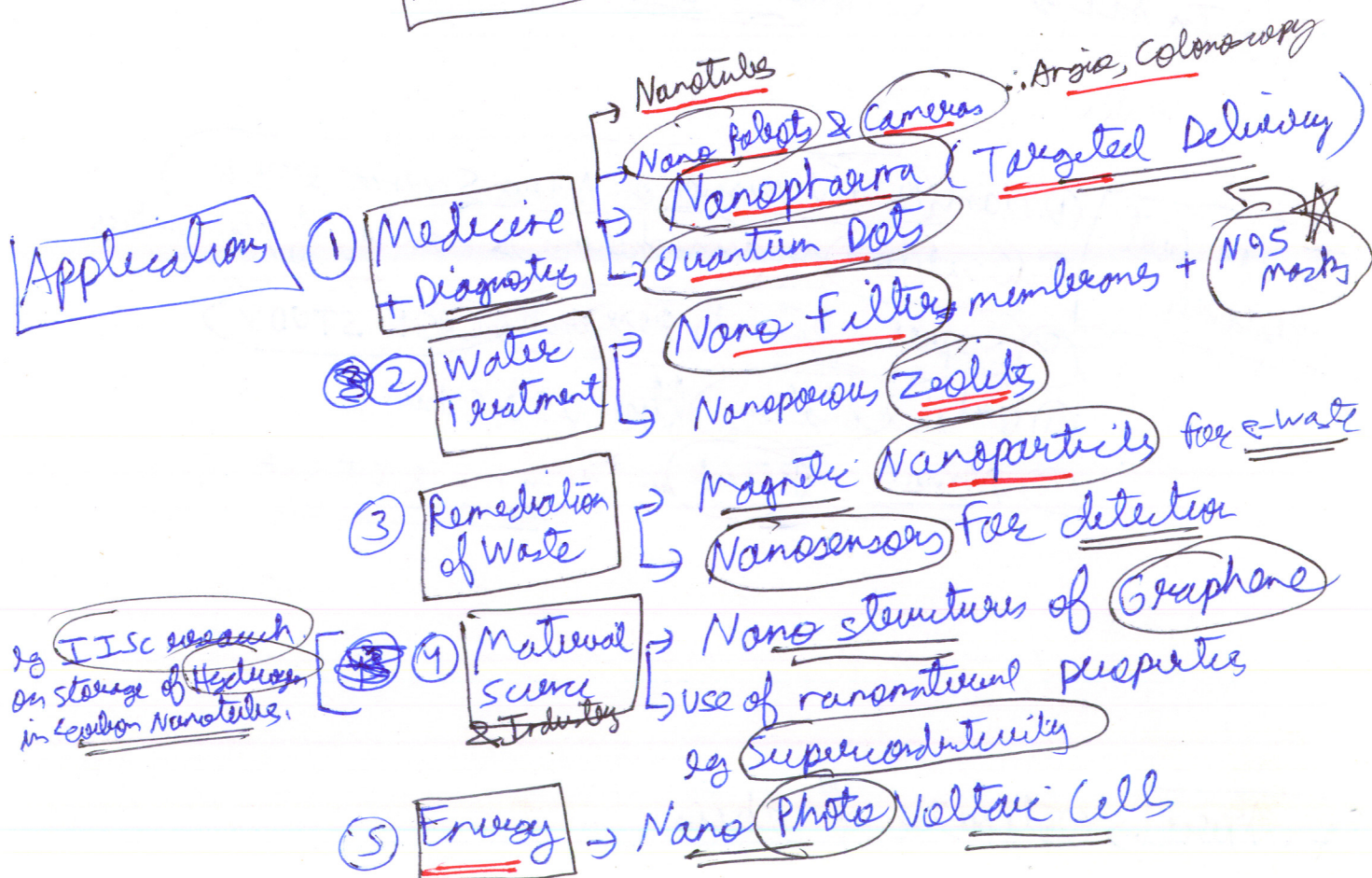
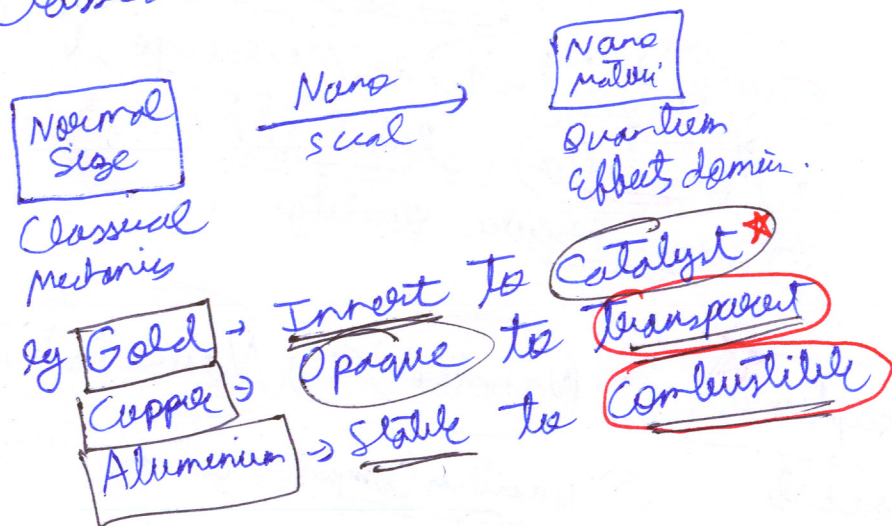


