The Future of Everything   Part 1- January 20, 2018   Part 2 - February 17, 2018
Title borrowed from a Wall Street Journal Magazine Nov/Dec 2017
by Bernie McCune

No one can really predict the future, but I would like to speculate on it a bit and maybe unravel a few promising threads from the tapestry of time and see what one or two future worlds might look like.

Demographic threads, a discussion of future growth, will Capitalism survive?, Artificial Intelligence (AI) in the future, the future of work, emerging medical processes, the future of poverty and the influence of global trade are a few of the hot spots of future development. And what might the future climate turn out to be?
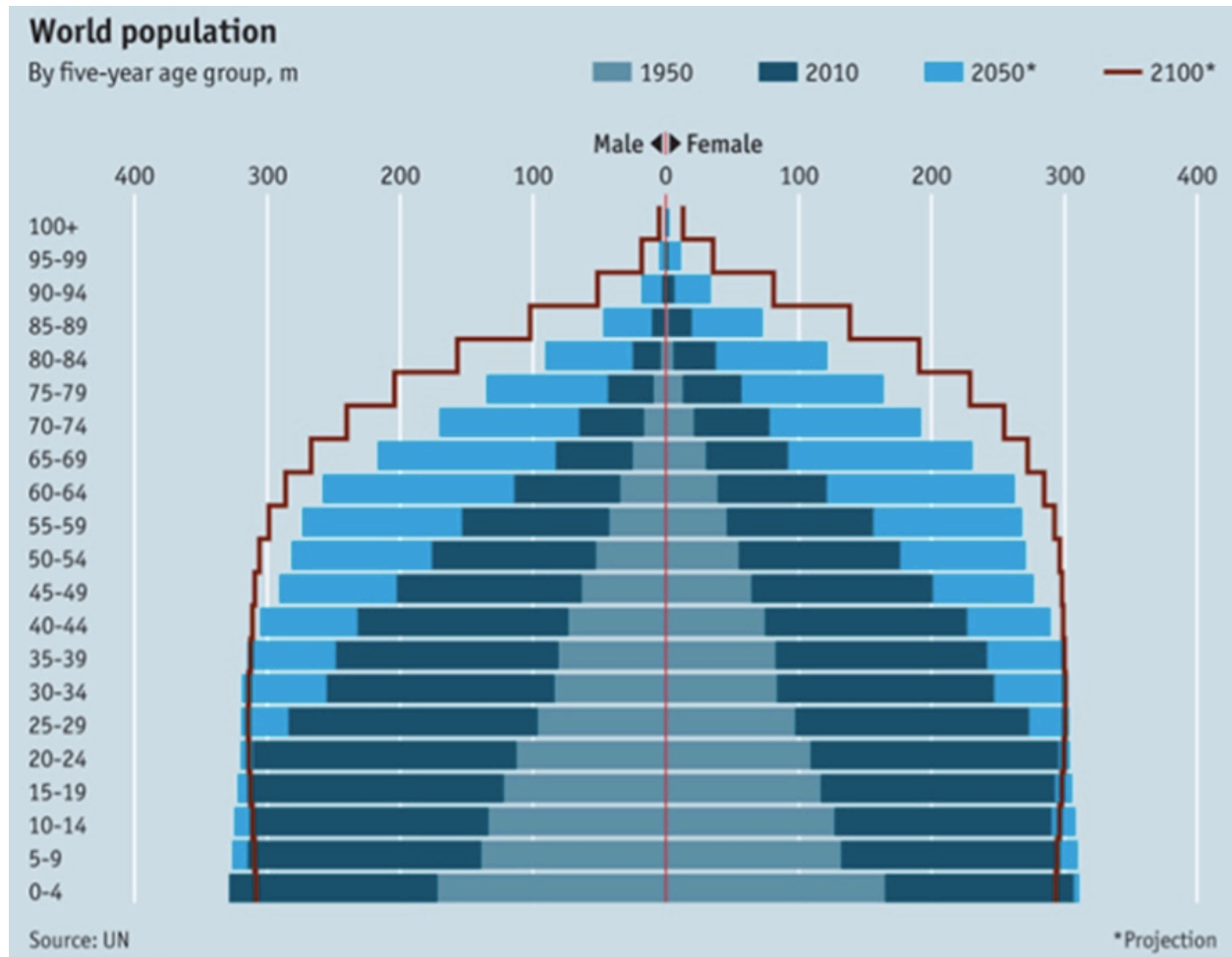
Demographics and the Future

In the past we have briefly discussed global demographic trends and I will only focus on them as they might influence the future of growth, poverty, work and automation issues.

Here is a recent US population "pyramid" from 2015. The true pyramids of the mid 20th century have turned into trapezoids with much fewer younger population groups than were common in the late 40s and early 50s.

Chart 1: Population Pyramid of the U.S.
Total Resident Population in 2015
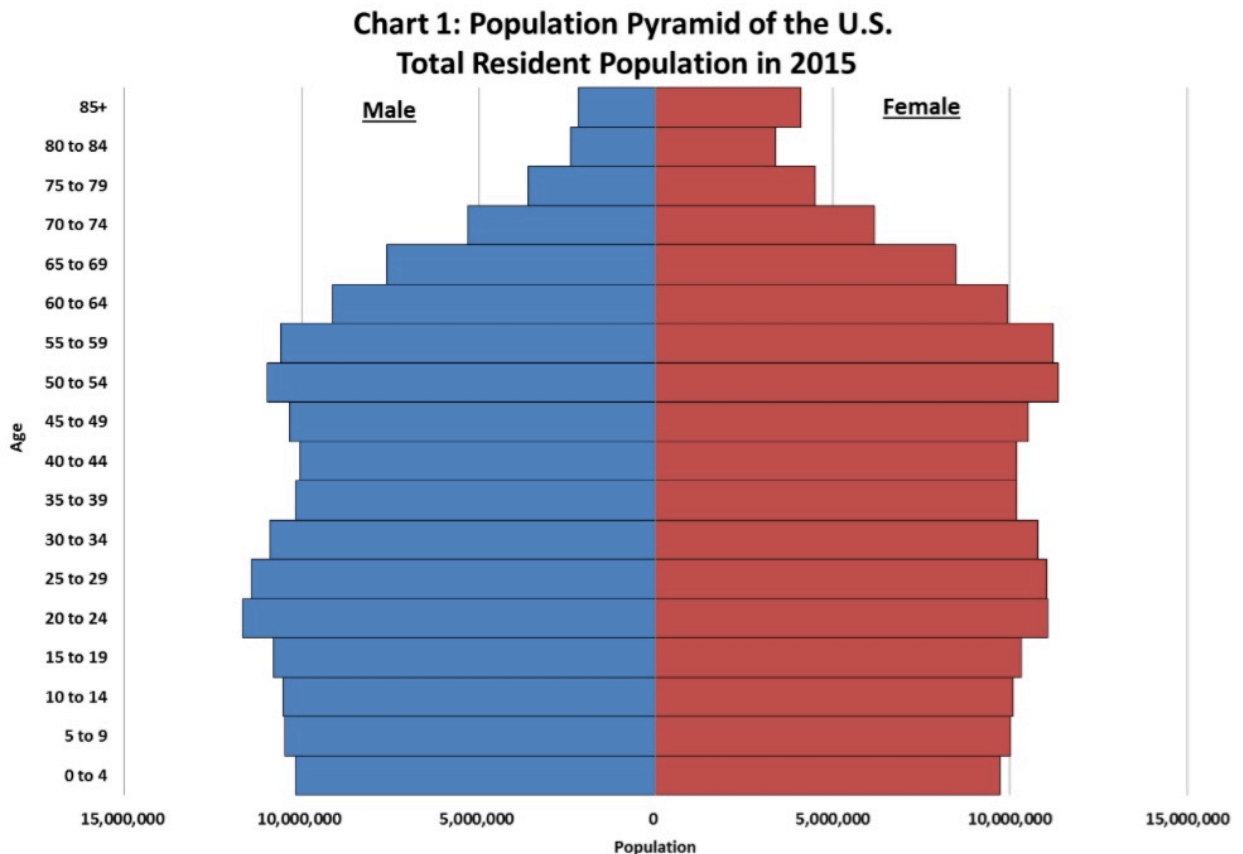
Source: U.S. Census Bureau, Vintage 2015 Population Estimates.

