

The Human Race - and The Technology Race!

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Chapter II: What is The Human Race?



Previous Chapters:

Chapter I: The Human - Technology Interface

Future Chapters:

Chapter III: Will Digital Technology Produce Super-intelligence - a Singularity?

Chapter IV: Practical Advice for Responding to Technological Change

1. Introduction

Chapter I discussed our experience with digital technologies and reviewed some of the research findings on the human-technology interface. While the benefits of digital technologies may be significant, there are considerable risks from unintended consequences. Among the findings: Multi-tasking is an illusion; Our digital devices are controlling us; Digital text lowers comprehension; Social networking may be anti-social; and Digital technology increases cognitive span but reduces cognitive depth.

In Chapter II we turn our attention to a very different topic - the Human Race. Specifically, we address several questions. First, what is it to be human - what makes human beings so special? Second, alluding to the "Race" metaphor, what is the goal of the human race - what are we trying to achieve - what do we aspire for? In both cases, we sought input from the audience at the Wayland Great Presenters meeting November 4th on these questions, and then reviewed some of the research findings in science and psychology that address the topic.

2. What is it to be human?

At the public presentation on November 4, we asked the audience to respond to these questions: What is it to be human? Can we identify some of the things that make human beings so interesting and special? The questions elicited a wide range of responses, as indicated in Table 1 below. While only one response noted a physical characteristic (opposable thumbs), the majority referred to behaviors or qualities of mind (language - humor - learning - thinking). Some were practical (technology - power) and others were spiritual (belief in God - presence of soul).

Table 1. What is it to be human?

empathy	feelings	behavior
inquisitive	opposable thumbs	free will
thinking of the future	consciousness	humor
language	mortality	presence of soul
learning from others	belief in God	assigning meaning
values	technology	power
writing	solving problems	

While the list is hardly exhaustive, it does suggest that people recognize that fact that humans are complex and interesting beings. With respect to the human mind and brain, scientists have described the human brain as the most complex and sophisticated object in the universe. Based on its complex electrochemical interconnections, the human brain has more potential brain states, that is, possible configurations of electrical and chemical signals in the brain, than there are atoms in the universe. Yet it is normal for a group of such immensely complex objects - a human community - to be sitting together in a single room.

Research by scientists and psychologists into human qualities and characteristics continues to provide corroboration of the fact that humans are more complex than previously thought. Seven specific topics are highlighted below.

a. Multi-dimensional sensory inputs:

Humans are complex bodies integrated in a multi-layered brain.

We used to think that our sensory inputs, for example, from our eyes and ears, operated like an electric signal that was carried along the nerves to the brain, where our conscious mind then constructed a representation. What we are now beginning to understand is how incredibly complicated this system actually is. The eye itself is a



sophisticated organ and the intelligent processing of visual input actually begins in the nerves of the eye, well before any signals reach the brain.

What happens between the eyeball and the brain is more like a symphony of complex interactions, a sorting and selection of neurological and biochemical signals through multiple channels and feedback loops. This entire process is invisible to our own senses -- completely below the level of conscious awareness. Moreover, all of the five senses, six if we include proprioception or bodily spatial sense, are all linked together to give us an integrated and unified experience of our own being and a fully engaged and interactive relationship to the world we live in.

b. Tactile use of the hands and body:

As humans, we move in and manipulate the world around us.

We use our hands and our bodies to do things, like walking or throwing a stone, that we have learned how to do without thinking about it. This is referred to as Tacit Knowledge – things that we know but can't explain. It turns out that the physics of walking is extremely complex, a form of actively controlled falling. This is a process you can observe when you watch a toddler taking those early steps.

But, like so much of what we do, it may be easy for humans to learn, but it turns out to be very difficult to program a robot to do the same thing. What we do with our hands and body so naturally, even elegantly, involves an incredibly complex process of perception, sensory feedback, and intentionality. It is easy for us to do, but nearly impossible to describe or explain.



c. Extension of our hands and minds:

Human beings use hands and minds for the making and use of tools in imaginative and creative ways.

