Technical

Technology is just a tool. In terms of getting the kids working together and motivating them, the teacher is the most important.

The number one benefit of information technology is that it empowers people to do what they want to do. It lets people be creative. It lets people be productive. It lets people learn things they didn't think they could learn before, and so in a sense it is all about potential.

Technology gives us power, but it does not and cannot tell us how to use that power. Thanks to technology, we can instantly communicate across the world, but it still doesn't help us know what to say.

Technology is supposed to make our lives easier, allowing us to do things more quickly and efficiently. But too often it seems to make things harder, leaving us with fifty-button remote controls, digital cameras with hundreds of mysterious features and book-length manuals, and cars with dashboard systems worthy of the space shuttle.

Cell phones, mobile e-mail, and all the other cool and slick gadgets can cause massive losses in our creative output and overall productivity.

The new electronic independence re-creates the world in the image of a global village.

Technology is such a broad kind of term, it really applies to so many things, from the electric light to running cars on oil. All of these different things can be called technology. I have kind of a love-hate relationship with it, as I expect most people do. With the computer, I spend so many hours sitting in front of a computer.

The most important and urgent problems of the technology of today are no longer the satisfactions of the primary needs or of archetypal wishes, but the reparation of the evils and damages by the technology of yesterday.

Cyberspace. A consensual hallucination experienced daily by billions of legitimate operators, in every nation, by children being taught mathematical concepts.

The digital camera is a great invention because it allows us to reminisce. Instantly.

The Internet is the most important single development in the history of human communication since the invention of call waiting.

The machine does not isolate man from the great problems of nature but plunges him more deeply into them.

Medical knowledge and technical savvy are biodegradable. The sort of medicine that was practiced in Boston or New York or Atlanta fifty years ago would be as strange to a medical student or intern today as the ceremonial dance of a !Kung San tribe would seem to a rock festival audience in Hackensack.

The most technologically efficient machine that man has ever invented is the book. Just because something doesn’t do what you planned it to do doesn’t mean it’s useless.It has become appallingly obvious that our technology has exceeded our humanity.

One machine can do the work of fifty ordinary men. No machine can do the work of one extraordinary man.

#### Technology frightens me to death. It’s designed by engineers to impress other engineers. And they always come with instruction booklets that are written by engineers for other engineers — which is why almost no technology ever works.

#### The greatest achievement of humanity is not its works of art, science, or technology, but the recognition of its own dysfunction.

#### First we thought the PC was a calculator. Then we found out how to turn numbers into letters with ASCII — and we thought it was a typewriter. Then we discovered graphics, and we thought it was a television. With the World Wide Web, we’ve realized it’s a brochure.

#### Programs must be written for people to read, and only incidentally for machines to execute.

#### The ultimate promise of technology is to make us master of a world that we command by the push of a button.

"The telephone wire, as we know it, has become too slow and too small to handle Internet traffic. It took 75 years for telephones to be used by 50 million customers, but it took only four years for the Internet to reach that many users."

Probabilistic design is a discipline within [engineering design](http://en.wikipedia.org/wiki/Engineering_design). It deals primarily with the consideration of the effects of random variability upon the performance of an engineering system during the design phase. Typically, these effects are related to quality and reliability. Thus, probabilistic design is a tool that is mostly used in areas that are concerned with quality and reliability. For example, product design, quality control, systems engineering, [machine design](http://en.wikipedia.org/wiki/Machine_design), [civil engineering](http://en.wikipedia.org/wiki/Civil_engineering) (particularly useful in [limit state design](http://en.wikipedia.org/wiki/Limit_state_design)) and manufacturing. It differs from the classical approach to design by assuming a small probability of failure instead of using the [safety factor](http://en.wikipedia.org/wiki/Safety_factor). When using a probabilistic approach to design, the designer no longer thinks of each variable as a single value or number. Instead, each variable is viewed as a [probability distribution]. From this perspective, probabilistic design predicts the flow of variability (or distributions) through a system. By considering this flow, a designer can make adjustments to reduce the flow of random variability, and improve quality. Proponents of the approach contend that many quality problems can be predicted and rectified during the early design stages and at a much reduced cost.  
  
Typically, the goal of probabilistic design is to identify the design that will exhibit the smallest effects of random variability. This could be the one design option out of several that is found to be most robust. Alternatively, it could be the only design option available, but with the optimum combination of input variables and parameters. This second approach is sometimes referred to as [robustification](http://en.wikipedia.org/wiki/Robustification), parameter design or [design for six sigma](http://en.wikipedia.org/wiki/Design_for_Six_Sigma).

