

# ***SCIENCE, TECHNOLOGY AND INNOVATION : SOME RANDOM THOUGHTS***



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## ***FAILURES OF VISION***

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**1876 - ‘This “telephone” has too many shortcomings to be seriously considered as a means of communication.’ -**

***Western Union internal memo***

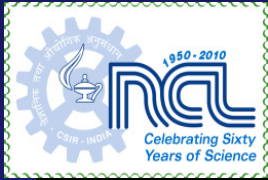
**1895 - ‘Heavier-than-air flying machines are impossible.’ -**

***Lord Kelvin, President, Royal Society***

**1899- ‘Everything that can be invented has been invented.’ -**

***Charles Duell, Commissioner of the US Office of Patents***

***Contd.....***



## **FAILURES OF VISION**

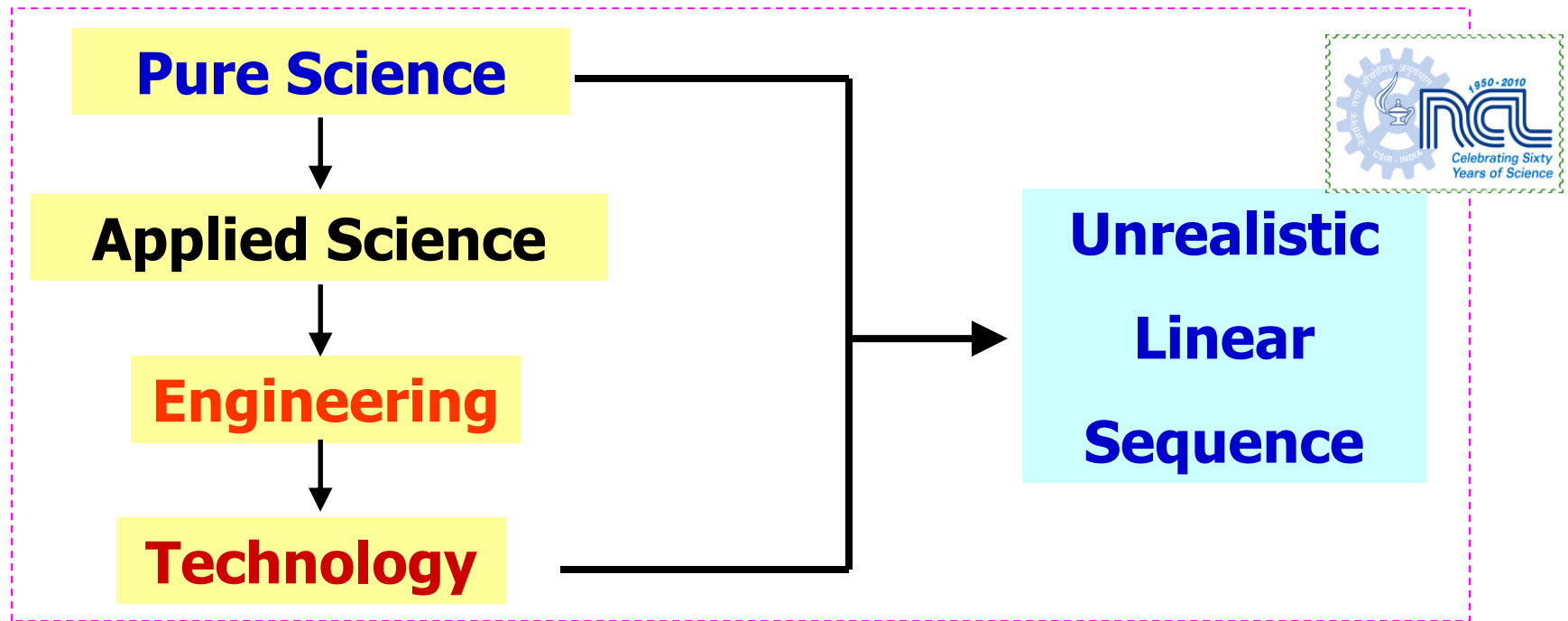
**1920 - 'The wireless music box (radio) has no imaginable commercial value. Who would pay for a message sent to nobody in particular?' - *David Samoff's associates, in response to his urgings for investment in the radio***