There is a concept of EXTENDED MIND that philosophers are talking about, and it is easy to see if you watch an expert craftsman or artist at work. They are so familiar with the materials and tools they are using that they don't really think about them – those tools have become an extension of their own mind and body.

The same is true of athletes – a major league baseball player doesn't have time to think about swinging his bat at a 90 mile an hour fastball – he is reacting instinctively based on

training – the bat is a part of him. The same thing is true of our use of language – it is a tool that becomes a part of our own mind.

The concept of extended mind also now applies to digital technology. How many of us have outsourced portions of our short-term memory to our smart phones?

d. Memory – cognition:

The complex phenomena of memory, cognition, abstraction, language, face recognition, etc., are key features of the human brain.

The conventional view of the brain in the past had been that the wiring was fixed (like a computer) but the programming – how we used the mind – could be switched. In recent years neuroscientists have begun to recognize a feature of the brain they call plasticity. When we use our brains in different ways, the circuitry itself is capable of changing and evolving.

For example, if you have travelled in London you may be aware that navigating the streets of London is incredibly difficult. Programmers have not yet developed a reliable GPS system. As a result, travelers are largely dependent on the specialized knowledge of the London cabbies (all 25,000 of them). London cabbies undergo extensive training for a period of years and are required to pass a very difficult exam that tests their knowledge of the City and detailed understanding of how to navigate its streets. Researchers have done brain scans on some of the drivers, and they have found that the parts of the brain responsible for visual and spatial processing are unusually large. As a result of the training and occupation, their brains are physically different than normal Londoners.

This finding - that the human brain physically adapts to the demands placed upon it - has been widely confirmed. The plasticity of the brain is one of the profound ways humans adapt to changes in the environment. Given the intimacy and immediacy of our digital technologies, it is worth considering how these technologies are changing our brains - and whether these changes are positive, harmless, or negative.

e. Self-conscious, self-aware:

Humans are self-conscious, self-aware, rational and curious - they desire to understand and to be understood.

It can be argued that humans share, to at least some degree, the above qualities - complex sensory integration, tacit knowledge, automaticity and plasticity - with other living beings. Self-consciousness, as we are talking about it here, is a characteristic of humans that may be unique – potentially unique in the entire universe. It is a subject

that is also poorly understood, even though it has been a fascination for religion, philosophy and science for millennia.

Perhaps you are familiar with Rene Descartes' famous dictum – “Cogito Ergo Sum – I think therefore I am”. That statement and the principle it conveys of a dualism between the mind and the body, or the mind and the world, continues today to fuel rancorous debate.

The paradox is that being self-aware and self-conscious – that sense of self-ness that we all have – could not begin to develop in an isolated brain, by itself. The self needs others to be able to identify and define itself. It is the contrast between self and other that provides the jumpstart for self-consciousness. There is a mystery in the apparent emergence of self-referential awareness from an electrochemical organ (the brain). There is also a paradox since this emergence of self is fundamentally based on a co-dependency with other self-aware beings.



The same mystery and paradox is true of language. Humans have abstracted and isolated the concept represented by the word “self” and published volumes of philosophy and psychology on this concept. Yet the tool of language that makes this abstraction and analysis possible is ultimately grounded in a shared community with “other” humans.

f. Emotions, feelings – transcendence:

Human beings experience emotions, feelings, intuition and insight – many report an awareness and experience of transcendence.

This is the wonderful, powerful, subjective side of human experience. Our emotions and feelings are fired up by our “limbic system” the so-called lizard brain. We are not directly conscious of its operation, but we immediately feel and can then observe the results: anger, fear, joy, love – and all the rest. We also seem to have the capacity to step beyond the immediacy of our world and experience bliss, joy, revelation, a sense of one-ness or religious faith that takes us beyond time and space

I read a wonderful book this summer by Stuart Brown: Play – How it Shapes the Brain, Opens the Imagination and Invigorates the Soul. He describes Play as a spontaneous expression of joy, and argues that is one of the most important characteristics of being human. He says, “Play is how we are made, how we develop and adjust to change. It can foster innovation and lead to multibillion-dollar fortunes. But in the end the most significant aspect of play is that it allow us to express our joy and connect most deeply with the best in ourselves and in others.” That’s a beautiful concept.

g. Empathy and morality – community and collaboration:

Human beings exhibit qualities of empathy and a sense of morality, and they need human community and thrive on collaboration.