## 2) Nanotechnology

Def: Usage of Nanomaterials is with dimensions of nano scale ( $10^{-9}$  m) for Technological applications

Principle → Materials show altered physicochemical, biological, mechanical, optical & electrical properties at nano scale as QUANTUM effects dominate classical mechanics

is  
Quantum  
Size  
Effect \*





- Nano Agri Products
- Nano Agri Input Products
- ⑥ Agri + Food
  - Antimicrobial Nanoemulsion used to disinfect food
  - Nano Bioconjugated Fertilizer capsule shown to ↓ release of Fert @ Nano Urea
- ⑦ Nano Textile → Use of Nanomaterials to enhance textile properties
- ⑧ electronics → chips, Graphene based Screen etc.

- Issues** →
- ① Erie + Health
    - Nanoparticles Imaging + Pollutant → no Plaster
    - In body they can infiltrate blood vessels, blood brain barrier
  - ② ↑ Cost of tech → Microscope, lithography lasers
  - ③ Regulation + global ethics & rules
  - ④ IPR
  - ⑤ Human Resource Quality

- Interdisciplinary** → In ALL
- ① Nanobio
  - ② Nano Robot
  - ③ Quantum Computers use nano
  - ④ 3D Nanoprinting

- India Govt. + Research**
- ① Nano National Mission on Nano Science & Tech.
  - ② Guidelines on Nanopharma & Handling of Nanomaterials
  - ③ Superconductivity Research CASE STUDY
  - ④ 3rd in Citations after US & China
  - ⑤ Nano Sc. B.Tech in IITs & IISc

**Future** → Optimistic + Growth



# SPACE

**Def** → Any technology that operates in ~~space~~ relation to or in space is space tech.  
 Indian industry is 8B\$

**Egs** → ① Telescopes eg ASTROSAT, GROWTH  
 ② Satellites + LVs eg ~~ASAT~~ <sup>INSAT</sup> Communication ③ Imaging ④ Military  
 ⑤ Positioning/Nav. ⑥ Sc & Tech ⑦ Small

Pocket  
Man of  
India  
↓  
Kalam

③ Space Station Gaganyaan

④ Interplanetary Mission

⑥ NAVIC

⑤ Solar Mission, Lunar → Artificial LI, Chandrayaan

~~Relevance~~ ⑥ Space Warfare + missiles (eg ASAT; EMISAT → Space Intel)  
 ⑦ Space Tourism ⑧ Tech → LIDAR, LIGO etc ⑨ IDRSS → Space 2 Space Comm.

