Coping with Future Catastrophes:

I don't think the human race will survive the next thousand years, unless we spread into space. There are too many accidents that can befall life on a single planet.

- - -Stephen Hawking

In the past we humans have endured epidemics, earthquakes, wars, floods, and blights. We also know that in the past, our planet has suffered volcanic eruptions and asteroid strikes that devastated whole continents—and the future will bring more catastrophes. This memo proposes a conference to discuss the costs and benefits that might come from attempts to prevent or to remedy these.

In fact, we've recently emerged from a great sequence of global ice ages. And during the present century, we expect a global temperature-rise to cause a substantial loss of land, along with extinctions of many species. We also know that, eventually, we'll need to leave our planet of birth—because in just a few billion more years, our Sun will expand to incinerate Earth.

In view of such vast spans of time, why propose such a conference now? Would it not be better to wait until we develop better technologies? No—because there's no time for delay: we already face urgent emergencies. *Unless we can quickly react to such threats, it may soon be too late to reverse their effects.*

-- Our activities already are changing our oceans, lands, and atmosphere.
-- Our biotechnology will soon enable us to invent new, more serious kinds of infections.
-- Our new high-speed social networks could propagate dangerous 'cognitive epidemics".

Epidemics

Before the advent of modern Man, evolution meandered with no long-range plans—until the arrival of human breeders of plants and animals. Today our farmers, scientists, and even young students are selecting and/or designing new genes. Furthermore, to synthesize these new chemicals, equipment is now widely accessible. However, this constructive research on genetics could also lead to inventing dreadful new kinds of diseases.

In the past, we've seen the extinctions of entire species—but we've never encountered a new disease that threatened to kill all living things, because each new infection could only spread through some limited spectrum of vectors and victims. However, this could suddenly change—because of what we should see as a problem:

> *All life forms on Earth use the same way to replicate—by copying gene-strings that all are composed of the identical four chemicals.*

This fact exposes all life on Earth to the risk of being extinguished by a single new plague or epidemic.

Climate

We cannot expect to find ways to prevent all earthquakes, volcanoes, and tidal waves—but we can improve our predictions of such events, and start moving to safer locations. However, Global Warming is one major threat, which we still may be able (partly) to remedy—but this would need an unprecedented scale of international cooperation. In any case, whatever measures we manage to take, our sea levels will probably rise enough to devastate many habitats and submerge such vast tracts of land that we'll need new sources of nourishment.

Automation and Unemployment

Over the past two centuries, automation has advanced so that fewer people are needed today for the initial manufacture of goods. However, we've seen less progress toward ways to maintain and repair those products—so many human jobs still remain. However, with progress toward more skillful robots, many remaining jobs will disappear.

Health, Population and Longevity

Seven billion persons now live on Earth. How many more could Earth support? How many should we want to support—and how should such decisions be made?

Future medical advances should result in an increasingly older population. Ideally, this would bring no increase of disabilities—but it is more likely that we'll

need more therapies and other services. Only smart AI robots could meet that demand.

What if we develop ways to enable people to survive for thousands of years—or even to live eternally? (We could achieve this, for example, by making all of our parts replaceable.) In Arthur Clarke's novel, *The City and the Stars* the population on Earth remains stable because each person's mind takes turns between being embodied for quite a long time—and being stored in computers for much longer times.

Artificial Intelligence and Human Future

We've all observed the rapid growth of our modern computers' abilities. Is there a danger that one of our new machines could evolve to be Super-Intelligent? What if some program concludes that it needs more resources (it doesn't matter what problem it's solving)—and finds a way to take control of many other networked computers—or hijacks a nuclear missile base, and forces some nation to give it more power? Such scenarios have been depicted in novels like Robert A. Heinlein's *The Moon is a Harsh Mistress*, D. F. Jones's *Colossus,* and James P. Hogan's *The Genesis Machine*.

Dangerous Physics Experiments

How dangerous are new Physics experiments? Do we risk creating Earth-consuming chain-reactions whenever we build new physics-machines? Before they tested the earliest Hydrogen Bomb, some physicists worried that this might ignite a world-consuming fusion reaction. Eventually, they chose to proceed—knowing that if this turned out to be wrong, no one would remain to complain about it.

Cognitive Epidemics

We're already seen blackouts and traffic jams in our still-growing networks for energy and communication. But even when those systems function well, that very fact can lead to new troubles. For example, our Social Networks excel at supporting fast interactions—and this can also enable them to support new forms of "instant democracy." But that could suddenly morph into mob rule—and then be replaced by dictatorship.

Of course such events have happened before—as when Hitler exploited his

radio talks—but that process was spread over quite a few years. But once we learn more about how our brain-networks work, could that lead us to new techniques that more rapidly alter most listeners' views? If so, then we could propagate all sorts of new doctrines, myths, and beliefs before anyone sensed what was happening. Could this lead to great new Utopias -- or to panics, depressions, and holocausts?

"Lifeboats" and Planetary Emigration.

The dispersion mandate: In any case, we should set as a high-priority goal to "not to keep all our eggs in one basket". Then, given that Earth is subject to serious threats, we should plan to disperse ourselves into space. One tactic would be to launch colony-ships designed to survive over eons of time.

If Earth were destroyed, could we live on the Moon? Perhaps, but present evidence is that human health fails in low gravity. An alternative would be to build huge rotating cylindrical "lifeboats" to float in Space—as depicted in Arthur C. Clarke's *Rendezvous with Rama (*1973) and in Gerard O'Neil's *Island Three* (1976).

Donald Moffitt's *Second Genesis* (1986) proposes a lower-cost project: Instead of attempting to save living humans, one could simply encode our genomes into radio messages, and transmit these out into the universe – hoping that some other beings will decode and reconstruct us. (Moffit's messages would also include enough knowledge to inform those new humans about their origins.) Of course, this alternative has a flaw: such messages won't have any effect unless some creatures exist to receive them.

Asteroid Collisions. Huge craters on the Moon and on Mars mark vastly destructive asteroid-strikes—and we see traces of similar craters on Earth. More such events will occur in the future—unless we find ways to deflect them. But if we predict these early enough, then gentle pressure from beams of light (projected from lenses or mirrors in space) could alter those asteroid's orbits enough!

Perhaps the most dismal prediction of all comes from the current theory of Physics, in which a force called Dark Energy causes space to dilute—until our whole universe becomes cold and dark, and even our atoms fall apart. Should we meekly accept that fate —or should we try to change Physics, instead?

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