For most of the time since Darwin published *The Origin of Species* (1859), empathy and morality were considered to be outside the bounds of evolutionary theory. The theory was, after all, about competition, and was colloquially referred to as “survival of the fittest.” Empathy and morality were outgrowths of civilization, or qualities received directly from God. But this traditional boundary line between empathy and evolution has dissolved in recent decades.

Many researchers (like Harvard’s Martin Nowak in [Supercooperators](#) in 2011) have shown that group or multi-level evolutionary selection gives rise to cooperative behaviors in a variety of species. In late October, *Nautilus Magazine* online re-published an interview with developmental psychologist Michael Tomasello, co-director of the Max Planck Institute for Evolutionary Anthropology (link) < <http://nautil.us/issue/1/what-makes-you-so-special/cooperation-is-what-makes-us-human>>.

“For decades Tomasello has explored what makes humans distinctive. His conclusion? We cooperate. Many species, from ants to orcas to our primate cousins, cooperate in the wild. But Tomasello has identified a special form of cooperation. In his view, humans alone are capable of shared intentionality—they intuitively grasp what another person is thinking and act toward a common goal...”



3. What do we aspire for?

These remarkable and complex qualities of human beings are quite stunning, and for me, contemplation of our expanding knowledge about human beings inspires awe. Taken as a whole, we seem to be rather magical beings - beyond easy explanations or simple categorizations.

So, if we are the human race, what is the race all about? What do humans aspire for – what is our calling? This is a question as old as humanity, and many philosophers and psychologists have made efforts to codify an answer.

The Greek Plato articulated the goal of being human as the cultivation of virtue – wisdom, courage, temperance and justice – these are the bases for living well, and by living well we maximize our happiness and satisfaction.

Many people are familiar with the modern description of human needs provided by Abraham Maslow (1943). He described the goal of being human as the satisfaction of a hierarchy of needs - physical; security; belonging; esteem; and self-actualization. The last of these, self-actualization, is clearly what the Greeks were driving at.

More recently (1991), Chilean economist and environmentalist Manfred Max-Neef provided an updated model for human development, as shown below. This is a picture of his wheel of inter-related human needs. The first four needs - subsistence, protection, affection and understanding – are similar to the first four categories of Maslow. The wheel goes on to identify needs for participation, leisure, creation, identity and freedom.

To this list of needs I would also add spiritual needs; our desire and need for experiences of transcendence, awe, joy, a sense of unity, the feeling of being part of creation or infinity or the sense of being loved by God. For many, this is the most important feature of human experience. It clearly deserves to be included in the Pantheon of human needs.

Chart 1. Manfred Max-Neef: Fundamental Human Needs.