**Relevance + for India**

- ① Resource → eg Heon moon, Asteroid mining
- ② Basic Questions on Universe & Life
- ③ Communication → Telephone, Internet, TVs etc
- ④ Military + Defense → Imaging + Anti Sat.
- ⑤ Soft Power → Launch other Sats
- ⑥ Global leader in Tech → ∴ ↑ HR + ↑ FDI + ↓ Brain Drain
- ⑦ Disaster Management ⑧ Env. → Track O<sub>3</sub>, Ice, CO<sub>2</sub> Trees
- ⑨ Agri forecast etc. ⑩ Rural Dev. → Comm. Sat + VRC ∴ Tele-Edu + Tele medicine
- ⑪ Transport (Rail & Air Comm.)
- ⑫ Sc R & D (Space Station)
- ⑬ GPS & Geostay  
↳ PMAY



## Issues

① Space Debris  
(500 Sat. in LEO & 5 Lakh debris)

② Global agreement on Use by COPUOS

③ Legislation + Regulation for PVT.

④ Manpower i.e. Engg + Scientists + Women + Training

⑤ Cost ⑥ Space traffic ⑦ Manpower

## Sol<sup>n</sup>

① Debris  
Natural / Man made

a) Junk orbit

b) ~~ISRO~~

c) Planned death

d) Capture + Cleaning

## ISRO

↓  
New PVT.

① Village Resource Centres

→ Tele Medicine + Edu. + DTIT  
→ Agri Info. + Met. Data

② Next gen

→ Yuva + Young Sc. Progy.

③ Soft Power

→ UNNATI progy + Collab

④ LVs + Tech

→ GSLV, PSLV, Nano, Giga, Vikas, Engine, Ramjet etc.

⑤ Space Tech

→ Chandrayaan, Mangal ~~etc.~~, Hysis + CHEAP

⑥ Space Tech. Park

in Bengaluru for ↑ Start ups etc.

Notes  
↓  
Track Debris



## Interdisciplinary

- ① Astrobiology
  - ② Space Biotech
  - ③ 3D printed sat.
  - ④ IT & Comp
  - ⑤ Polestics eg Vijaymitra & Polestics Telescope
- ~~Vijaymitra~~

## Future

- ① Pvt.
- ② Polestics
- ③ Cities + Optimist
- ④ Resources
- ⑤ Space Junk / Traffic
- ⑥ Space Tourism

