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September 30, 2018

To Our Clients and Friends:

The Monthly Letter covers three topics this month. First, we provide an overview of the coming race to control Technology's Future. While common wisdom indicates Technology stands apart as its own industry sector, reality stands quite differently. In fact, Technology permeates all areas of the economy as an integral part of all industries and a nation's ability to compete in the global marketplace. Second, examine the Long Cycle in Commodities. Commodities represent a potential investment option for investors. Much of the time the focus stands on the cyclical opportunity tied to an individual commodity's supply and demand. However, once every 15 to 20 years, Commodities provide an opportunity to earn outsized returns as a super-cycle ensues. Third, as always, we close with brief comments of interest to our readers.

Hypersonics, Quantum Computing, and AI: The Race To Control Technology's Future

> "*The question is how a nation provides an environment in which its firms are able to improve and innovate faster than foreign rivals in a particular industry. This will also be fundamental in explaining how entire national economies progress, because technological change, in the broad sense of the term, accounts for much of economic growth.*
> *In a static view of competition, a nation's factors of production are fixed. Firms deploy them in the industries where they will produce the greatest return. In actual competition, the essential character is innovation and change. Instead of being limited to passively shifting resources to where the returns are greatest, the real issue is how firms increase the returns available through new products and processes. Instead of simply maximizing within fixed constraints, the question is how firms can gain competitive advantage from changing the constraints. Instead of only deploying a fixed pool of factors of production, a more important issue is how firms and nations improve the quality of factors, raise the productivity with which they are utilized, and create new ones. Where factors are mobile and can be tapped through global strategies, moreover, the efficiency and effectiveness with which factors can be used become even more central.*"
>
> Chapter 1: The Need for a New Paradigm
> The Competitive Advantage of Nations
> By Michael E. Porter, 1990

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Technology changes constantly. Whether the new technology of automobiles in the 1910s and 1920s, the rollout of radio in the 1920s, the advent and adoption of the television in the 1940s and 1950s, the commercialization of the jet engine in the 1940s and 1950s, the creation of the computer and transistor radios in the 1950s and 1960s, the explosion of plastics, space technologies, and color TV in the 1960s and 1970s, the invention of the Internet in the 1970s with the rollout in the 1980s and 1990s, the rollout of cellular phones in the 1980s, the mass adoption of personal computers in the 1980s and 1990s, the creation of fiber optic telecom networks in the 1990s, or the introduction of smartphones in the 2000s, all these technologies transformed both the economy and the way society functioned. Countries at the leading edge of these new technologies, developed industries that dominated these new areas. Countries not participating in these developments found themselves left behind. Not only did new technologies perform a transformative role, but they created winners and losers across the globe, enabling select countries to dominate both the global economy and fight for global strategic position.

Today, there exists a new race to dominate Technology's Future. It pits old rivals, such as the US, Europe, Russia, and China, and new entrants, such as Taiwan, India, and Thailand, against each other in a contest to create the winners of the next 20 years. The losers will find themselves conceding economic growth to the winners as these countries enjoy the growth that new industries experience leaving the losers with older, outdated economies with lower growth. In addition, the losers will find themselves conceding global strategic position, with other countries dictating to them terms and conditions of their economic participation in the global economy. Key new technologies include Robotics, 3D Additive Manufacturing, Micro-Chemistry, Performance Materials, Bio-fabrication of Tissues and Organs, Drones, Personalized Medicine, Miniature Satellites, Space Travel, Magnetic Propulsion, Hypersonics, Quantum Computing, and Artificial Intelligence. These technologies, along with a long list of others, will revolutionize the way the economy and society functions over the next 20 years. Just as the average consumer cannot imagine being disconnected from the world, due to the smartphone, there exists the potential for the consumer of the future to not imagine being unable to create the food they want to eat at home, as 1960s science fiction technologies become everyday reality. For the companies that invent and commercialize these technologies, huge markets will open, allowing them unprecedented growth. For the existing companies that dominate these industries today, huge risks stand ahead as their technologies and business models become outmoded. So too for the countries involved. Should a country not participate in these technologies, it stands at huge risk over the next 20 years.