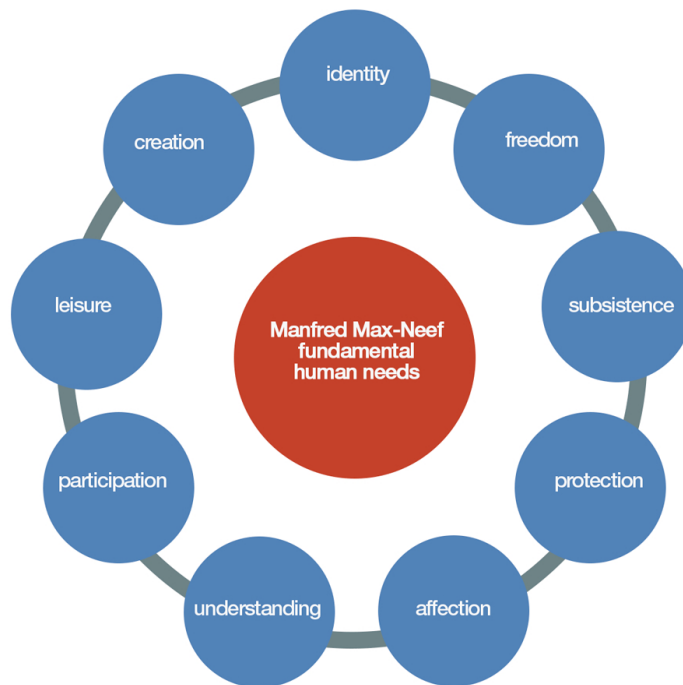


Diagram Kenneth bodtha Jeans

Max-Neef also set up a classification for how well activities or things could satisfy these needs. The classification identified five categories of Satisfiers: Violating; Pseudo; Inhibiting, Singular and Synergistic.

- 1 Violating Satisfiers: Violators claim to be satisfying needs, yet in fact make it more difficult. As discussed in Chapter I, Facebook falls in this category for me. It is ostensibly about increasing one's social network and interactions, but has the opposite effect.
- 2 Pseudo Satisfiers: Pseudo satisfiers claim to be satisfying a need, yet have little to no real effect. This would include the proverbial snake-oil remedies and, according to some, many multi-vitamin products. Perhaps there is no harm, but there is no benefit either.
- 3 Inhibiting Satisfiers: Inhibitors over-satisfy a given need, which undermines satisfaction of other needs. In other words, too much of a good thing can crowd out satisfaction of other needs. I would put both fame and fortune in this category. They may be positive up to a point, but I do not envy the lives of the rich and famous or the public scrutiny to which they are exposed.
- 4 Singular Satisfiers: Singular satisfiers satisfy one particular need. An example would be having an adequate supply of food to meet basic nutritional needs.
- 5 Synergistic Satisfiers: Synergistic satisfiers satisfy a given need, while simultaneously contributing to the satisfaction of other needs. If we take the "adequate" food and make it a part of a family or community celebration – that would be a good example of a synergistic satisfier.

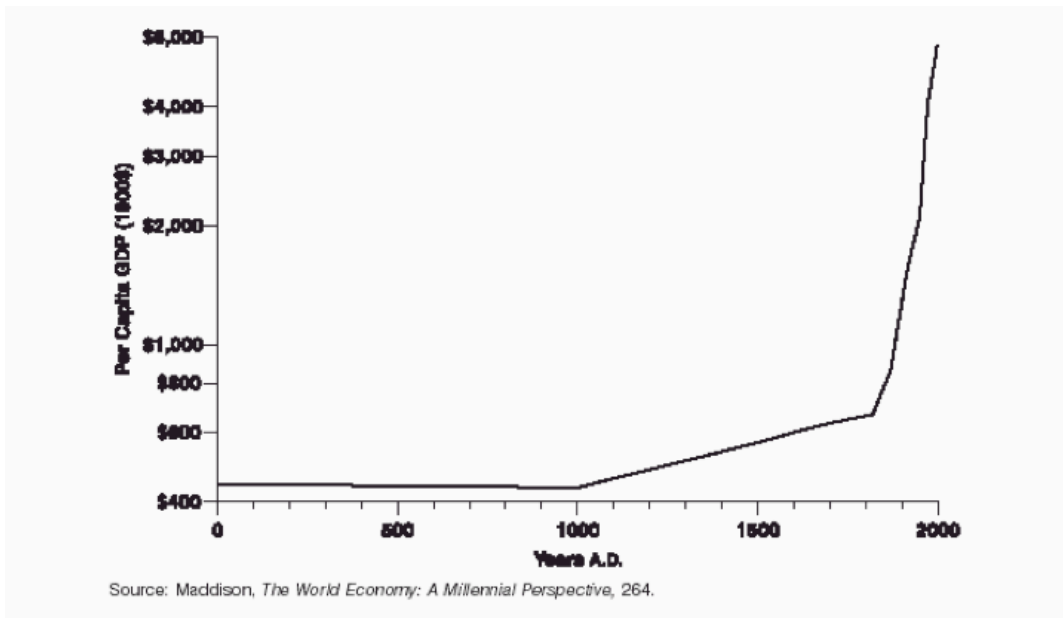
4. How are we doing?