Now take a look at global population from 1950 to 2100. The UN estimates that world population as of December 2017 was 7.6 billion and will be 11.8 billion by 2100. See my post on **Stuff** that I did last year.

World population

By five-year age group, m

| 1950 | 2010 | 2050* | — 2100* |

Male ◀▶ Female

| | 400 | 300 | 200 | 100 | 0 | 100 | 200 | 300 | 400 |

Age groups (top to bottom): 100+, 95-99, 90-94, 85-89, 80-84, 75-79, 70-74, 65-69, 60-64, 55-59, 50-54, 45-49, 40-44, 35-39, 30-34, 25-29, 20-24, 15-19, 10-14, 5-9, 0-4

Source: UN

*Projection

Demographic numbers beyond a 50 year horizon are very difficult to predict. A few possible scenarios that involve behavior and economic changes or the 4 horsemen of the apocalypse (death, famine, disease and war) could drastically modify the above numbers. Probably downward by 1 or 2 billion.

Clearly there will be a very modest growth in global population especially in the developed countries over the next 50 years. A much more active level of growth primarily in Africa is predicted to raise world population to about 9 or 10 billion people. That pattern will flatten by 2100 so that there may even be a decline in global population in the years that follow. Many of the richer countries of the world will have already seen a drop in population by 2050 (some are already seeing that drop now - countries in Europe and Japan). The US is expected to keep growing at a very

moderate rate due mostly to immigration. Asian immigration has already increased and will continue to funnel more people into the US in the next 80 years.

The global workforce will begin to age in the next 30 years and some special processes to accommodate these changes will be needed. By 2050 the population in general will "mature" as the age group from 0 to 40 begins to stabilize and have a stagnation of growth. This stagnation will reach to the 60 year old age group by 2100. Only the older population groups will see any significant growth in that 50 year period leading up to 2100.

The geographical locations of most of these growing populations will be centered in Africa. If in the next 50 years the middle class of Africa grows very rapidly, this whole demographic projection through 2100 will likely to be changed to a much smaller growth pattern. And that smaller pattern could be lower population in 2100 by 1.5 billion people.

Growth in Broad Terms

We can see the influence of population growth on a number of fronts. Not the least is a fear by some that our national identities will be lost due to our own demographic winter and unbridled immigration. Economic and population growth has been the norm in the world from the beginning of time. There are now serious questions about growth in the future as it relates to our resources (both goods and energy). In an earlier presentation on Stuff, I indicated that most of the resource questions of running out of stuff is of little consequence especially if population levels do not climb much beyond 12 billion people. Paradoxically if we continue to develop our economies, lift large portions of our poor out of poverty and expand our middle class we could easily find ourselves in 2100 with only about 9 billion people. This might put us into a situation where growth on all fronts - population, economic systems, resources, labor force, consumers and a variety of other segments has completely stopped. There is a question about whether human society can survive a no growth future. Lets explore some possibilities of future technology and social developments before we come to any conclusions on a non-growth scenario.

**A few technology and software developments that might change our world**

In a Wall Street Magazine published late last year there were a number of issues raised that were summarized on the cover. The title of the magazine was The Future of Everything - A look ahead. Also a layout of a microchip with Quantum Leap written across it and finally at the bottom Encryption.Medicine.Artificial Intelligence. How Google's new chip could change everything - if it works.

Now that is an interesting way to end the hype - "if it works"! And that is part of any look into the future - the fact of the uncertainty of it all.