**1943 - 'I think there's a world market for maybe five computers.' - *Thomas Watson, chairman of IBM***

**1949 - 'Computers in the future may weigh no more than 1.5 tons.' - *Popular Mechanics***

**1977 - 'There is no reason anyone would want a computer in their home.' - *Ken Olson, president, chairman and founder of Digital Equipment***

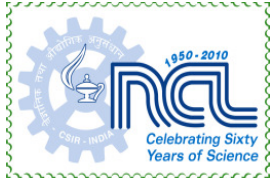
**1981 - '640K ought to be enough computer memory for anyone.' - *Bill Gates, chairman of Microsoft***



**Science by itself provides no panacea for individual, social and economic ills. It can be effective in national welfare only as a member of a team. But without scientific progress, no amount of achievement in other directions can insure our health, prosperity and security.**

**Vannevar Bush**

**"Endless Frontiers" -1946**



# **SCIENCE & ENGINEERING**

## **Scientists as Inventors**

**“Often considered distinct, engineering and science are frequently difficult to distinguish”**

**Henry Petroski, American Scientist, 2008, Vol 96, 368.**

**“The scientist seeks to understand what is :  
the engineer seeks to create what never was”**

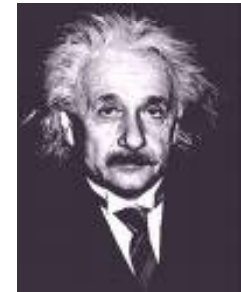
**Theodore von Karman**



**Discovery : Penicillin**



**Invention : Light Bulb  
Relativity**



**Innovation : Retail Store**





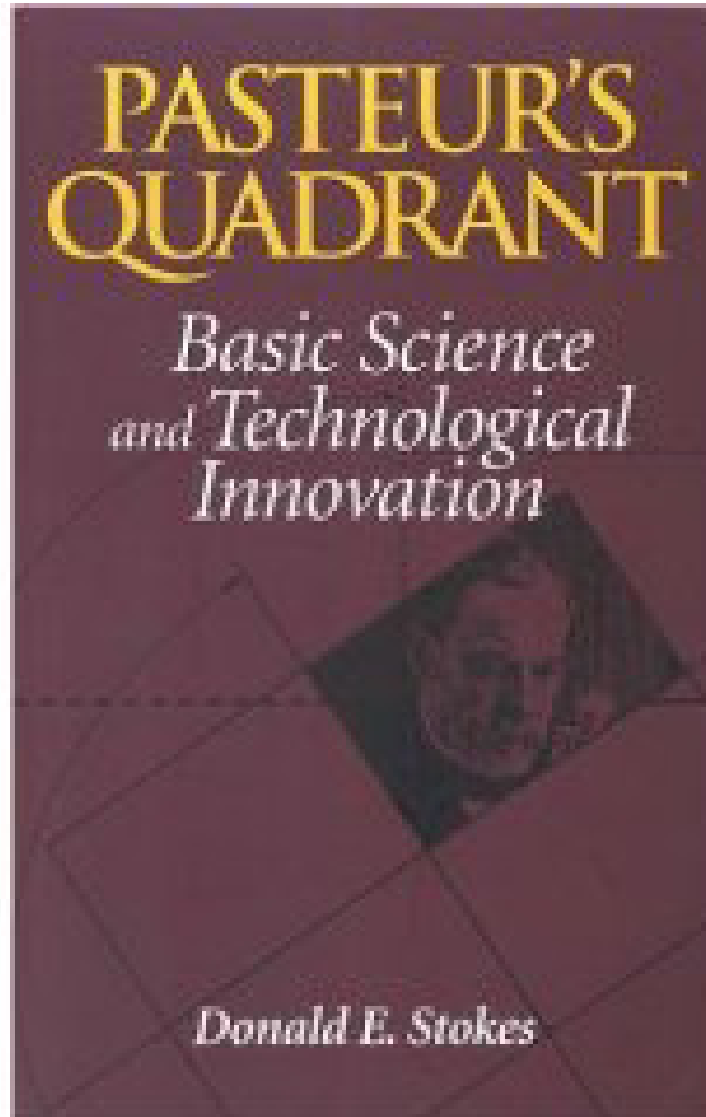
**Ideas**

**Translation**

**Development**

**Marketable Product**

**“ Success in the laboratory does not always translate into success in the market place ”**



**1997**

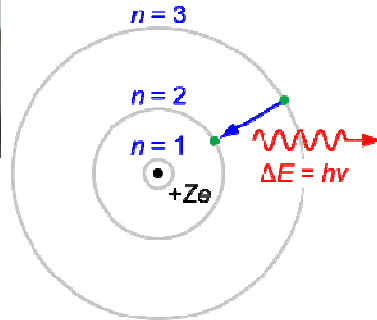


# Pasteur's Quadrant

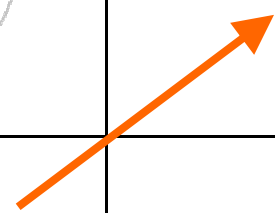
Fundamental Research



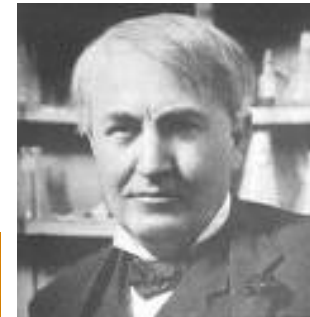
**Bohr**



**Pasteur**



**Average  
Academic  
and  
Industrial  
R & D**



**Edison**

**Use Inspired Research**





## ***EMERGING MODELS OF INNOVATIVE ORGANIZATIONS***

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- From hierarchal or linear to distributed networks
- Fluid network of many interacting parts, with many nodes, but no singular leader

***Leadership will need skills to create partnership, govern loose networks and lead by influence rather than control and command***



## ***THE STARFISH ORGANIZATION***

***(The Starfish and the Spider : The Unstoppable Power of Leaderless Organizations by O. Brafman and R.A.Bckstrom***

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- Being small gives competitive advantage
- Communities of networks creates better value of human resources
- Creativity thrives in chaos; order and structure squelch creativity
- Knowledge is spread throughout the organization; the best knowledge is at the fringe of the organization
- The spirit of sharing thrives; everyone wants to be a contributor
- In a starfish organization, people will do what they will do; the role of management is to connect people and ideas

