

Triple Threats for the Human Future

Will Civilization Arrive?

L. David Roper

Forward by Michael Abraham

Forward

Saudi Arabian proverb: "My grandfather rode a camel, my father drove a car, I fly a jet plane, my son will ride a camel."

Special.

As the twenty-first century dawns citizens of the planet earth benefit from amazing technologies. The Hubbell space telescope and radio interferometry array telescopes bring us views of our universe that boggle the imagination. Intergalactic distances, fabulous supernovae and black holes warping time and space indicate a universe of unfathomable energy, size, and scope.

Yet what astronomer Carl Sagan called our Pale Blue Dot, the starship Earth, stands apart, special.

Special, as a verbal construct, is arguably the most browbeaten word in the lexicon. It's been diced and sliced, mashed, trampled and marginalized. Special delivery! Special: two for one! Special offer; act today!

Before we assaulted it, special meant this: distinguished by some unusual quality; especially: being in some way superior. And no word better described our home planet, for, as far as we know, it is the only one that supports life. That's it. As far as we know, we're utterly and completely alone.

In the universe, energy is everywhere, grand and fabulous in places, scarce in others. Life, however, is excruciatingly rare. Energy can and does exist without life, but life cannot exist without energy. The story of life on earth, of microbes and mastodons, of amoeba and apples and antelopes, of condors and cornstalks and caterpillars, of bacteria and broccoli and bears, is about the use and consumption of energy.

Paradoxically, what's so rare in the universe is almost overwhelming in profusion here on earth. Life here is so tenacious, fecund, and resolute, it's sometimes easy to take for granted. Always there. Like so many things we experience in profusion, it's difficult to grasp the specialness.

And maybe that's the root of our problem.

Millennia ago on the steppes of Eurasia emerged a new species, one destined to impact the earth, its other species, and itself in unprecedented ways. Homo sapiens, wise man, was neither bigger, more agile, nor faster than the proto-humans from which he evolved, yet he possessed many competitive advantages that would serve him well. He had an opposed thumb, making grasping tools easy. He had an uncanny, unprecedented ability to communicate with other members of his species. And he had reasoning and thought powers as never before. He was omnivorous, shrewd and adaptable. His range spread and his populations grew, withstanding periods of feast and famine, heat and cool. He used the last Ice Age to his advantage, bridging to the New World and further expanding his numbers and predominance.

But in spite of his successes, when the glaciers retreated ten thousand years ago, worldwide human population numbered some five million, less than the current population of my native state of Virginia. When Christ sat with his disciples at his final Passover Seder, merely 250 million souls populated the earth. It took 1800 more years to hit a billion. Since then, the population has exploded nearly seven-fold and growth continues unabated.

In the 1995 essay, *Energy and Human Evolution*, David Price tells the tale of a planned introduction of a herd of 29 reindeer introduced to St. Matthew Island in the Bering Sea in 1944. With an untouched bounty of the lichen on which they feed, by 1957 the population, given ample food and no predators, reached 1350 and by 1963 was 6000.

We'll revisit this herd in a moment, but let's return to our human population.

Competing theories vie for acceptance as to how and why human populations soared, beginning about 200 years ago. Did humans become more fecund? No, offspring production was about the same as before. Were humans suddenly smarter? No, the human brain reached its current size and acumen thousands of years earlier. The correct answer is simple and intuitive: humans found and exploited a new energy source, fossil fuels. This endowment, always buried literally beneath their feet, had always been there for any species at any time to use, but neither the grasshopper, the cocker spaniel, the housefly, nor the jellyfish had the intelligence, the dexterity, or the need to make use of it, as neither did humans theretofore.

So profoundly important was the discovery and use of energy from fossil fuels, particularly petroleum, in the population explosion that we might see humans as having almost literally evolved into a new species, *Homo petroleum*: Oil Man. Oil Man, not in the J. R. Ewing, Boone Pickens, or Jed Clampett model, but in the form of John Q. Consumer, physically resembled *Homo sapiens*, but clearly different in his prodigious appetite for food, clothing, recreation, travel, refrigerators, color TeeVees, and all the other accouterments of what we now think of as everyday modern life.