The previous sections give us a sense of the qualities of humans and our aspirations - what we are like, and what we want. While this is hardly a complete explanation of "the human race", it does allow us to begin asking the next question. In terms of meeting these needs, how are we doing?

The evidence suggests that we are doing pretty well. One overall measure we can look at is human prosperity, as measured in the production of goods and services that provide tangible benefits to human beings. Chart 2, below, is a graph showing the estimated World Gross Domestic Product (GDP) per capita. The graph covers the last two millennia, from 0 to 2000 A.D. While these historic numbers are hard to estimate, Angus Maddison, who died in 2010, is the respected source.

As we can see from the chart, for the first thousand years, a period that includes the rise and fall of the Roman Empire, the Dark Ages, and a thousand years of Chinese empire, the curve is pretty flat. Apparently, not much economic progress was achieved in this period of time.

Chart 2. Human prosperity, measured as World Per Capita GDP (inflation adjusted).



Going back into prehistoric and early historic periods of the human race, we can imagine some improvements in the human standard of living. The mastery of fire, the working of clay, flint knapping, the development of agriculture, metals, the wheel – all these technological advances would have served to bring greater prosperity to the humans that deployed them. In addition, there were some increases in trade as humans moved from bands to tribes to clans to cities to nations. In these cases, the increasing division of labor and exchange of goods and services would serve to raise the overall standard of living. At the same time, it is worth noting that the standard of living for many - those living in slavery or subject to invasion or natural disaster - would have been horrific.

Nevertheless, if any progress in the human standard of living was achieved in the first millennium, the effect does not appear in the chart. There are, however two significant changes in the curve that appear in the second millennium.

The first turning point is at about 1,000 A.D. This corresponds with advancements in navigation, trade and commerce. These advances brought a consistent increase in standard of living – on average – to humanity. The second turning point, at the end of the 18th century, corresponds with the industrial revolution. Technological advances, fueled by accumulating investments of capital and increasingly skilled labor, turned the economic prosperity curve upward at what appears to be a very rapid pace.

Note that Chart 2 is on a logarithmic scale, which means that the scale for GDP increases exponentially while the scale for years is linear. As a result, the two inflection points that appear in the second millennium are actually quite dramatic. The straight line for the

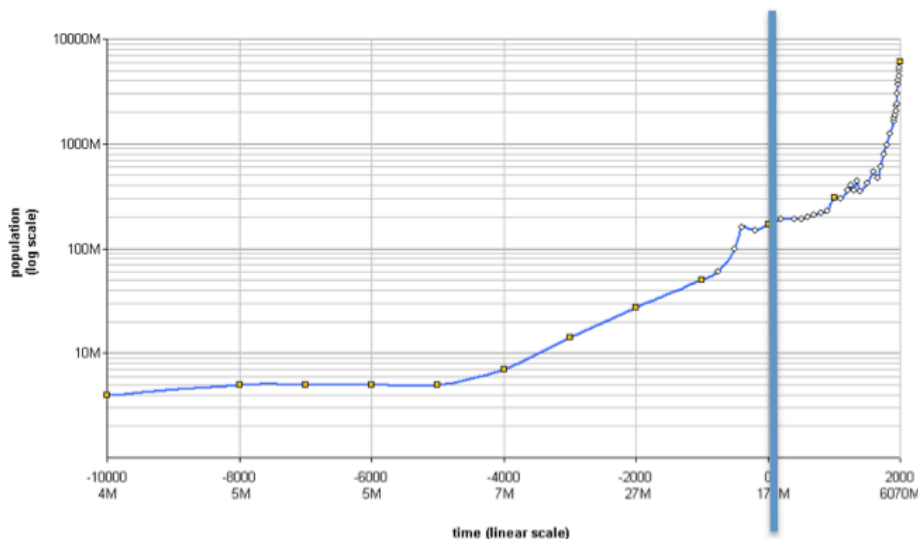
period 1000 - 1800 depicts economic prosperity growing exponentially for this period. The steeper straight line for the last two centuries corresponds to a dramatically higher exponential growth rate.

