WHAT IS INDEPENDENT RESEARCH?

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HOW DO WE PERFORM INDEPENDENT RESEARCH?

- A researcher comes up with a novel idea or question!
- He/she submits the idea to a funding body with a proposal on how he/she intends to answer this question, and requests funding proposing a specific budget.
- The funding body evaluates the idea!

WHAT ARE THE CRITERIA FOR SELECTING A PROPOSAL FOR FUNDING?

1. Is this idea interesting and its answer important to the scientific community and/or society?
2. Can the researcher answer the question asked i.e. does he or she have the required background and access to equipment to do so?
3. Can the question be answered with the budget requested?
4. Will this idea generate interest in its respective field and spur follow-up projects for other scientists?

DOES FUNDING GUARANTEE SUCCESS? YES AND NO!

- Possible Outcomes

1. The researcher gets funding completes the project and answers the question! Success!!!!
2. The researcher gets funding works on the project but does not answer the fundamental question, instead answers other questions that came up while doing research: Success!!!!
3. The researcher gets funding works on the project, fails to answer the question nothing else comes from the project: Failure!!!!

FAMOUS SUCCESSFUL PROJECTS.

- Human Genome Project 1991-2003 Budget 1 billion dollars

  - Largest Collaborative Project (Universities in the US, the UK, Japan, France, Germany, Canada, China).

  - Goal: To map all the genes of the human genome.

  - Started in 1990 completed in 2003, with sequencing “euchromatic” regions, making 95% of the genome.

  - Outcome: Understand Diseases, Identify Mutations linking to Cancer, Design Medication, Genomics Research.

Video: https://www.youtube.com/watch?v=PwdDa6QCDWw

FAMOUS SUCCESSFUL PROJECTS.

- Large Hadron Collider Budget 7.5 billion euros

- **LHC** is the world's largest and most powerful particle collider

- Built by CERN between 1998 and 2008.

Consists of a 27 Km ring of magnets that accelerates the particles.

Goal: to test theories of particle physics and answer unsolved problems of the field.

Outcome: understanding black holes, identifying exotic particles.

- Virtual tour of the Hadron Accelerator:

http://virtual-tours.web.cern.ch/virtual-tours/vtours/LHC/LHC.html

FAMOUS SUCCESSFUL PROJECTS.

- The Manhattan Project appr. 2 billion dollars

Research mission during WWII that produced the first nuclear weapons.

Participants: US, UK, Canada. 30 distinct sites.

Goals: To successfully produce nuclear weapons before Hitler's Germany.

How: Study and understand nuclear fission, identify gun-type fission and implosion-type fission, produce Little Boy and Fat Man.

Outcomes: Trinity Test, Hiroshima and Nagasaki, the world as we know it changed!

Video of the Trinity Test: https://www.youtube.com/watch?v=7dfK9G7UDok

FAMOUS SUCCESSFUL PROJECTS.

- The Apollo Program 1960 -1973 Budget 25.3 billion dollars
- Human Spaceflight Program by NASA
- Duration 1961-1972
- Goal: “Landing a man on moon and returning him safely to earth” – Kennedy
- Outcome: 20 July 1969: Neil Armstrong and Buzz Aldrin land Lunar Module on the moon.
- Video of moon landing:

https://www.youtube.com/watch?v=PrSD8tpoSz0

MOST FAMOUS "UNSUCCESSFUL" PROJECTS

- War on Cancer - since 1971 100 billion + USD.
- National Cancer Act – "The same kind of effort that split the atom and landed man to the moon should be turned toward conquering his disease" – Nixon, 1971.
- Anticipation of fast results by 1976.
- How increase funds towards research, understanding the disease and prevention.
- Why is it a "failed" project? Because "cancer" is not a single disease hence it doesn't have a single cure!

https://www.youtube.com/watch?v=SGaQ0WwZ_0I

MOST FAMOUS "UNSUCCESSFUL" PROJECTS

- The NASA DART project (failed computer calculation resulted in crashing) – 95 million USD, 2006.
- DART – Demonstration of Autonomous Rendezvous Technology
- Goal: To demonstrate automated navigation of an aircraft.
- How: Launch DART from a rocket, achieve orbit, and meet the satellite.
- What happened: During proximity, multiple mishaps let to a soft collision with the satellite.
- Why did it fail? Inaccurate position and velocity information i.e. incorrect calculations.

MOST FAMOUS "UNSUCCESSFUL" PROJECTS

- The Mars Climate Orbiter – 327.6 million
- Miniature Spacecraft to evaluate water on Mars, daily weather conditions, temperature profiles and evidence of past climate change.
- What happened?

  Communication with the spacecraft was lost as the spacecraft went into orbital

  The spacecraft encountered Mars on a trajectory that brought it too close to the planet, causing it to pass through the upper atmosphere and disintegrate.

  Why? **Computer Software produced output in non SI units (Imperial Units) whereas NASA uses SI units!**

https://www.youtube.com/watch?v=q2L5_swAT5A

CONCLUSIONS

- Research is the only way forward as mankind!
- Governments are responsible for funding research!
- Even failed projects teach us a lot!

- THANK YOU