The Exploration of Space

Overview

Space. The Final Frontier. The two most distinctive technical accomplishments of the twentieth century, the invention of quantum physics and the exploration of space, are quite different in their expression, yet they are curiously related. One deals with achieving a deep understanding of the working of the smallest features in the universe, the atom, and its constituent parts. The other deals with the exploration of the vastness of the universe, something so large that we really can't grasp its size. For example, those photons of light energy that strike our eye when we view the stars of the Big Dipper departed on their journey to our retina before the dinosaurs roamed the earth.

To further understand the interrelation of these two feats, we must look (as is always the case) to the social dynamics of the times in which they were born and flourished. Perhaps coincidentally, the serious attacks on both problems began at the same time, around 1890.

Quantum physics was born out of a very bothersome discrepancy between an existing theory and the observed behavior of an apparently very simple activity—the amount of heat absorbed by and radiating from a "black body—one whose surface is completely non-reflective. The work of Planck, Bohr, Einstein, Heisenberg, and others produced, in the incredibly short span of 30 years, a theoretical model of the physical world that turned classical physics completely on its ear.

If, as we believe, everything, including life, is made of atoms, and if quantum physics has given us a correct model of the workings of atoms, then we have yet to resolve huge discrepancies between the way we operate at the "macro" level, and the way our constituent atoms are working at the "micro" level. Neils Bohr, in a speech shortly before his death in 1962, predicted that the eventual reconciliation would be the most profound and important breakthrough in philosophy since the Greeks.

One of the major players in this drama, Albert Einstein, best typified the social dimension of this esoteric and bizarre scientific work. He was not only well-known among scientists, but also among the public at large, which developed an unprecedented curiosity for all things technical and scientific. The "popularization" of science and technology was one of the most far-reaching outcomes of

this incredibly prodigious period. Even the average “man on the street” knew that $E=mc^2$.

Simultaneously, on another corner of this stage, came people like Lielenthal, Langley, the Wright Brothers, and Robert Goddard (the father of American rocketry). They drew their inspiration from an equally simple phenomena that had captivated people’s attention for aeons: the reality of flight. It’s hard to imagine the excitement of knowing that you were on the verge of successfully solving a problem that had remained unsolved for perhaps a million years!

We know that the general level of technical curiosity that was being created by the people in theoretical physics was fueling the excitement in other areas of scientific pursuit and visa versa. It was, in effect, a rising intellectual tide that was lifting everything. It was no accident that the problems of flight and of atomic physics were being attacked at the same time: They were both part of a larger flow of interacting currents, as well as eddies of confidence, curiosity, and capability.

Quantum physics gave us atomic energy. It also gave us the transistor, the laser, the electron microscope, MRI’s, CAT scans, microwave ovens, color television, and a host of other products that are an integral (and sometimes problematic) part of our modern life.

The exploration of space, inspired and driven by the breathtaking vision of President Kennedy, resulted in perhaps the greatest technical feat ever accomplished by the human race: the Apollo Lunar Exploration program. It also provided a graphic and tragic example of what can happen, in an incredibly short span of time: how an organization such as NASA, which always reflects the mood of the society in which it operates, can go from astonishing brilliance to astonishing mediocrity in such a short period of time, simply by loosing its compelling, thrilling, and exciting vision.

The tragedy of the Space Shuttle Challenger’s explosion in 1986, only 15 years after the last Apollo mission to the moon, had many lessons to teach, but none more important than the one that whispers to us from the tomb of Cheops and across the Golden Gate: boldness of purpose and audacity of vision, fueled by a relentless pursuit of excellence and detail, are what propel the human condition forward to that “final frontier.”

Professions and Trades

One interesting aspect of the development of professions and trades required for the conquest of space was the fact that they had to be borrowed and adapted, at least initially, from existing professions and trades that had not previously considered aeronautical problems. The subsequent evolution of professions and trades that are distinctly aerospace in nature provides a very good example of how professions and trades evolve to meet current human needs. A Computer

Scientist, for example, a distinctly “space age” phenomena, is a new profession, which stems from the professional disciplines of Mathematics and Electrical Engineering. Our list below contains some professions and trades that may, at first glance, seem “non-obvious,” but they are included as a way to illustrate the enormous skill required, as well as an aid to stimulate your thinking:

- Agricultural Products Specialist
- Artist
- Astronomer
- Automotive Designer
- Biologist (human, plant, space, marine)
- Carpenter and Cabinet Maker
- Chemical Engineer
- Chemist
- Cooper
- Demolitionist
- Draftsman
- Electrical Engineer
- Film and TV Producer
- Film Maker
- Food Processing Engineer
- Geologist
- Human Factors Engineer
- Industrial Engineer
- Lumberjack
- Materials Scientist
- Mathematician
- Meteorologist
- Minister (including priests, rabbis, etc.)
- Petroleum Engineer
- Philosopher and Theologian
- Physicist
- Pilot
- Project Manager
- Scenery Designer
- Steelworker
- Tailor and Seamstress
- Textile Engineers and Technicians