TILL ROBOTS DO US PART

A Stanford student's chatbot has saved motorists millions in parking fines. Now he's trying to put divorce lawyers out of business
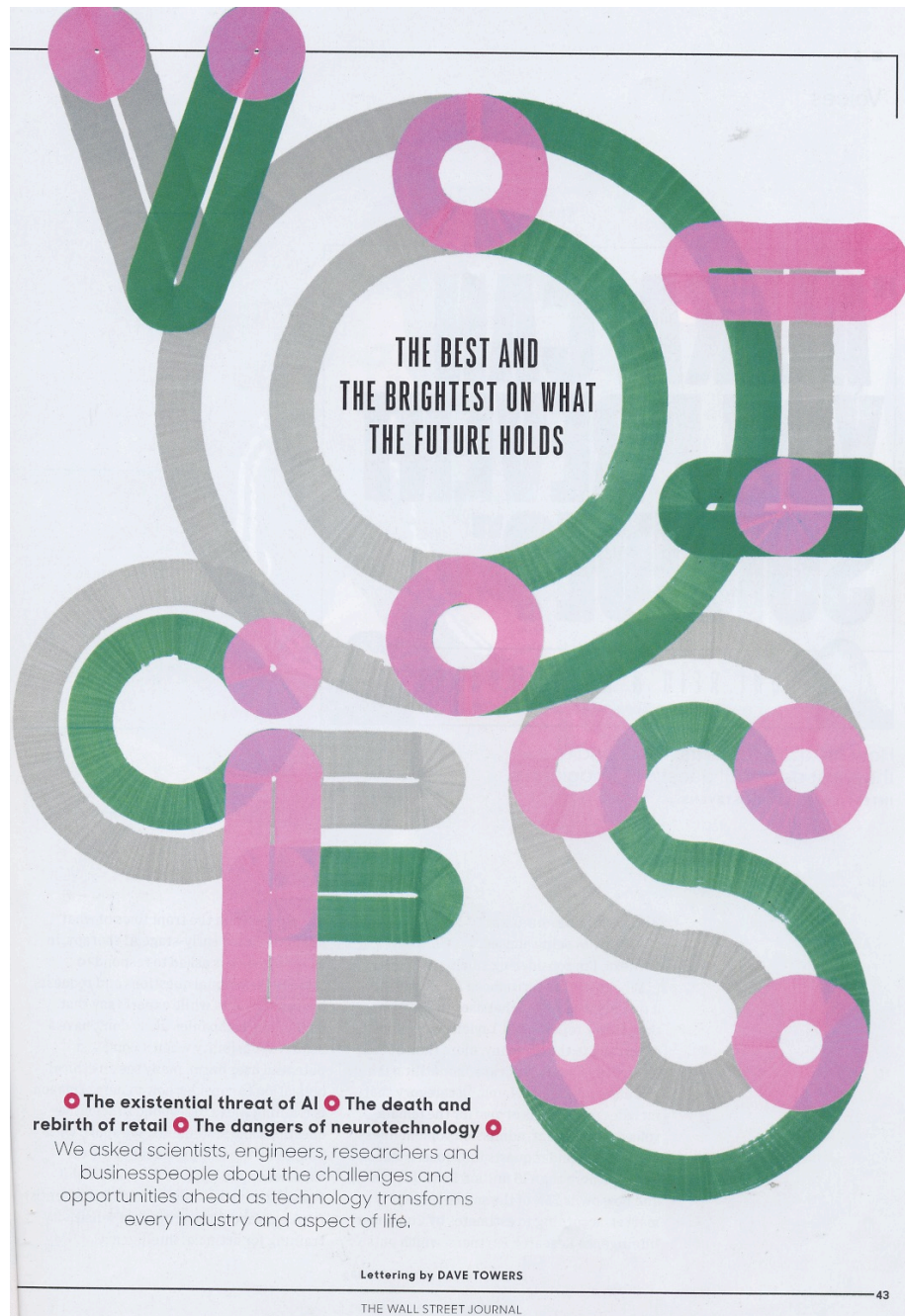
BY ELLIOTT KRAUSE
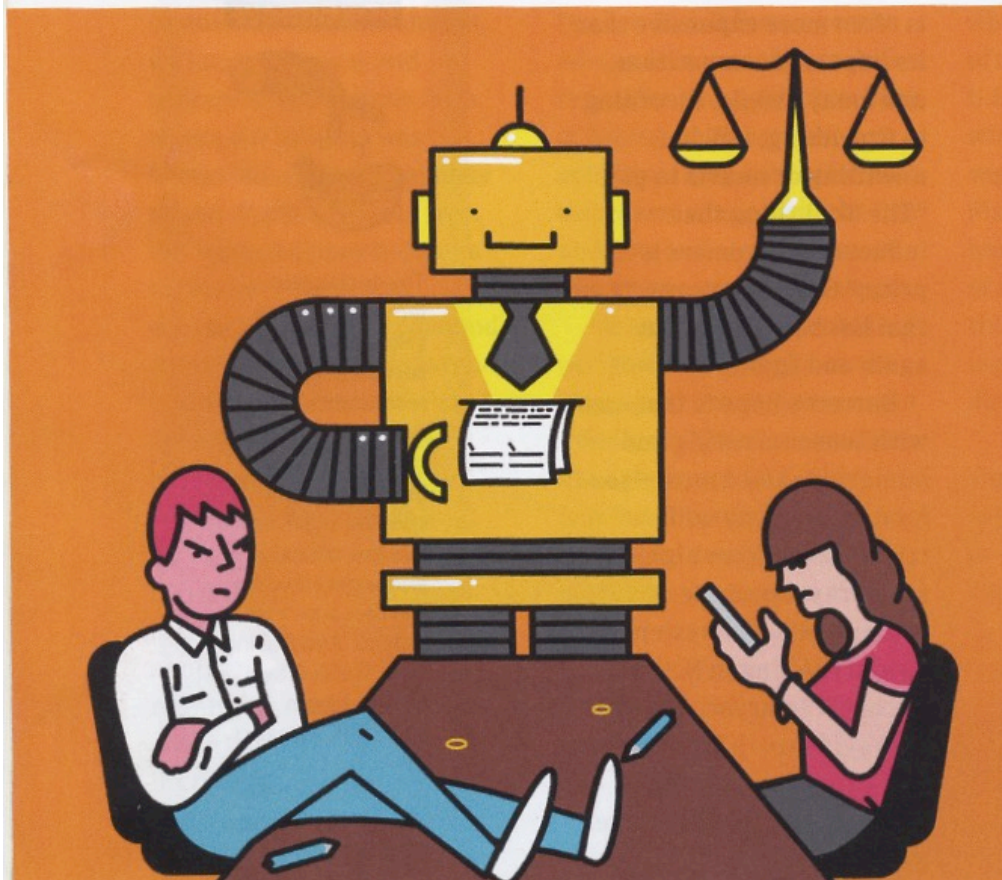
The articles in this magazine were wide ranging - from making alcoholic beverages more healthy to transforming the drug "ecstasy" into a therapy for PTSD. The death of retail at the mall and methods to make AI safe for human use were discussed. It is an interesting magazine if you want to see some interesting leaps that might be coming in our future. I will to pick out just a small handful of subjects in the interest of time.

Technology, computers and the future

Clearly quantum computers if they can be harnessed will have huge computing power. The nature of the bits being in two possible places at the same time leads to issues of

verification and a sort of truth and lies dichotomy. Right now all that can be said is that the latest Google quantum computing chip has made the first baby step on a pathway to the unknown. Part of the unknown may be a dead end that answers our question of will it work? with a flat no.

THE BEST AND
THE BRIGHTEST ON WHAT
THE FUTURE HOLDS

The existential threat of AI ○ **The death and rebirth of retail** ○ **The dangers of neurotechnology** ○
We asked scientists, engineers, researchers and businesspeople about the challenges and opportunities ahead as technology transforms every industry and aspect of life.

Lettering by DAVE TOWERS

Artificial Intelligence and the computers that foster this activity have begun to show a real and interesting path into the future. There are computers like IBM's Watson that have reached some very encouraging thresholds of playing very complicated human

games and beating our best players. The "mining" power of these machines have started to make some headway in diagnosing some very complicated medical conditions and proposing the latest cures. This same process of looking deeply into a database will probably eliminate the majority of lawyers. Small technical legal teams located regionally will feed information from anyone with legal problems to a computer that is set up to deal with any and all of those problems, produce a form and present the issues if there is a continuing problem so that most conflicts can be resolved without going to court. Or simply assist in filling out the necessary forms to complete a legal process.

Another significant idea that is bound to affect all of us within the next decade is driverless transportation. It will probably affect how we view personal automobile ownership, over road movement of goods and all the processes that this innovation would affect. Road safety, insurance, energy use, new methods of traffic control and so on. Work that supports this driver-less concept will also drastically change. It is likely that the work force that presently supports this large segment of today's motoring world will dramatically shrink.

The issue of the machines running amok is of great importance and will be briefly discussed later in Part 2.