[Turbulence](http://en.wikipedia.org/wiki/Turbulence) is flow characterized by recirculation, [eddies](http://en.wikipedia.org/wiki/Eddy_(fluid_dynamics)), and apparent [randomness](http://en.wikipedia.org/wiki/Random). Flow in which turbulence is not exhibited is called [laminar](http://en.wikipedia.org/wiki/Laminar_flow). It should be noted, however, that the presence of eddies or recirculation alone does not necessarily indicate turbulent flow—these phenomena may be present in laminar flow as well. Mathematically, turbulent flow is often represented via a [Reynolds decomposition](http://en.wikipedia.org/wiki/Reynolds_decomposition), in which the flow is broken down into the sum of an [average](http://en.wikipedia.org/wiki/Average) component and a perturbation component.  
  
  
It is believed that turbulent flows can be described well through the use of the [Navier–Stokes equations](http://en.wikipedia.org/wiki/Navier%E2%80%93Stokes_equations). [Direct numerical simulation](http://en.wikipedia.org/wiki/Direct_numerical_simulation) (DNS), based on the Navier–Stokes equations, makes it possible to simulate turbulent flows at moderate Reynolds numbers. Restrictions depend on the power of the computer used and the efficiency of the solution algorithm. The results of DNS have been found to agree well with experimental data for some flows.  
Most flows of interest have Reynolds numbers much too high for DNS to be a viable option, given the state of computational power for the next few decades. Any flight vehicle large enough to carry a human (L > 3 m), moving faster than 72 km/h (20 m/s) is well beyond the limit of DNS simulation (Re = 4 million). Transport aircraft wings (such as on an [Airbus A300](http://en.wikipedia.org/wiki/Airbus_A300) or [Boeing 747](http://en.wikipedia.org/wiki/Boeing_747)) have Reynolds numbers of 40 million (based on the wing chord). In order to solve these real-life flow problems, turbulence models will be a necessity for the foreseeable future. [Reynolds-averaged Navier–Stokes equations](http://en.wikipedia.org/wiki/Reynolds-averaged_Navier%E2%80%93Stokes_equations) (RANS) combined with [turbulence modelling](http://en.wikipedia.org/wiki/Turbulence_modelling) provides a model of the effects of the turbulent flow. Such a modelling mainly provides the additional momentum transfer by the [Reynolds stresses](http://en.wikipedia.org/wiki/Reynolds_stresses), although the turbulence also enhances the [heat](http://en.wikipedia.org/wiki/Heat_transfer) and [mass transfer](http://en.wikipedia.org/wiki/Mass_transfer). Another promising methodology is [large eddy simulation](http://en.wikipedia.org/wiki/Large_eddy_simulation) (LES), especially in the guise of [detached eddy simulation](http://en.wikipedia.org/wiki/Detached_eddy_simulation) (DES)—which is a combination of RANS turbulence modelling and large eddy simulation.

Previous posts in this series went over [basic strategies for tackling this type of passage](http://magoosh.com/gre/2011/science-passages-on-the-gre/), and [applying them to an actual example passage](http://magoosh.com/gre/2011/the-really-fun-hard-dense-science-passage-part-ii/). This post offers practice questions and explanations for the same passage, for some actual hands-on practice. Good luck!

In the mid-1970’s, Walter Alvarez, a geologist, was studying Earth’s polarity. It had recently been learned that the orientation of the planet’s magnetic field reverses, so that every so often, in effect, south becomes north and vice versa. Alvarez and some colleagues had found that a certain formation of pinkish limestone in Italy, known as the *scaglia rossa*, recorded these occasional reversals. The limestone also contained the fossilized remains of millions of tiny sea creatures called *foraminifera*. Alvarez became interested in a thin layer of clay in the limestone that seemed to have been laid down around the end of the Cretaceous Period. Below the layer, certain species of foraminifera—or forams, for short—were preserved. In the clay layer, there were no forams. Above the layer, the earlier species disappeared and new forams appeared. Having been taught the uniformitarian view, which held that any apparent extinctions throughout geological time resulted from ‘the incompleteness of the fossil record’ rather than an actual extinction, Alvarez was not sure what to make of the lacuna in geological time corresponding to the missing foraminifera, because the change looked very abrupt.

Had Walter Alvarez not asked his father, the Nobel Prize-winning physicist Luis Alvarez, how long the clay had taken to deposit, the younger Alvarez may not have thought to use iridium, an element rarely found on earth but more plentiful in meteorites, to answer this question. Iridium, in the form of microscopic grains of cosmic dust, is constantly raining down on the planet. The Alvarezes reasoned that if the clay layer had taken a significant amount of time to deposit, it would contain detectable levels of iridium.  The results were startling – far too much iridium had shown up. The Alvarez hypothesis, as it became known, was that everything – not just the clay layer, could be explained by a single event: a six-mile-wide asteroid had slammed into Earth—killing off not only the forams but the dinosaurs, and all the other organisms that went extinct at the end of the Cretaceous period.