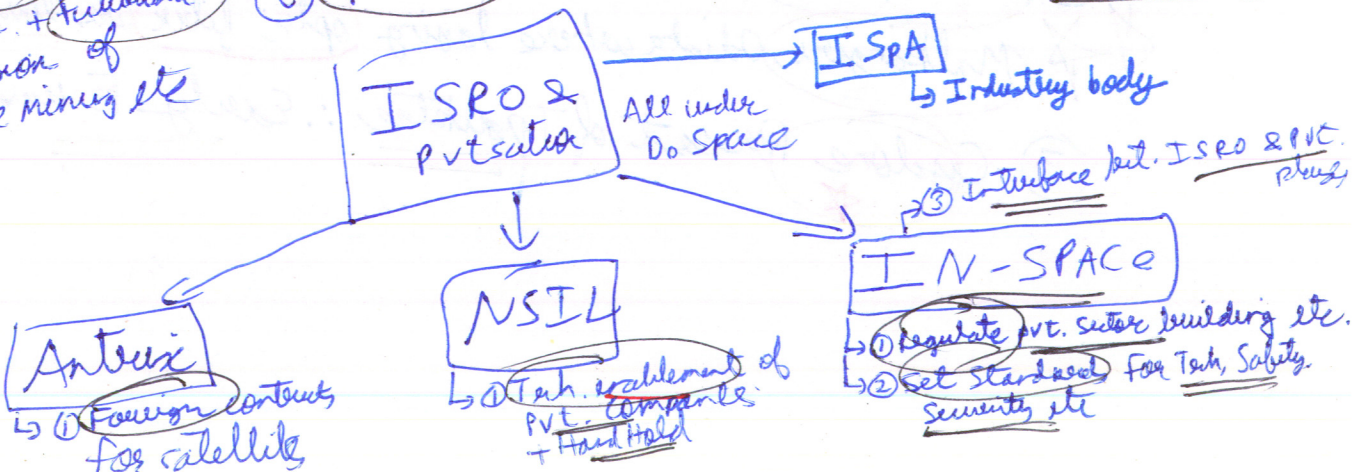
## Pvtisation of Space

→ Plan to allow  
Pvt. prod. of  
PSLV

- ① 350 Bn\$ worldwide industry 10 Bn\$ in India
- ② Pvt participation ↑ Competitiveness + ↑ Tech.  
 & Manpower in industry + Entrepreneurship  
 eg ① Exo seed sat  
 ② Pheonix Space → made sat
- ③ Use of ISRO data ↑ AI etc
- ④ ↑ Pvt. Satellites etc. need Launchers
- ⑤ Global esp. of Space X etc
- ⑥ ↑ ISRO focus on Core R&D & project  
 + ↓ Taxpayer burden

⑦ ↑ Global demand of Satellites

⑧ ↑ R&D in space Tech. + Future mission of Space mining etc



- Case Studies →
- ① Gemini For Deep Sea Fishermen ★★
  - ② ISRO provided internet to Kordh tribals in Malkangiri, Odisha where laying optic fiber was tough ★★
  - ③ Cyclone forecast of Tamketae ∴ Early Evaluation ★



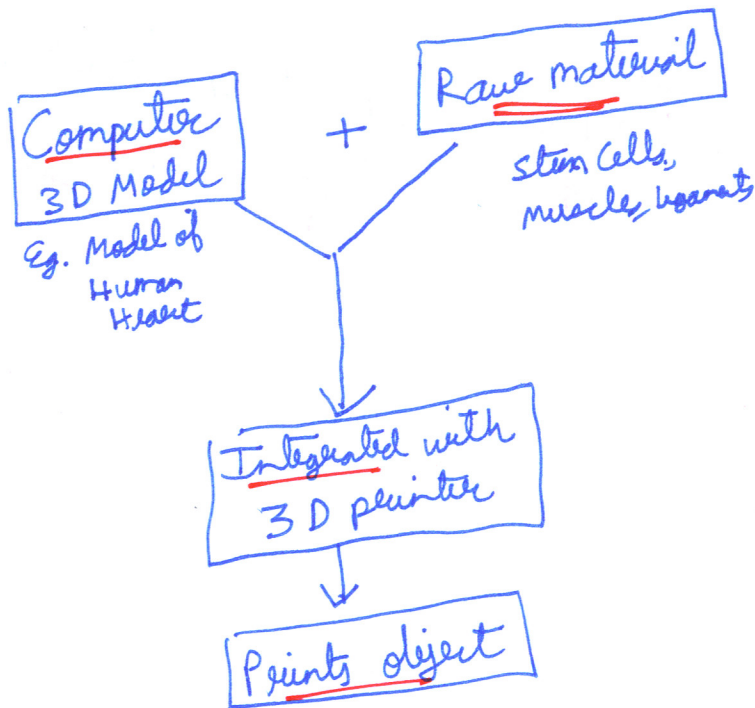
# 3D Printing / Additive Manufacturing

Def

Technology that uses a 3D computer model to "print" objects by layerwise integration of material

eg. A human lung tissue printed by IISc in 2019  
using lab made cells.

Process



App.

- ① Industry & mfg + why
- ② Healthcare  
↳ personalised + biotech
- ③ Space Tech.

Issues & challenges

- ① Disrupts labour market
- ② Expensive Capex. ★
- ③ Only possible for some materials currently is plastic etc.
- ④ Skilled Manpower
- ⑤ Monopoly

Tech. Limitations

↳ Issue for all's

+ve's

- ① End to End Mfg. by 1 Machine
- ② ↓ Wt. & Material used  
as no assembly & supply chain
- ③ ↑ Quality & ↓ Error
- ④ ↓ Pollution

Govt. Steps

① Nat<sup>n</sup> strategy on Additive Mfg.