***If you cut off a spider's head, it dies; but if you cut off a starfish's leg, it grows a new one .Traditional top down organizations are like spiders***



## ***INNOVATION AND CROSSFUNCTIONAL TEAMS***

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- **Cross functional diversity provides multiplicity of ideas essential to creative thinking**
- **However, merely including a large number of functional areas in a team does not improve performance. While more ideas may be generated problem solving becomes difficult**
- **For a team to succeed, one must have a strong “superordinate identity” to the team. Often team members retain deep rooted functional allegiance**
- **Strength of interpersonal ties among team members influences innovativeness. High social cohesiveness a deterrent to innovation**
- **Close monitoring of activity is a powerful motivator for enhancing innovation**



## ***ATTRIBUTES OF AN INNOVATION TEAM***

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**Unpredictable**

• **Problem Solvers**

• **Integrator**

**Predictable**

• **Implementors**

• **Problem Finders**

**Simple**

**Complex**



## ***LEADERSHIP ROLE IN INNOVATION PROCESS***

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- **Leadership that is failure tolerant; views failure as complement to success, not opposite**
- **Leadership that is fully engaged in the innovation process; Focused on increasing organization intellectual capital**
- **Leadership that is collaborative, not controlling**
- **Leadership that is less evaluative, more interpretative**
- **Encourage communication; Create avenues for ideas to “bubble up”**



# LEADERSHIP GRID

<b>PEOPLE</b>	<b>Country Club</b>	<b>Team Leader</b>
	<b>Impoverished</b>	<b>Authoritarian</b>
	<b>TASK</b>	

***A good leadership is one whose presence is barely known or felt***



# ***FUTURE OF INNOVATION***

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- Innovation will move from large enterprises to small companies
- Disruptive innovation will most likely emerge from publicly funded institutions
- Larger companies will need to build entrepreneurial, agile R&D teams through an open innovation or venture models
- Partnership and collaboration in R&D will become necessary criteria for success based on shared responsibilities, risks and benefits





## **SOME USEFUL LESSONS LEARNT**

- Learn to walk the last mile
- 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
- Passion to succeed; Are you ready to stake your reputation?

***Science is an individual effort; technology is a collective endeavor***



***We must learn to happily progress together or miserably perish together. Man can live individually but can survive only collectively***

***Atharva Veda***



***THANK YOU***