Japan is exploring some interesting pathways into using robotic helpers especially for the aged. Traveling in Japan these days I see a dramatic graying of their population. In all the cities with a shrinking population, one can see more abandoned houses and empty lots that is portending a large real estate bust. This has serious consequences for municipal tax authorities and also for folks who wish to get into real estate sales. Real estate as a method to enrich yourself may prove a disappointment to some folks in Japan who would like to follow this career path. Business real estate may become more challenging as future retail infrastructure becomes very different from what we have seen over the past 50 years. In many cases, computers and novel delivery systems may preclude the need for these old style buildings. The medical system may see some of this downsizing as well due to automation techniques.

Another interesting robotic area that Japan is exploring is the idea of exoskeletons. These are smart systems and human controlled assist devices. They are basically a strong flexible super assist metal frame that a person straps on. One example is that of an old man who is in his late 60s and is still working in a small construction company warehouse. His exoskeleton gives him the strength of at least a couple of young muscular men. He loads work vehicles with all the equipment and materials that will be needed for the next day's work. He can handle all the vehicle preparation by himself. The owner likes hiring older people due to their knowledge, work ethic and good attitude. This fellow is experienced enough that he can handle his job with almost no supervision or help. Another type of exoskeleton is a smart one that can have a blind or disabled person put it on and can take them wherever they need to go. A simpler version for old people who are unstable or prone to fall can keep them upright but

allow them to do the walking. Depending on their cost, these devices could make life much easier for a growing future population segment of older people.

Poverty as a hindrance to population control

Technology and AI methods will likely play a big part in supporting these demographic changes. These will be discussed in later portions of this report. But let's look at an interesting future that Bjorn Lomberg sees if we can find ways to implement some of his ideas on global poverty.

His recent report in April of 2017 "Low Cost of Ending Poverty" shows us some possibilities for getting rid of one of our most pressing world problems. In summary he notes that about 2.7 billion people today live in very poor environmental conditions. Namely indoor smoke from cooking and heating which is equivalent to about 2 packs of cigarettes a day. Think of the huge health risks and burden to health care facilities that this population poses. Not all these folks are in extreme poverty but consider that 700 million of them do live below the $1.90/day line that is generally accepted to denote third world poverty (adjusted to local currency). This population is 9.1% of the global population. Less than 1 in 10 people. This figure was stuck in the low teens until recently.

This is quite remarkable since in 1820, nine out of 10 people in the world lived in extreme poverty and about 65% of the world lived in poverty in 1920.

The biggest group in the world that presently live in extreme poverty are found in India and that total population of poor people is 268 million strong. These individuals on average are 38 cents below the $1.90 line which totals a difference of $11 billion/year. Another country, the Democratic Republic of Congo (DNC) has 77% of their population in very extreme poverty. They are on average about $1 under the daily poverty line and will require $12 billion a year to bring them all out of poverty. These two countries are at a global extreme and this value of $23 billion is about 1/3 of all the funds needed to raise the threshold of the global poor each year.

Taking into account lack of data from North Korea, Yemen and Zimbabwe a fairly good estimate can be made of world poverty figures. A calculation has recently been made of the amount of money that would bring the world's poor out of poverty (at the $1.90/ day level) and it is thought to be about $75 billion a year (as of 2015).   Contrast this figure with the annual budget for world development aid which is $140 billion.

We have seen improvements in recent times at all levels of world poverty and in fact by 2030 without any additional support beyond present development plans the global poor will number 400 million which is down 300 million from today's 700 million figure. And by 2060 poverty at the $1.90/day limit (inflated to the 2060 value) will not exist.

If we wished to eradicate global poverty today the developed world could supply funds to a special account with a one time donation of $1 trillion dollars (considering interest)

and over the next 40+ years starting today, all the poor populations of the world would have a minimum per capita income of $1.90/day until funds are no longer needed. To put $1 trillion in perspective it is 1% of global annual GDP or 1/20 of the US national debt. It is only one year of the cost that the Paris climate agreement requires to rein in CO_2 emissions in order to drop global temperature in 2100 by 0.17 degrees C.

A practical plan to get these funds directly to those in need, much less a method of certifying that they are actually needy is probably a bigger issue than finding the funds. Bitcoin-like money transfers may soon be available for getting the money directly to the extreme poor and once the individuals are certified (which is probably the biggest hurdle) networked computer systems and personal cell phones might be the mechanism for actually completing the process.

However, Lomborg's final comment is that basic economic growth is by far the best way to raise the global poor out of poverty and an added bonus is that more economically well off people have less children. A good example of this economic miracle is the fact that China over the past 30 years has lifted 680 million of its people out of extreme poverty. And now China is considering removing the "1 child only" ban due to an impending demographic winter in China. Demographic winter is a threat of population rate dramatically falling far below replacement rates. There is often a steep curve involved with this phenomenon (in this case a steep downward trend).
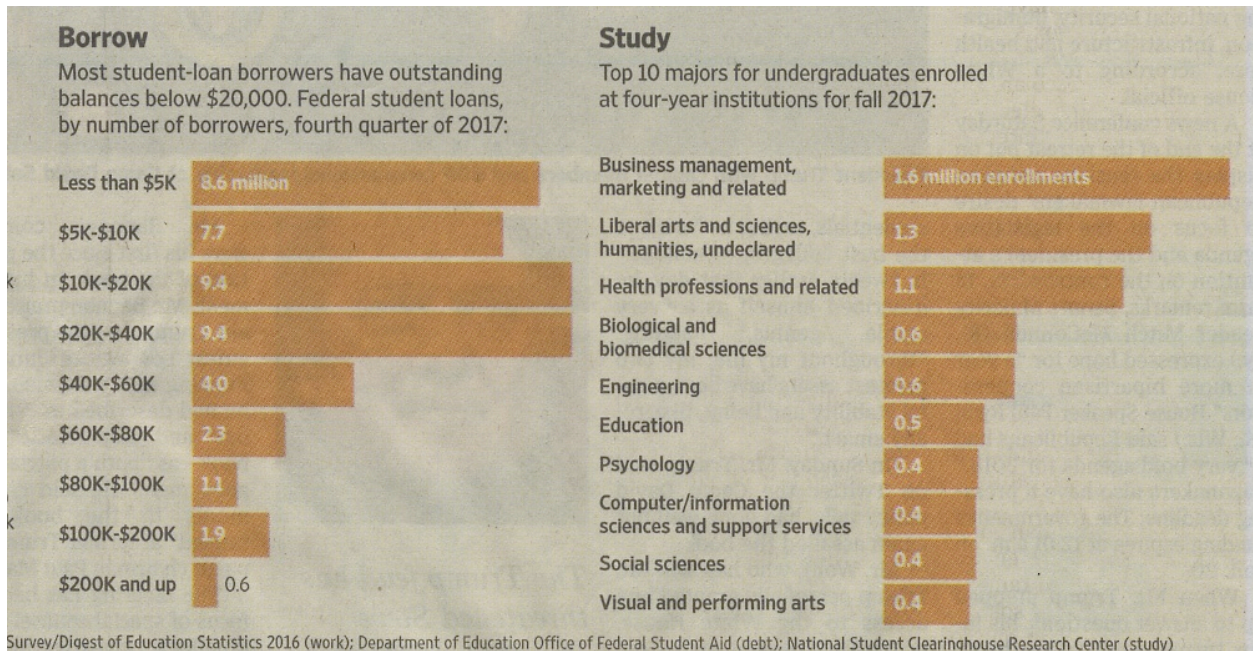
Present Trends in Education

There are a number of unsettling activities occurring in our educational systems both K-12 and at the university level. None of these processes look at all like when I was going to school. There are also some very interesting new ideas appearing that may help improve any apparent short comings that we can see. To some degree the idea that those who fail to understand and look into our past history may be doomed to repeat some of the historical mistakes that we made.