Some prognosticators also now claim that the digital transformation has created another turning point in the growth of human prosperity and will result in an even steeper line for GDP per capita. We may have to wait for more data before that can be confirmed.

On the scale on Chart 2, the increases in GDP per capita in the last two centuries appear nearly vertical. A vertical growth rate would be a theoretical impossibility - what mathematicians call a “singularity”. It is impossible since it would imply the quantity being measured in the graph, in this case the GDP per capita, becomes infinite. Yet advocates for advanced computer technology have borrowed the term “Singularity” to refer to advances in computing intelligence so vast that the speed of increases would appear to be nearly vertical. We address that issue in Chapter III.

Critics might say that GDP per capita does not necessarily measure human flourishing, and I would agree. But there is other evidence as well, which I will briefly summarize here. Chart 3 shows estimated world population over the last 12,000 years. The very right hand column covers the last two thousand years - covering the same years as the previous graph of GDP per capita.

Chart 3. World population over the last 12,000 years.

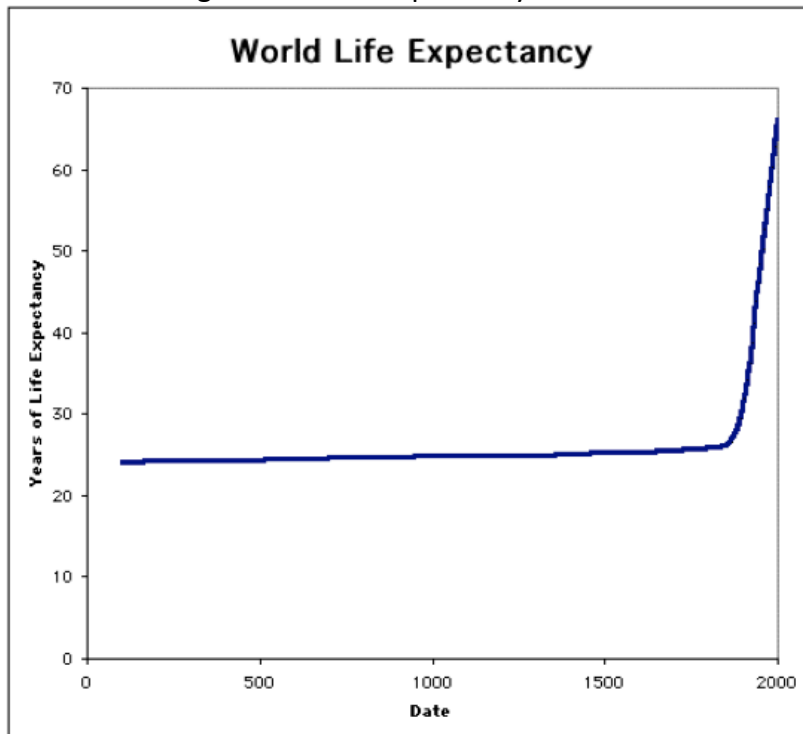


This graph is also logarithmic – and it tells a similar story as GDP. In the pre-historic and early historic periods, population was estimated to be fairly stable at about 40M, until about 4000 B.C. Population then began a period of increase, reaching 100-200M at year 0. Human population then remained nearly flat in the first millennium, but was followed

by a period of much more rapid growth beginning around 1,000 A.D., with a significantly steeper increase appearing in the last few centuries. The data suggests that humans were forming families and having babies, and were able to support an increasing number of people, as time marched on. This is at least an indirect indicator that the human race was thriving.

A growing population is one indicator of human thriving at the species level but it may not tell us much about the individual human experience. For that, we might look at a different measure - average human life expectancy. Chart 4 shows world average life expectancy over the last two millennia. While this graph is NOT logarithmic and therefore the changes shown are linear not exponential, it does show a very flat curve until the last 2-3 centuries, when life expectancy began to climb steadily. One suspects that the germ theory of disease and subsequent improvements in global public health played an important role in the dramatic increases in life expectancy in the modern era.

