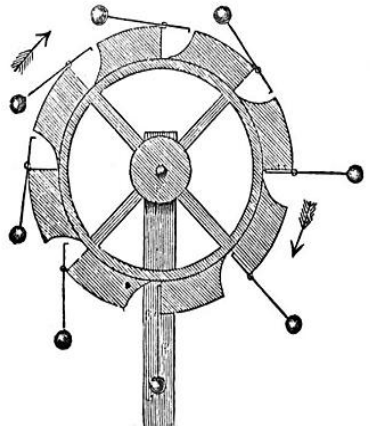
Creativity in Science and Technology

Creativity

Creativity is sought everywhere: in the arts, in entertainment, in business, in mathematics, in engineering, in medicine, in the social sciences, in the physical sciences. Common elements in creativity are originality and imagination. Creativity carries feelings of wide ranging freedom to design and to invent and to dream. But in engineering and science creativity is useful only if it fits into the realities of the physical world.

Example of Constraint on Creativity

A creative idea in science or engineering must conform to the law of conservation of energy (including the mass energy mc^2). If an inventor thinks that they know how to violate the conservation of energy, he or she will have to overcome a vast amount of laboratory measurements and accepted theory.

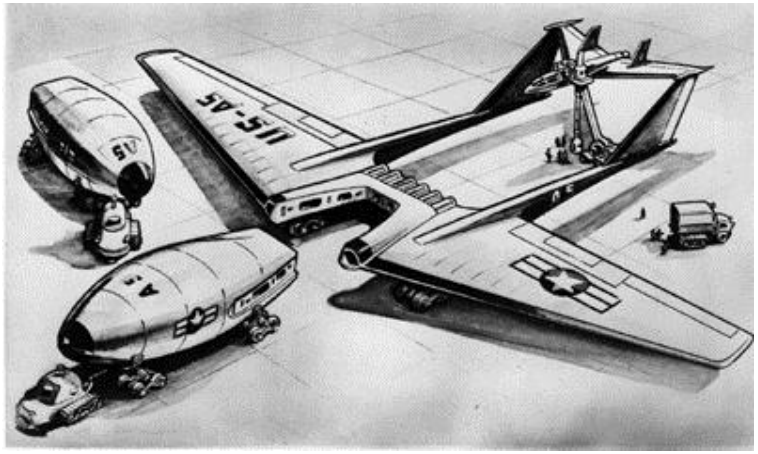


A perpetual motion machine violates the conservation of energy

Practicality and Feasibility Constraints

Creativity in science, engineering and computer science is constrained by feasibility and practicality.

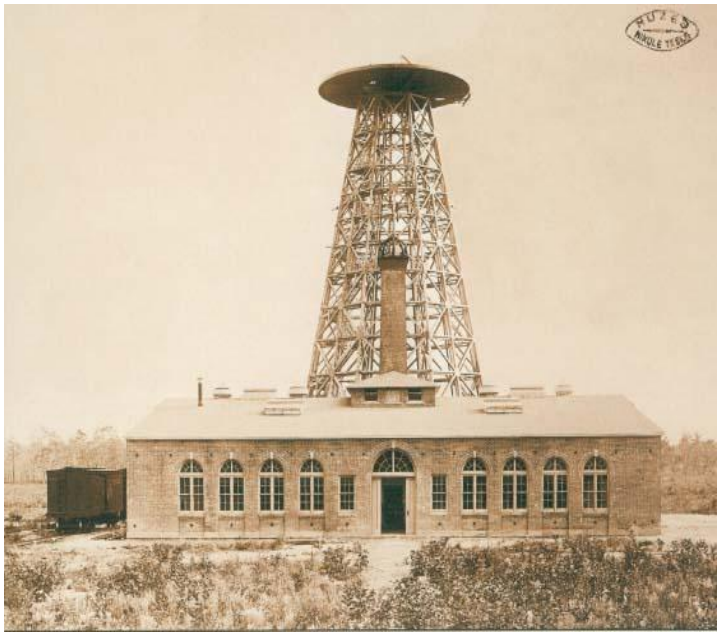
Consider the work in the US on a nuclear reactor powered airpl ane in the 1950's



The reactor was to be in the front and the crew in The rear.

How to get a good idea

Creative engineers and scientists get bad ideas along with the good ideas.