Just a bit of data on what is going on at the university level in the US and I will leave the speculation on our future educational path for another day. Some interesting statistics on the nature of our university student population may give us pause. Forty percent of our students in universities today of the roughly 17.5 million undergraduates attend two-year colleges. Almost 1/3 of college students attend part time. Many of these students are not straight out of high school. Clearly only about 25% of university students today are on an educational path that was what I experienced when I started NMSU in 1961.

Costs for all this advanced education have skyrocketed and some graduates today are deeply in debt even before they can begin their career which for some degreed young people may be flipping burgers or maybe waiting tables. What are the careers of tomorrow going to be and will any of this education they will be getting help prepare them for those careers?

Borrow

Most student-loan borrowers have outstanding balances below $20,000. Federal student loans, by number of borrowers, fourth quarter of 2017:

Less than $5K	8.6 million
$5K-$10K	7.7
$10K-$20K	9.4
$20K-$40K	9.4
$40K-$60K	4.0
$60K-$80K	2.3
$80K-$100K	1.1
$100K-$200K	1.9
$200K and up	0.6

Study

Top 10 majors for undergraduates enrolled at four-year institutions for fall 2017:

Business management, marketing and related	1.6 million enrollments
Liberal arts and sciences, humanities, undeclared	1.3
Health professions and related	1.1
Biological and biomedical sciences	0.6
Engineering	0.6
Education	0.5
Psychology	0.4
Computer/information sciences and support services	0.4
Social sciences	0.4
Visual and performing arts	0.4

Survey/Digest of Education Statistics 2016 (work); Department of Education Office of Federal Student Aid (debt); National Student Clearinghouse Research Center (study)

The above is a narrative version of my presentation to the CASF group on January 20, 2018. The following is the narrative of my Part 2 presentation to the group done on February 17, 2018.

Part 2 Non-Growth possibilities, more on AI ideas and a cooling planet

Future Climate - The Next 100 years

First let me quickly make the case for a cooling climate until 2100 using Ed Caryl's three cycle model. I think this model far outperforms any IPCC models and is a better predictor of future patterns since it seems to be very good at hind casting the temperatures of periods that we have actual instrument or proxy temperature values for. There are a number of events in the present inter-glacial period (about the last 11,000 to 12,000 years) that seem to correlate with climate changes that follow ice core data and Caryl's model as it is projected back in time.

The model uses 3 separate cycles and sums them in order to get the composite cycle of past and future temperature values for the past 1000 years and the future 200 years. These cycles are 62 years (AMO ENSO based ocean surface temperatures), 204 years (solar output variation) and 1040 years (Bond cycle). The Bond cycle is thought to be based on atmospheric/ocean circulation patterns and/or solar/cosmogenic patterns. The Bond cycle is clearly found in the temperature record but the cause of it is presently uncertain.

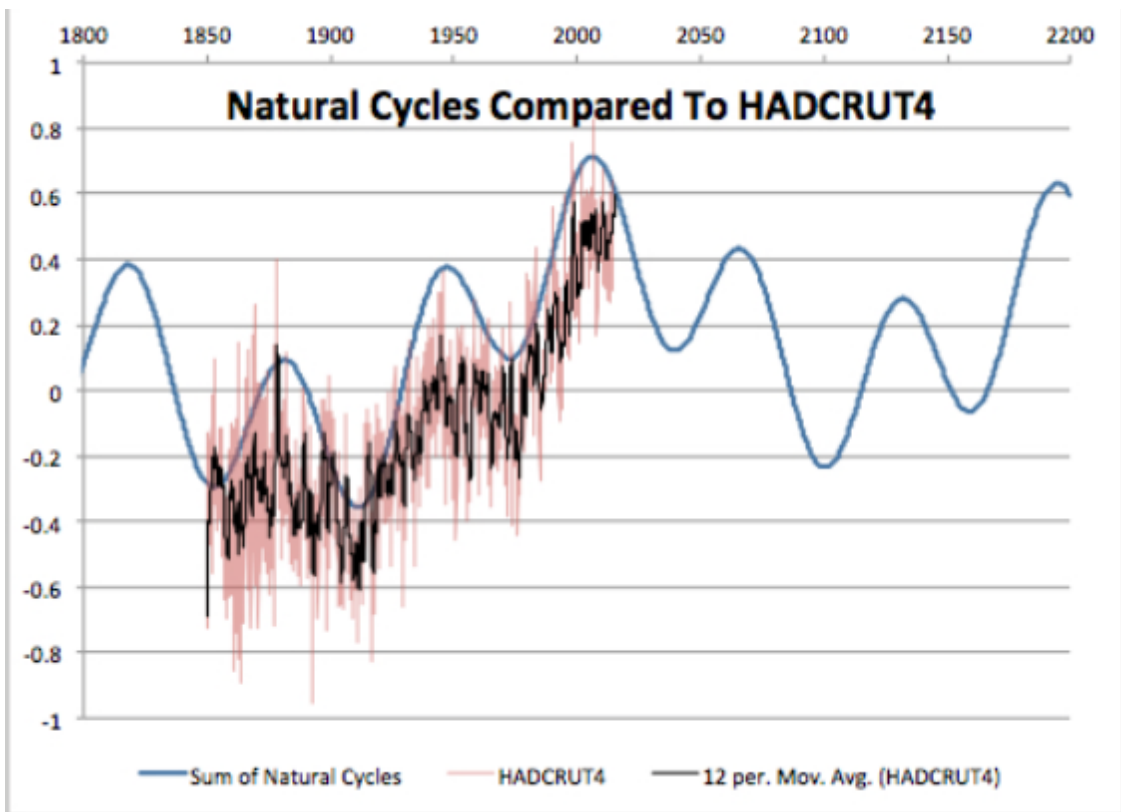The following image is the smoothed sum of the 3 cycles for the period 1000AD to 2200.
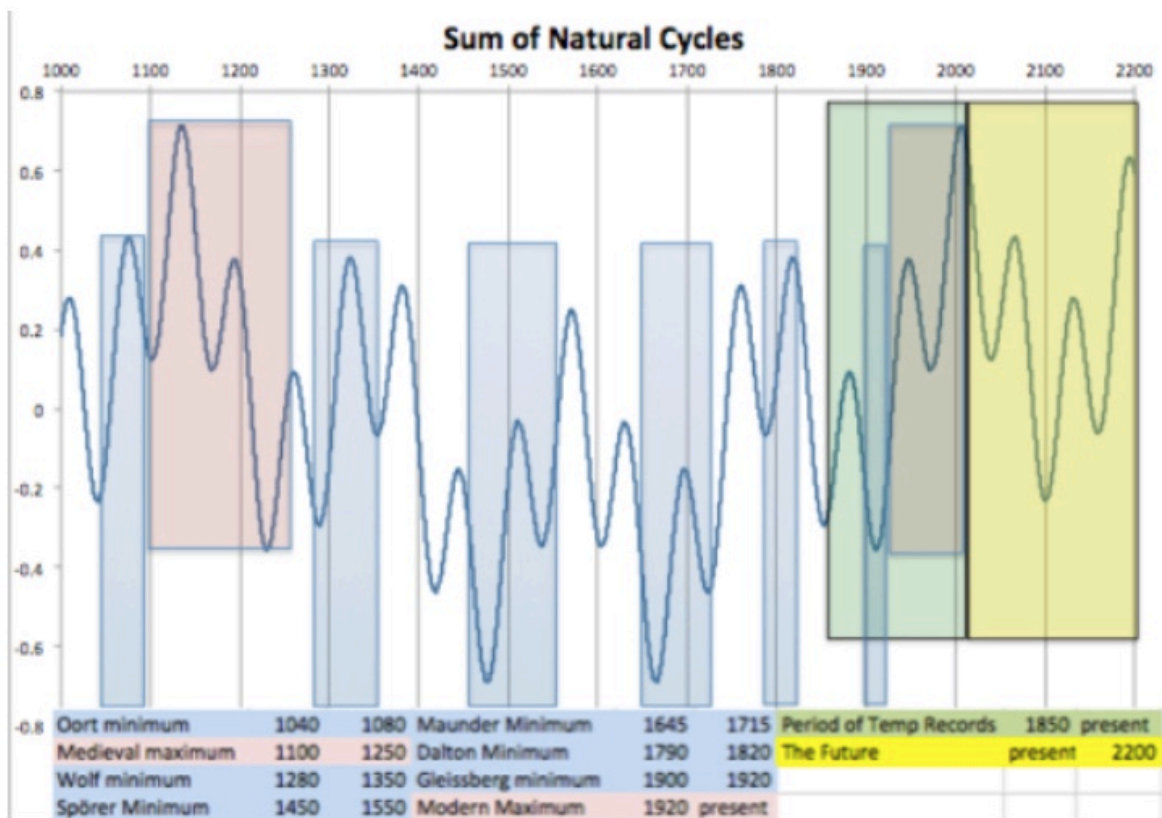
This figure shows the sum of the three natural cycles, the 62, 204, and 1040 year cycles. The green rectangle outlines the historical temperature record, from 1850 to 2015. The blue rectangles highlight cold periods, the red rectangles the warm period. Yellow highlights the future.