- IPR ★
- R&D ★
- Ecosystem for industry ★
- Nat<sup>n</sup> AM Center ★

Nat<sup>n</sup> strategy for XYZ

- ① Personnel
- ② Infra
- ③ R&D + IPR
- ④ Enabling gov. + policy
- ⑤ Nat<sup>n</sup> Centre
- ⑥ ↑ Industry - Academia

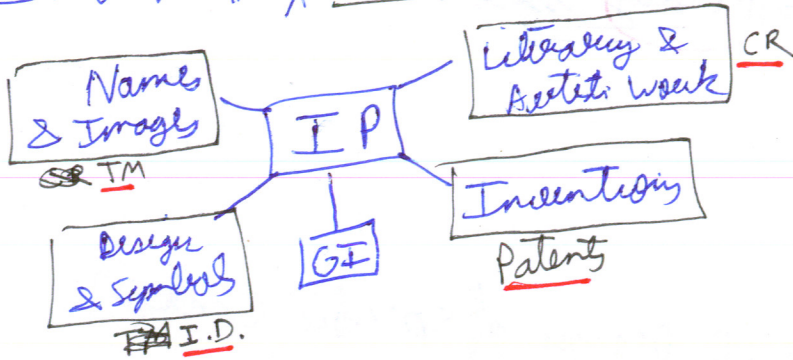
Applications

- ① Aerospace & Defence (Components, small parts integration) ★
- ② Automobiles ★
- ③ Electronics ★
- ④ Healthcare ★
- ⑤ FMCG (Toys, shoes etc)



# IPR

Def → IP refers to novel creation of the mind ~~products~~



Significance → Art 27 of UDHR allows creators to benefit from their work & IP

→ Incentivize Innovation

→ Strike Balance between innovative interest & Public Interest

Type → ① Patent → For an invention i.e. novel product or process

Paris

→ Patent Act, 1970

→ Does not allow evergreening

→ Issue of novelty def. eg. Tuamocin etc

i.e. TKDL items cannot be patented

→ Section 4 of Patents Act DISALLOWS patenting of Biological products & process

② Trademark → Image / Symbol to distinguish product / process

Nice

→ 1999 Act

Eg Brand Value of McDonalds / Coca Cola

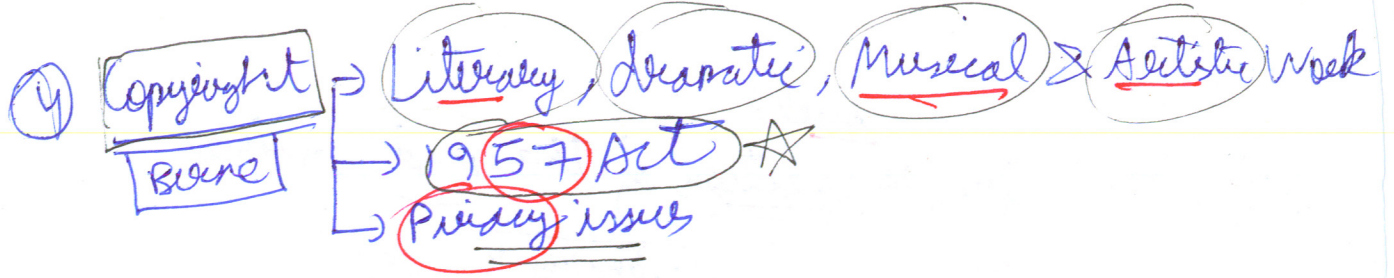
③ GI → 1999 Act to denote place of origin as a distinguishing Character.

Eg. Kashmiri Saffron, Bihar Litchi, Alphonso Mango

Extra Patent Ps.

