



Numeracy Nugget #8: The Singularity and Its Early Effects

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Understanding what the Singularity is will explain a lot of things happening in the world from here on. Its early effects are felt by us all and most strongly by the world's poor and ignorant who are already the most impacted. In this Nugget I will attempt a short explanation that will astound most people and will make many shake their heads in disbelief. Enough references will be given to enable the independent thinkers draw their own conclusions.

The Singularity is the name of the coming confluence of three earth-shaking areas of development – nanotechnology, genetic engineering, machine intelligence – in which new things are arriving at a ‘super exponential’ pace. Nanotechnology is the domain of the very small machines and structures down to the size of custom designed molecules where interactions happen at the atomic level. Genetic engineering is the means and methods to manipulate the genomes (DNA) of all living things to make new and, hopefully, better functioning critters, plants, bacteria, . . . , and even some new materials. Machine or artificial intelligence (AI) is the development of computer programs that can learn from their environment to automatically fashion vast knowledge bases and the means to process them (‘think’) in ways of which we humans cannot even dream.

A hallmark of the Singularity will be the advent of super-humans (Homo X, transhumans) and AIs more intelligent than any human alive today. We will not know when the Singularity arrives, only that it has already passed and that then we will live in an age never before experienced on Earth. Vernon Vinge chose the name Singularity for that event since it will represent a point of departure into a totally undefined and indefinable future. Other singularities with which you may be familiar are the creation of this universe known as The Big Bang, the inside of a Black Hole, what a mathematical function does at the point where its denominator goes to zero. If you have a religious bent, then you may already believe in an additional set of singularities past and yet to come.

The main point to remember about a singularity is that it is the turning (tipping) point for profound and unpredictable changes in its environment. It may herald the start of a new golden age of intelligence on this planet that will quickly inhabit the solar system and then expand into the galaxy to, perhaps, meet other such post-Singularity intelligent races. Or it may bring all life as we know it to a rapid and horrible end. Most of us are hopefully focused on the golden age scenario, but we just don't know.

If you are still with me, you may now ask ‘when is this all going to happen?’ Well, the answer depends on which of the world-class scientists, engineers, and futurists you want to believe. Again, no one dares to offer a precise answer, but the most credible answers cover the interval from about 2025 to 2060. I'm not aware of anyone anticipating the Singularity beyond the 21st century. Of course, the third scenario that we humans will do

something very stupid before the Singularity that will either wipe us out or return us to a primitive state from which it will take centuries for us to recover.

Now that you've heard my side of the Singularity story, here are some other references and links on the subject that will expand your horizons.

- The upcoming [Second Singularity Summit](#) at Stanford University in September 2008;
- [The Singularity is Near](#) (2006) by Ray Kurzweil;
- [The Intelligent Universe](#) (2007) by James Gardner;
- [I AM A STRANGE LOOP](#) (2007) by Douglas Hofstadter;
- [The Physics of Immortality](#) (1994) by Frank Tipler;
- [On Intelligence](#) (2004) by Jeff Hawkins;
- [Robot](#) (2000) by Hans Moravec;
- The websites of [The Singularity Institute for Artificial Intelligence](#), [Acceleration Watch](#), [Moravec article](#) in Journal of Evolution and Technology, [KurzweilAI.net](#).

Those of us who have worked for some time in one of the Singularity technologies have been discussing this topic since we first were made aware of the [Turing Test](#) early in our education. For years it has been a point of interest to us as to when the socially conscious non-technical academia, the mainstream media, and political leaders will start discussing today's social and economic dislocations, and public policy decisions in the apprehension of the Singularity. My personal feeling is that it will not happen for a few years yet because those folks are in the business of defining our future and selling certitude. By its very nature, the Singularity will not allow them to practice their trade with any credibility.

Debating the Singularity may generate way more heat than light in the body politic because there are no good answers to the many hard questions that its approach is already forcing us to confront. For example –

- Globalization is fostered by accelerating information and transportation technologies – what political impacts will deflation of human capital cause in the developed world?
- Third world standard of living – will we really buy things, especially foodstuffs, from them that they can produce cheaper than we can?
- Income inequality – how will this (sometimes called the 'alfa/beta problem') be resolved as machines take more jobs from the un/under-educated? (See more on this here)

I conclude this Nugget by suggesting that the evidence of the onrushing Singularity is all around us and growing by the day. Most people are blind to it because they do not or cannot connect the dots and see at what the arrow is pointing.

NN7 Problem Solution: In NN7 you were presented with three regular light switches on the first floor one of which operates a light bulb in the attic. Each is wired in the standard way with the up switch position denoting ON and the down position denoting OFF. Can you figure out which switch operates the attic light if you are allowed only one trip up to the attic to check the light bulb? Hint: This is not a trick problem with some cutesy answer, but to solve it you should incorporate all you know about light bulbs and switches.

Solution: The problem requires you to remember that a turned on light bulb also gets hot and stays at least warm for several minutes after it is turned off. Knowing this, first turn on only switch A and leave it on for a few minutes. Then turn on only switch B and go up to the attic. If the bulb is off but warm, then A operates the light; if the light is on then B operates the light; and if the bulb is off and cold then C operates the light.

NN8 Problem: Moving A Slab on Rolling Logs. Here's a problem adapted from SESF's TechTest2007 that will tickle your noodle. A flat stone slab is moved by placing it on two parallel cylindrical logs each one foot in diameter as shown in the figure below.



How many feet forward will the slab move (distance D) for each revolution of the logs?