Chart 4. Average human life expectancy 0 - 2000 A.D.

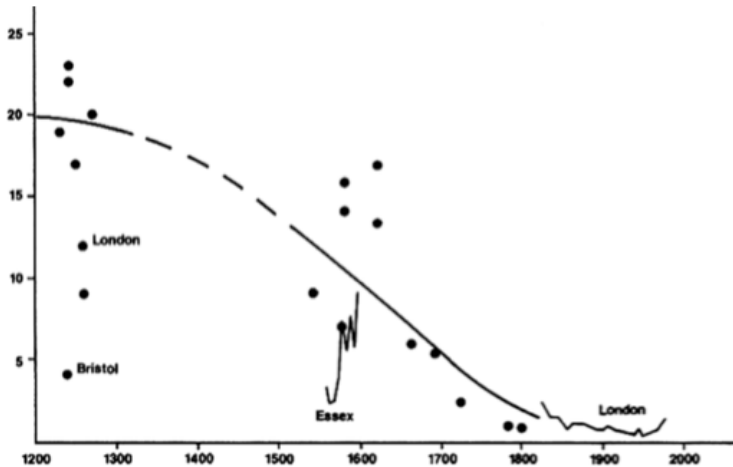


At the Wayland Great Presenter's session in October, Dr. Vince Giuliani talked in detail about human life expectancy. His presentation focused on the more recent past and he concluded that, while maximum life span was not increasing, people in the industrial countries particularly were getting closer to that maximum on average. This is consistent with what Chart 4 shows. Beginning at about the time of the industrial revolution, average human life span (but not the maximum human life span) began shooting up rapidly. According to Dr. Giuliani the maximum human life span is about 120 to 130 years. This implies that this graph can only increase so far, at least until additional

breakthroughs in medicine and biology are made that allow maximum human life span to increase.

A different measure of human quality of life is the prevalence of violent death. Hard data on violence and war casualties are difficult to estimate, but this is another measure that suggests that humans are thriving. Chart 5 shows the trend in estimates of homicides in England from 1200 to 2000 A.D., a positive downward trend.

Chart 5. Data on Homicide in England 1200-2000 A.D.



Stephen Pinker recently released a book, The Better Angels of Our Nature, in 2011, that provides support for more generalized claims about the decline of violence in human history. This may seem difficult to reconcile with what we know of mass slaughter and war in the 20th Century, but these known horrors apparently pale in comparison with the average life experience of humans living in earlier centuries. As Pinker puts it in the 21st Century:

“Violence has been in decline for thousands of years, and today we may be living in the most peaceable era in the existence of our species.”

5. Conclusion

The evidence we have reviewed – economic wellbeing, population, life expectancy, and violence – clearly shows very positive trends relative to human wellbeing. Over the last millennium, and particularly the last century, humanity seems to be thriving. Life is getting better for most people – and the pace of these improvements has been accelerating, consistent with exponential growth in prosperity and population. Humans seem to be flourishing and seem to be winning the human race.

In 1798 Thomas Malthus published his groundbreaking thesis that human population would soon collapse. Almost 200 years later, in 1968, Paul Ehrlich and others, in books with titles such as The Population Bomb or Limits to Growth, repeated a similar message. It now appears that all those gloom and doom predictions have been entirely wrong ... - at least so far.

Whether this will continue to be the case, or not, seems increasingly to depend on the trajectory of our technological advance. While technology is progressing along a number of fronts in many different fields of science, all of them have one thing in common - they are increasingly dependent on digital technology as a principle tool and the key infrastructure on which further progress depends.

Given that digital technology has assumed a ubiquitous presence in our lives, and provides the basis on which humanity may, or may not, continue to advance technologically in order to further the human race, it is appropriate to turn to the question of where digital technology is now going. That is the topic for Chapter III.



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Acronyms

MMOG – massively multiplayer online game

MOOG – massive open online course