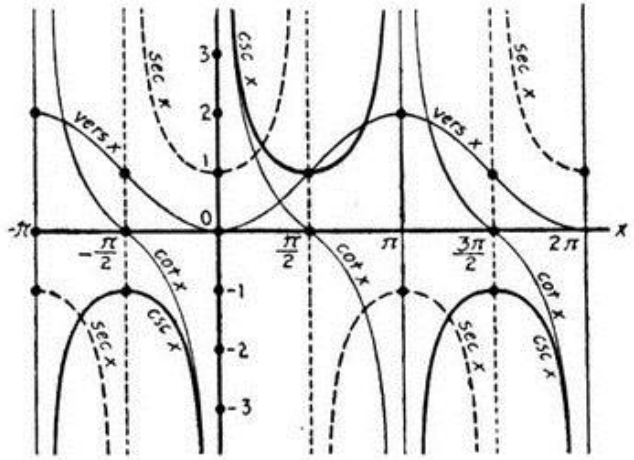


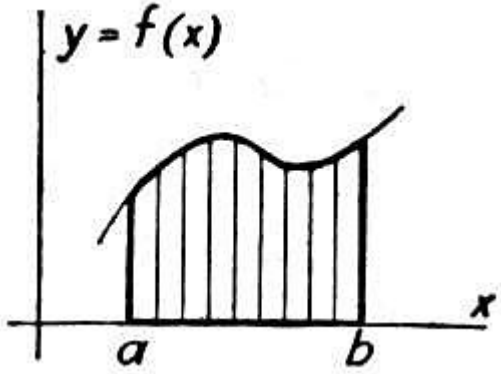
Nikola Tesla was a pioneer in long distance wireless, a good idea, but he also thought he could use the same tower to transmit Large amounts of low frequency power

How to get a good idea

Mathematics and getting good ideas

Don't try to fit yourself into any particular image of what a scientist or an engineer should be. You don't have to be a mathematical genius. There are lots of fields where mathematics is secondary.
But you should be competent in mathematics.





How to get a good idea

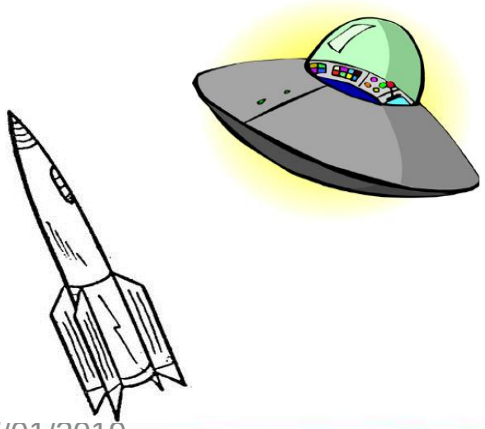
Hand-on skills, laboratory skills and getting good ideas

Evaluate the extent of your hands-on skills and laboratory skills
Are you good at working with tools, at building equipment,
at running equipment – electronics, microscopes, telescopes ?

How to get a good idea

Imagination and getting good ideas

Imagination is a second crucial ability required to be creative in engineering and science, imagination with the constraints I have talked about: known physical laws, correct observation and experimentation, feasibility, practicality. Begin with the far reaches of imagination at the science fiction level, then apply the constraints gradually.



How to get a good idea

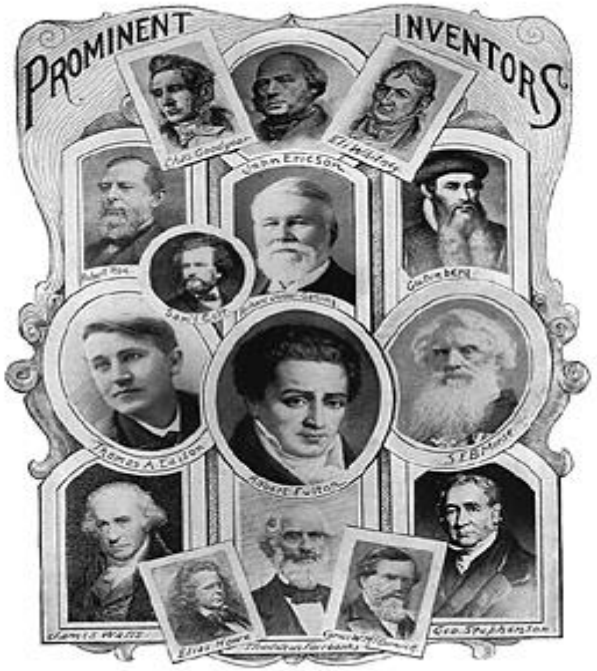
Work Alone or leader of the pack

There are two opposite personality traits that can contribute to getting good ideas. One personality trait is to be a lone wolf, a contrarian in your field. The opposite is to lead the pack of colleagues and competitors.

How to get a good idea

In the modern world the highly productive lone engineer or inventor or scientist is very rare

Find colleagues who are smarter than you and know more.



Obsession is important when you have a good computing, en gineering or science idea

When you are imagining and visualizing an idea that you expect to be fru itful it is important to be obsessed with the idea. Think about the idea as much as possible, neglecting boyfriends, girlfriends, children spouses. O bsession will bring immersion of your mind into all the aspects of the ide a: what has been done on related ideas, compatibility with physical laws and mathematics and logic, feasibility, practicality, extensions, variations

But if the course of the work you find that someone has a better idea or that you have run out of money or that the idea has a serious flaw. Give up the obsession and move on