The next figure shows a more noisy (and more realistic) pattern with monthly data presented to look more like actual instrument temperature data taken in the modern era. Note the three cycles shown in purple (Bond), green (solar), and red (ocean surface temperatures).
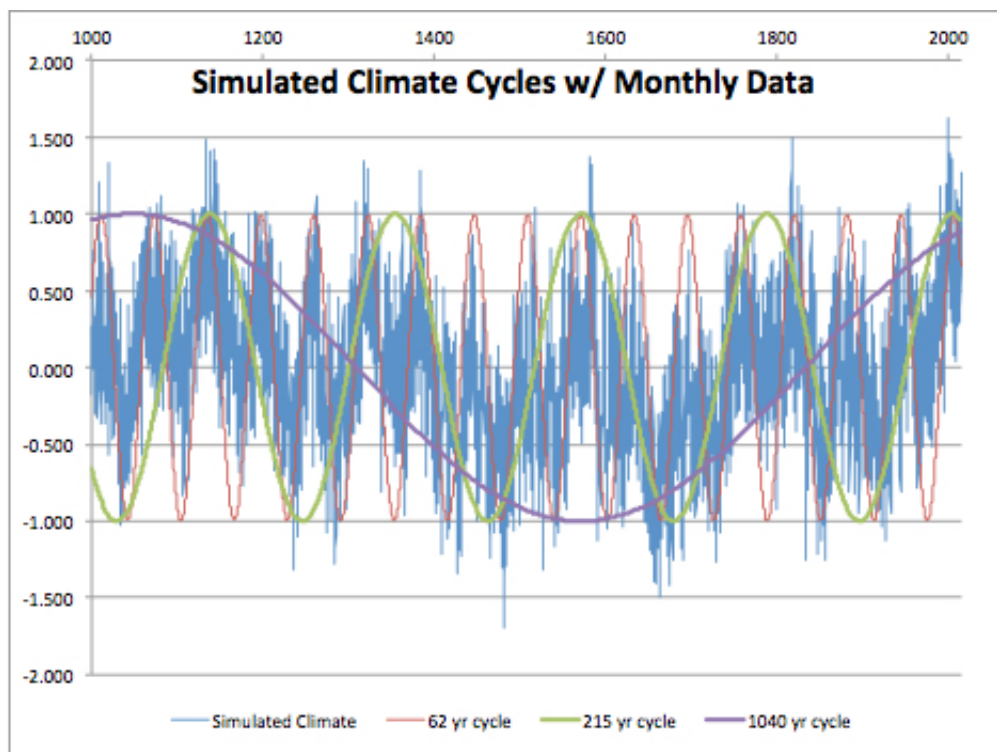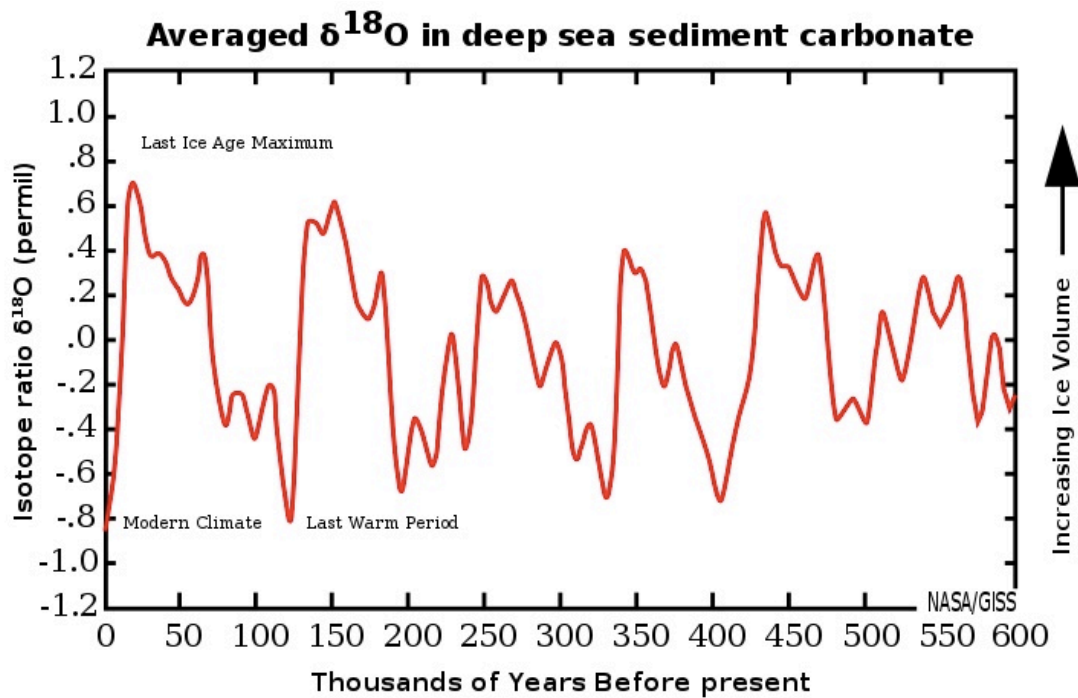