- ① TRIPS
- ② Compulsory Licensing



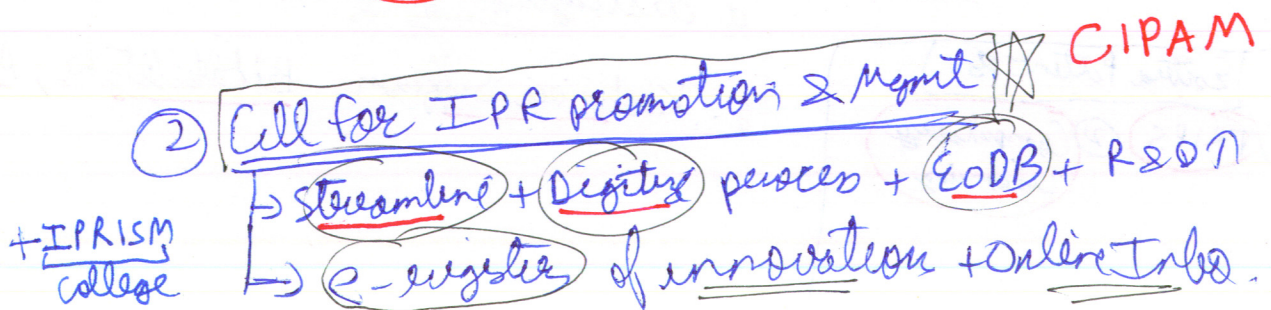
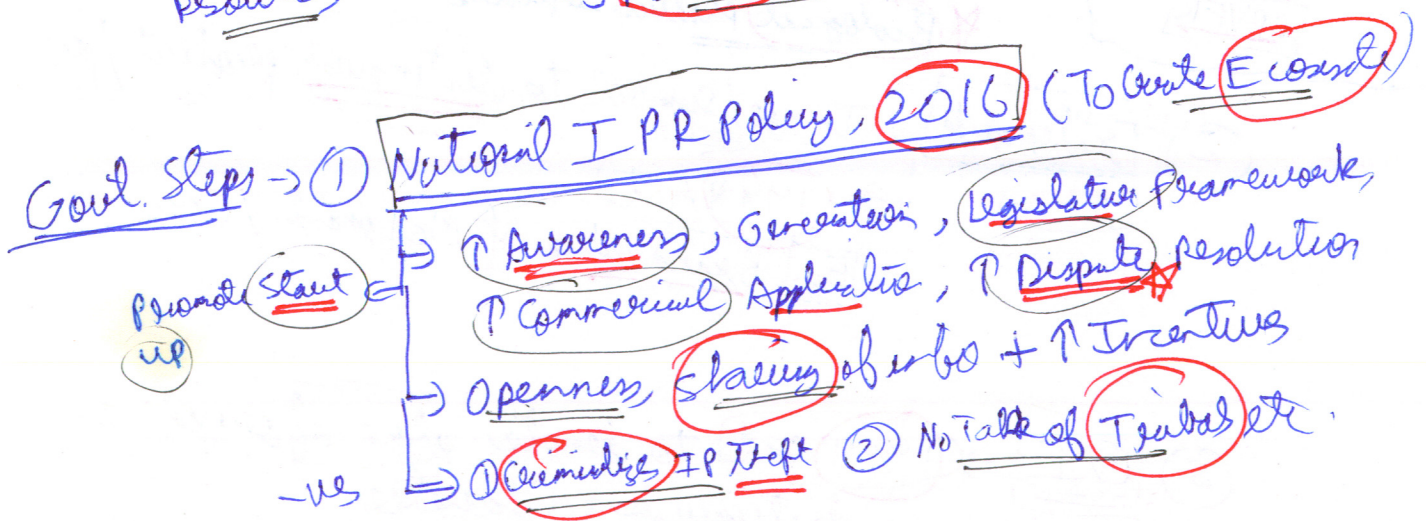
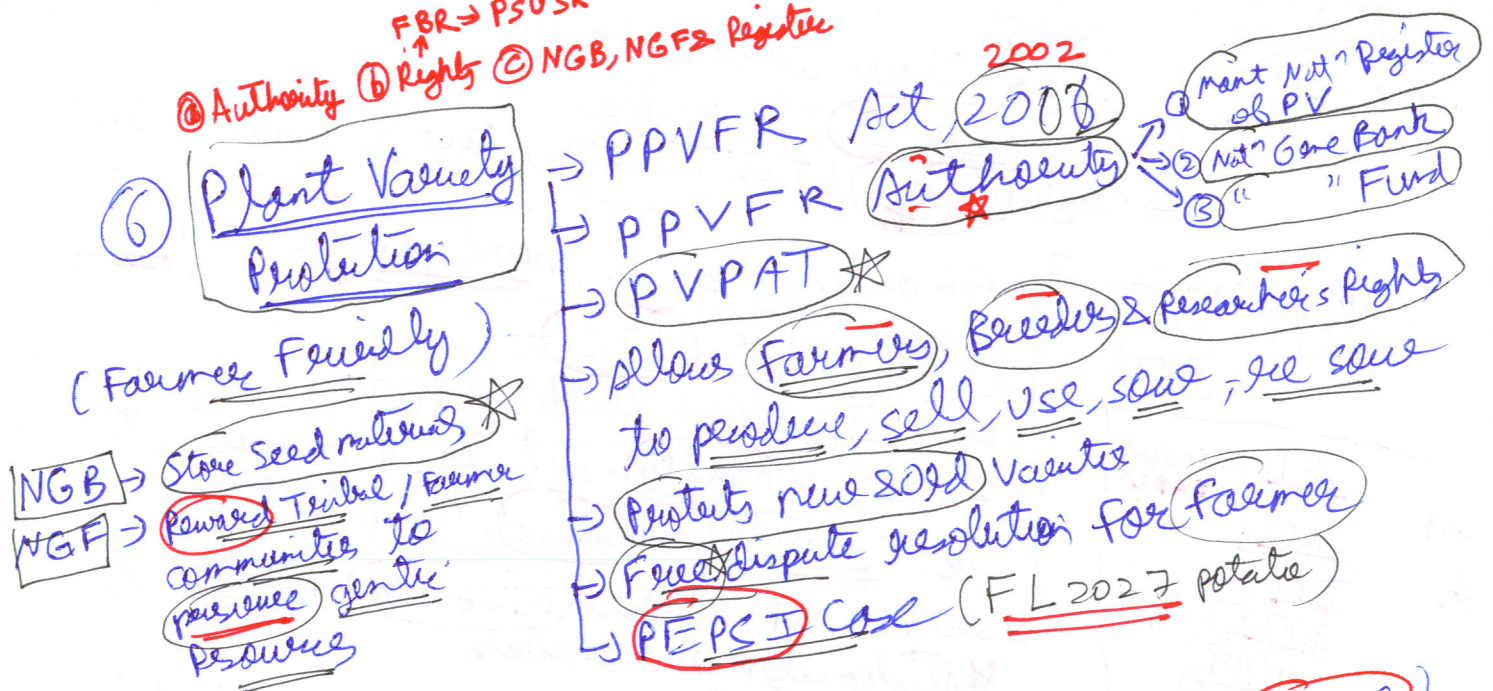