Oil Man's newfound gift of coal, oil, and natural gas let a farmer grow enough food not to feed a few as before but to feed hundreds. Furthermore, Oil Man could build skyscrapers, interstate highway systems, particle accelerators, microwave ovens, space telescopes, and so much more. Oil was quickly put to use not solely in food production, but in plastics, fabrics, pharmaceuticals, and notably transportation. Oil Man radically re-engineered his living environments to consume fuel in frantic, profligate ways. Heat trapping greenhouse gasses, previously encapsulated in these fuels, were liberated into the atmosphere in unprecedented quantities, blocking radiant energy from breaching into the infinite heat sink of space. Oil Man competed aggressively for land and other resources with many species, driving untold numbers to extinction. Most measures of environmental health of the planet have become significantly negative, including topsoils, fisheries, aquifers, and surface fresh-water.

Oil Man's skyrocketing numbers resembled the reindeer on St. Mathews Island; the bounty in fossil fuels was to Oil Man what the untouched lichen were to the reindeer. Oil Man was like a newly introduced species on his own planet, feasting voraciously on an energy source, always there but never before touched.

“Growth, growth, growth – that’s all we’ve known... World automobile production is doubling every ten years; human population growth is like nothing that has happened in all of geologic history. The world will only tolerate so many doublings of anything – whether it’s power plants or grasshoppers.”
M. King Hubbert, 1975

Today, informed, sentient, and rational Oil Men almost universally conclude that a crossroads is at hand. We occupy a society in which growth is revered, worshipped by politicians, economic developers, and demographers, and accepted as a normal condition of existence. The emergence of a competing view, that the only thing that grows unrestrained is cancer, is sacrilegious, blasphemous. Yet growth has only been possible with a continuously expanding availability and consumption of fossil fuel energy. Oil Man is in nature’s crosshairs, standing like a blinded deer in the headlights, facing an impending collision between continually escalating demand and peaking supply.

Thirty years ago, Professor David Roper wrote a book entitled, “Where have all the metals gone,” documenting the peak in production of scores of valuable minerals and energy sources. Domestic production of gold, silver, mercury, lead, and many others were found to already be in “highly depleted” states even then. As alarming as his conclusions were, the sky didn’t fall. Our economy, lifestyle, and consumptive patterns have continued unabated. We’ve always been able to find ready substitutes. Oil, because of its amazing energy density, transportability, and versatility, will be different. Its looming scarcity will not be easily replaced.

Many esteemed oil production geologists believe the peak of worldwide oil production is neigh. And with the peak in oil discovery forty years behind, who can doubt them? The “when” and “how disruptive” questions of Peak Oil are open to debate, but the “whether” is a certainty.

The threat is real, imminent, and dreadfully, frightfully serious.

Dr. Roper, in this volume, lends his thorough, analytic and mathematical voice to the growing choir of alarmists, warning us in his use of the tools of scientists: charts, graphs, and displays, of the impending threats of Peak Oil, Global Warming, and the next Ice Age. It is important and valuable that he has done so, as the issues are complex and the means of understanding vary from interested person to person.

The trifecta of impending maladies of which Dr. Roper writes is completely predictable. Our ability, or inability, as a society to begin the process of adequate preparation will define our generation.

Incidentally, the reindeer herd on St. Mathews Island effectively consumed all the lichen on the entirety of the island and collapsed in one season from 6000 to 41 females and “one apparently dysfunctional male.”

Nature doesn’t care if we’re having a nice day.

Michael Abraham, Blacksburg, Virginia April 2006

Preface

References are often made to “Western Civilization” or “civilization” in books, magazines, newspapers and speeches by politicians. When I encounter the word “civilization” I often wonder what is meant by the word.

The on-line encyclopedia <http://www.wikipedia.com> defines “civilization” as follows:

By the most minimal, literal definition, a *civilization* is a complex society. Technically, anthropologists distinguish civilizations in which many of the people live in cities and get their food from agriculture, from band and tribal societies in which people live in small settlements or nomadic groups and subsist by foraging, hunting, or working small horticultural gardens. When used in this sense, civilization is an exclusive term, applied to some human groups and not others.

The second definition is widely used; for example, as in the title of the book *The Clash of Civilizations and the Remaking of World Order* by Samuel P. Huntington.