And to see how the full actual instrument temperature record fits the Caryl model, look at the HADCRUT4 data nested in the period from 1830 until present in the figure below. Now look at the future plot of the model from present until 2200. The next 80 years show a cooling pattern until 2100 when the trend begins to warm again. The actual temperatures will possibly drop to the level of the period of around 1900 and probably not as cool as was seen in the late 1800s.

Natural Cycles Compared To HADCRUT4

Legend: Sum of Natural Cycles — HADCRUT4 — 12 per. Mov. Avg. (HADCRUT4)

If the Caryl model is any good then recent peak global average temperatures will eventually drop almost 1 degree C in the next 80 years to a cooler level that was last seen about 100 years ago.

The last prediction that could be made about future climate is that we may have period of deep glaciation in the not too distant future that will possibly include 10 or 20 degree C drops in global average temperature. There have been a series of these deep glacial periods over the past several million years that last on average about 100,000 years.

Look at the following chart showing the last 6 cycles of this global phenomenon. These are not a one or two degree fluctuations in global temperature as we are seeing over the past 200 years. This is Chicago with a mile of ice on top.

Averaged δ^{18}O in deep sea sediment carbonate

The chart shows Isotope ratio δ^{18}O (permil) on the vertical axis versus Thousands of Years Before present on the horizontal axis, with labels "Last Ice Age Maximum", "Modern Climate", "Last Warm Period", "Increasing Ice Volume", and "NASA/GISS".

The End of Growth

An article in Business magazine by Ned Smith in February 2013 entitled "Is the End of Growth the End of Capitalism?", raises many fundamental questions about what population and economic stagnation might do to future life as we now know it. After all, in all these respects human society has developed over the past several hundred years in growth conditions of every sort. What happens when poverty stops increasing and in fact goes away? And population actually declines and perhaps at a very rapid rate to a level close to our present level?

The idea that economic stagnation will be the death of capitalism was promoted by Occupy Wall Street. They proposed that perpetual growth on a finite planet is impossible. This assumes that growth needs infinite resources. But what do we mean by growth? There are two types of growth, extensive and intensive. Extensive growth is what we normally think growth to be where inputs to the system increase and there quickly are limits to be found. Intensive growth uses inputs in different ways to produce more interesting stuff. Limits to this type of growth are not known.

An example of intensive growth is the information economy that tries to satisfy more and more people while using decreasing amounts of energy.

And we have the two BIG questions - if growth ends does our economy end with it? and does Capitalism need growth?

Growth is not a factor in Economics 101 and basic economic theory. Capitalism flourishes from more trade and not from more and more stuff to trade. Raising the poorer 30% of world's people into the middle class and promoting broad economic efficiency is the "gold ring" of future economic well being not growth.

In the 1970s as we began to think in terms of resource limitations and threats to our environment while at the same time we began to look at lower taxes, deregulation, wide spread privatization and a bigger role for financial markets. Under these conditions rich countries (Japan, Europe and the United States) have become stronger capitalists while most Communistic and Socialistic countries have begun to shrink or go away and/or they have successfully introduced Capitalistic elements into their economies.

In fact, the biggest challenges to Capitalism come during periods of rapid growth. The early 20th century with rapid changes and rapid growth was the heyday of Communism, Anarchy and Socialism. This type of chaotic growth disrupted stable social systems that were in place before the Industrial Revolution.

With rapid technical change that started late in the 20th century and continues into the early 21st century, we are exposed to another "growth" related disruption. At the same time change coming from a few African and Middle Eastern countries due to a power struggle between competing ideologies within those regions is producing chaos and mass immigration that threatens the rest of the world.

Does our financial system require growth? Real estate debt requires interest because of the "time value" of money and produces growing equity over time. There is also a concept of consumption "now" rather than in the future that produces unsecured debt. When consumption is spread over time, the basic financial functions continue unaffected in spite of growth or the lack of it.

And finally are the activists correct in thinking that there is some secret dynamic buried in a growth economy that will produce inequalities (and rage) to ultimately destroy Capitalism? Clearly all economic systems tend to eventually have inequalities not just capitalism. The inequalities can be a problem so is there a way to reduce them?

Probably yes. By restraining excesses and providing strong social safety nets, by demanding efficient and well functioning bureaucracies, with prudent regulations and a generous provision of public goods (roads, police and military protection etc.). In other words by promoting a mixed economy.

Those countries with growing wealth will continue to prosper and do well even when they begin to shrink if they do not squander their resources on non-problems. The few "problem" countries of the world will become a growing future issue unless the rest of us learn how to isolate and restrain them. This will require that we engage the "enabling" countries of China, Russia and some of the countries of the middle east.

Another look at Artificial Intelligence and Cyberspace

The joke is, that until robots can learn how to easily open doors, they cannot be sophisticated enough to really be helpmates but at the same time they cannot be too much of a threat since all we have to do to escape them is to leave the room and close the door. Weaponized robots are now being tested and they clearly can not be stopped by a closed or even locked door. There is a whole -not so new- issue about ethical behavior for machines and why should we worry about machines so much when humans have not done very well on this?

Up until now most of our smart machines have been chip microprocessor devices and even powerful computers that process algorithms and complex math to help us control other machines or help us analyze complex relationships and processes. They are starting to have powerful capabilities of recognizing faces and have situational awareness that they seem to be able to almost think for themselves. Some of the algorithms are quite complex. An early one of them is a tool to help banking loan officials determine the risk level of customers on loans to a very high level of success. However, there is a growing concern that some of these types of algorithm based processes have biases embedded in them that may turn out to be unfair to certain groups of people. And even Watson's main talent is the ability to mine huge amounts of data off the web to determine correct answers in a very short time. That is not exactly a thinking process that humans are capable of.

AI with a learning function added to it may indeed become something of a thinking machine. Some of the game playing learning algorithms have really quickly improved their skills to be even the masters of complex games like Chess and Go.