⑤ Design → 3D Design of specific Config'

⑥ Plant Variety Protection

FBR → PSUSR

① Authority ② Rights ③ NGB, NGF & Register





③ Guidelines for approval is term limit, second approval etc.

- Issues
- ① Secondary Patents → Patent holders try to extend monopoly  
aka evergreening  
→ Patents act has technical safeguards
  - ② Documentation + Registration cost → Proof + Patent office + Corruption  
+ Time cost + Opp. cost
  - ③ Intl' developed countries want stronger protection  
to ↑ monopoly under WTO, TRIPS PLUS
  - ④ Traditional knowledge → Bioprospecting & Biopiracy
  - ⑤ Quality R&D missing in India
  - ⑥ Issues of IP Theft, Compulsory licensing  
lead to ↓ incentive

\* BD Act, TKDL, Sch 6 of WPA, ICBD - Nagoya + Cartagena, (ABS) (LMO), PPVFR



Way Forward

- ① Industry - Academia Link + NEP factor
- ② Start up innovation ★
- ③ Companies invest in R&D as Patent Box
- ④ Fair & Quick contractual dispute resolved ★★
- ⑤ Protect Traditional knowledge of Tribes  
∴ TKOL, BD register

Hves

- ① ↑ Industry + Business
- ② ↑ R&D by Pvt.
- ③ ↑ FOI
- ④ ↑ focus on culture of music, art

Case Study

- ① Patent Pooling is mutual sharing of all IPR related to COVID-19 discussed in VN as it harmonizes complementary patents for consumer save + ↑ complementary innovation + ↑ efficiency