I would change the conventional definition for “civilization” to be part of the definitions for “industrialization” and “urbanization.”

There is a computer game called “*Civilization*.” It involves game players as nations accruing resources for their survival and vanity and involves much fighting over control of those resources. That is, it is a somewhat realistic game about what happens in the real World. I know people who are almost addicted to playing that game.

I prefer a loftier simpler definition of “civilization” not mentioned in Wikipedia:

A civilization is a society in which the basic needs (shelter, sustenance and meaningful contributing work) of all its members are achieved through cooperation among its members.

The smallest unit of a civilized society is a household (often called a family) working together for the good of all members of the family. The next smallest unit of civilization is a local community with its members cooperating for the good of all, then regional communities, then continental communities and, finally, a cooperating planetary community. For the World to be “civilized” by my definition, cooperation for mutual benefit among humans would have to occur at all of these geographical scales. It appears that being civilized becomes more difficult the larger the geographic region involved. Words that also describe a civilized society are a “nurturing community.”

By my definition no truly “civilized” society has ever existed in the World. Proto-civilizations have existed to varying degrees of being civilized. See **Error! Reference source not found.**

The degree to which humans are civilized will be sorely tested in the near and far future as the “Triple Threats” discussed in this book plague humans.

Many books have been written with the theme “Can Civilization Survive?” For example: *Global Warming: Can Civilization Survive?* by Paul Brown. Since by my definition no civilization has ever existed, I think a better question to ask is “**Will civilization arrive?**”

So, the question this book addresses is “Will civilization **arrive?**” as human societies try to cope with the extreme stresses that they will undergo as the end of the Petroleum Age, increasing Anthropological Global Warming and the next Major Ice Age occur. See **Error! Reference source not found.**

However, the messages of this book are not all distressing. I show that there is hope if humans come to understand the dangers and act now to make survival of humans more likely in the future. The remaining half of crude oil and natural gas must be used to develop the infrastructure for renewable energy sources and recycling of materials. If the current rates of growth of wind power, photovoltaic power and biodiesel production are enhanced by reasonable amounts, these renewable sources of energy can provide replacements for declining crude oil and natural gas extraction and make it possible to slowly and carefully use some coal and nuclear energy to help further develop infrastructure for eventual sustainable renewable energy and recycled materials use. Other minor sources, if increased in magnitude can fill in to make the vision of a Multi-Source-Distributed-Energy System (MSDES) future possible. For such an energy system to work, World population must be stabilized and eventually reduced by pre-conception birth control and education of women. In any case, World population will be reduced, either by intentional more pleasant means or by very undesirable means.

My emphasis is on the survival of humans into the far and not-so-far future on Earth. Of course, plants and other animals must also survive, if humans are going to survive. The current rapid extinction of other animals and plants by human activities must be curbed. Wilson (**Wilson, 2002**) and Benford (**Benford, 2000**) discuss possible ways to assure survival of a complex biodiversity into the far future. This book presents a more comprehensive view of the threats to the survival of humans (and plants and other animals) into the near and far future than any other book that has been published.

This book presents much data and discussion of those data. I have read too many books that discuss quantitative data without presenting the data for the reader to see; so I prefer to err on the side of perhaps too much data. The best way to present so much data is by graphs. Study carefully the many graphs that I present, as they contain a wealth of information, not all of which I discuss.

Some mathematical equations are occasionally used. A reader can skip over them.

This book refers to many Internet web pages. Since the average lifetime of an Internet web page is probably only a few years, some of the Internet references may not be valid in the near future. One can often find another version of a specific page by “backing up” on the web address to parent directories or search for a title or collection of words.

My training and professional life was in theoretical particle physics, but I also did research in theoretical biophysics and resources depletion. I am a scientist who is capable of putting together

information from several fields of study, some of which are often neglected by the specialists in the separate fields involved. The interactions of data between different fields are often more important for human welfare than are the isolated data from the separate fields. I believe that this book presents a more unified view of the interactions of the triple threats that are its theme than any other book that has been published.

The author has benefited from discussions with his beloved wife, Prof. Jeanne Baril Roper, Prof. Richard A. Arndt, Prof. Linda Hinov and Michael Abraham.

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