The downside of machines with great power is that it could also be used for evil or have defects that inadvertently cause a recession in the process of handling complicated financial transactions.

There may be a teaching process that is akin to our teaching our children facts and values together to produce an AI that thinks within the lines of logic and ethics so that the growing power of the machine is focused on positive outcomes.

Another issue that I will not delve too deeply into is the growing cyberwar activity being waged by many of the countries of the world. The more worrying efforts come from China and Russian. These may prove to be some of the most serious threats to all of our futures. This is probably a topic for a complete presentation of its own.

What is Bitcoin's Future and should we care?

The whole idea of a computer based system that will eliminate a trusted human interloper is somewhat revolutionary. This type of activity could eliminate some of the more complicated activities that lawyers, the whole financial system and all other go-between functions handle in our society. Today Amazon is the trusted go between in

getting people together so that they can buy and sell all manner of things. Is today's huge new marketplace going to be only a brief flash in the pan due to blockchain methods?

Bitcoin in particular appeals to me when I have had to transfer money between far flung places and have run into very usurious money exchange fees or security restrictions that are meant for terror organizations. This limit on me from sending money to friends, family and legitimate businesses is often a very serious roadblock. Before 9/11 these activities were simple to complete.

The complaint from governments and banks is that from the government prospective criminals can use Bitcoin transactions to cover their illegal activity and as for the banks, it will probably run them out of business. This "follow the money" idea of dealing with day to day business activity may turn out to be a thing of the past. I personally believe that both these organizations need to start looking for better ways to take care of their key business operations.

Let's see if I can explain what this whole idea of blockchain and ledger activity really means. Don't expect me to explain the details since I don't really understand them myself. But perhaps I can help reach a broad understanding of what this revolutionary way of dealing with some of our daily transactions mostly means. The gist of this system is summarized here:

A blockchain is a ledger of facts replicated across several computers assembled in a peer-to-peer network.

Facts can be anything from monetary transactions to content signature validation. Members of the network are anonymous individuals called nodes. All communication inside the network takes advantage of cryptography to securely identify the sender and the receiver. When a node wants to add a fact to the ledger, a consensus forms in the network to determine where this fact should appear in the ledger; this consensus is called a block. For money exchanges directly and for purchasing items there is also the idea of a wallet.

In a distributed system it is almost impossible to reconcile conflicts or to offer referential integrity. If two incompatible facts arrive at the same time, the system must have rules to determine which fact is considered to be valid. You must have a consensus system in order to agree on the ordering of facts.

The blockchain implements another algorithm, the proof-of-work consensus, using blocks. There is an good description of the blockchain theory at this website:

https://marmelab.com/blog/2016/04/28/blockchain-for-web-developers-the-theory.html

Some practical implications follow. Facts stored in the blockchain can't be lost. They are there forever, replicated as many times as there are nodes. Even more, the blockchain

doesn't simply store a final state, it stores the history of all passed states, so that everyone can check the correctness of the final state by replaying the facts from the beginning.

Facts in the blockchain can be trusted, as they are verified by a technically enforceable consensus. Even if the network contains black sheeps, you can trust its judgement as a whole.

Storing data in the blockchain isn't fast, as it requires a distributed consensus.

Bitcoin is only one of a number of new businesses that are starting to form using this blockchain idea. But are we there yet? By reading the next two parts of the blog post from the web developers who did some deep research on this whole concept, the answer is yes and no. They suggest that the concept seems to be sound but it is in need of a super app that someone might produce sometime in the future so that individual applications can be developed easily and with few bugs. In their attempt to develop their own application they found the process to be very tedious and in some cases non-functional (all of which costs time and money and may drive the programming staff crazy). The other issue is that the operation of the system can be very inefficient and consume huge amounts of memory, time and computing power. And finally the cryptography in some of the Bitcoin operations seems to be weak since hackers have several times in the past stolen Bitcoins from the system. Resolving this issue is only one of several tasks that must be successfully completed before Bitcoin is ready for prime-time.

This group of very experienced software developers believe that blockchain is not ready yet because it is not mature enough while at the same time they think it may very well be "the future". And they would not venture a guess at what time in the future that it will reach maturity.

The Future of Space, Medicine and Citizenship

Commercialization and privitization are likely to be where our future in space is headed. On the space front, NASA, the private sector in general, and Elon Musk and Jeff Bezos (less so - he is somewhat a loner) in particular are already planning and working toward this new concept of space.   This will probably continue and expand into the future. Reusable rockets are "the" thing.

Global citizenship to date has been somewhat disappointing just as centrally controlled government seems to have fallen short of expectations. I have no real idea where this aspect of our future is headed. In fact at this moment a wave of nationalistic fervor seems to be taking over the planet.

Certain global ideologies will continue to confound our future outcomes until perhaps we face a hostile extraterrestrial invasion or more likely the next ice age. For much of our unknown future, we probably will not have much of a clue about what it will be. All

we can do is to try to prepare for the worst and the best. And have some hope and faith that intelligence will guide us to a peaceful and successful outcome.

And the last couple of major topics involve energy and medicine. I talked about the future of energy in my presentation on **Stuff**. There seems to be very little chance of much crisis in our energy future since there seem to be an abundance of viable energy sources available to us for at least the foreseeable future. The big question is which source will emerge and take over the 80+% lead that fossil fuels have had for the past almost 60 years in supplying us with almost all our energy needs.

Though there have been huge improvements and breakthroughs in medicine over the past 200 years we still have some big medical issues facing us. Bringing medical care to the patient rather than the patient to the institutionalize bureaucracy is now one of the goals of "future" medicine. The ability to telemeter patient data and to diagnose ailments from remote sites using modern electronic technology is growing fast. There is an X Prize being proposed for a Star Trek type tricorder to be developed. This is a futuristic device that is relatively portable that can scan a patient and quickly tell us what ails him in both broad and specific terms. Cancer continues to be a big medical concern in spite of numerous attempts to cure this disease starting with Nixon's war on it and lots of money being thrown at it. Treatments using immunological and DNA methods show great promise to focus on some specific tumors and to cause them to at least for a few years, go into remission. This is as far as I will speculate on the future threads of medicine. Many more of us are now taking care of ourselves through diet and exercise. Again there is plenty of hope for better outcomes in the future.

Conclusion

I have picked a few areas and a few possibilities for what we might expect in the future. My expectations are probably well short and well off the mark of what will actually be our future. The truth seems to be much different and stranger than any of us can imagine. My only hope is that we try to focus on the real issues that drive our future and not waste a lot of time on wild goose chases that seem to be grabbing our attention these days. In particular I am thinking about the global warming hysteria that has distracted us for the past 30 years.

Just the fact that I question it, brings up the issue of me being anti-scientific. My whole training and work has been in science and engineering and I wonder what is it that those who question my stance have as a basis that supports their view when I am always expanding and have always had a fairly solid basis for my view. Frankly most of these folks never show any sort of data as a basis for their position and seem to have more of a political than a scientific agenda when discussing this subject. So I remain a sceptic on all counts concerning some folks' view of the future.