For the United States, which dominated Technology for the past 50 years, the movement of global supply chains to Asia, over the past 20 years, provided other countries an opening to develop their own technology hubs and participate in the technology race. In fact, the Obama Administration encouraged the movement of advanced technology manufacturing to other countries to foster their development and to catch up with America economically. For example, Taiwan and other countries in Asia now stand as one of the global semiconductor and optical communications advanced manufacturing hubs, despite

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only producing trailing edge technology during the 1990s. Unfortunately, while aiding these countries growth in the short term, these policies did not consider the long term consequences to American growth or U.S. competitiveness. This policy, along with other policy choices, contributed to the subpar U.S. economic growth from 2009 through 2016, as the US economy did not recover from the 2008 – 2009 housing bust in a similar manner to the 1990s post-bust recovery under the Clinton Administration.

Not only have new technology manufacturing hubs emerged, but the consequences of these policies means the US must play catch-up in a number of areas. For example, China recently tested Hypersonic missiles and leads the U.S. in this technology. If perfected and deployed first, China would possess a significant military edge making US warplanes, submarines, missiles, and naval ships yesterday's technology. This would impact the United States strategic position across the globe. The U.S. Congress just authorized billions of dollars in R&D to enable deployment of a U.S. version by the early 2020s. China poured billions of dollars into Quantum Computing over the past few years, demonstrating the first quantum encrypted transmission from Asia to Europe this year. In addition, China's government funded a $10 billion Quantum Computing Center to focus on Quantum Computing research. The U.S. government through DARPA and other departments responded over the past year, joining with IBM, Microsoft, Google, and other companies to fund a U.S. response. In Artificial Intelligence, including technologies such as facial recognition, China's government continues to work with its largest companies to create a global edge. The U.S. finds itself outflanked as only Amazon joined with the American government, while companies such as Google refused to participate in the race to counter China's attempt to dominate AI. Even in Semiconductors, the U.S. is struggling to keep up with Asia. Intel continues to have issues in its leading edge manufacturing and appears to be ceding market leadership to Taiwan Semiconductor. Micron Technology stands behind Korean giant, Samsung Corporation, in memory chips, who continues to extend its market leadership. Even in other areas, such as space launch which the US dominates, new countries, such as the UK and India, plan to compete to drive their economies. For a country used to leading the globe with the next new thing, the U.S. stands in unfamiliar territory.

In order to meet this existing challenge to America's global position, the Trump Administration acted over the past year to set the U.S. on the path to compete in the industries of tomorrow. Unlike the Obama Administration, the Trump Administration understands the critical nature of technology in the economy and the need to dominate leading edge areas in order to support American manufacturing prowess. In fact, the Trump Administration just issued a report titled: Strategy For American Leadership In Advanced Technologies. (The full report may be found at: https://www.whitehouse.gov/wp-content/uploads/2018/10/Advanced-Manufacturing-Strategic-Plan-2018.pdf .) As the report states in its opening:

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> "*The United States has long thrived on its ability to manufacture goods and sell them in domestic and global markets. Manufacturing plays a vital role in almost every sector of the U.S. economy, stretching from aerospace to pharmaceuticals and beyond. Advanced manufacturing – which includes both new manufacturing methods and production of new products enabled by innovation – is an engine of America's economic power and a pillar of its national security. Advances in manufacturing enable the economy to continuously improve as new technologies and innovations increase productivity, enable new products, and create entirely new industries.*"

And goes on to state later:

> "*Although the United States is still the largest producer of products in some sectors, a worrisome development is the sharp decline in production and employment in some strategically important sectors, notably the communications and computer industries. America's manufacturing and defense industrial base and supply chain, composed of these and other key sectors, is essential to economic prosperity and must maintain the capacity to rapidly innovate … The manufacturing sector is strongly coupled to infrastructure development, job creation, and growth in the Gross Domestic Product (GDP). The U.S. standing in the global innovation index recently dropped from 9th to 11th as measured by the 2018 Bloomberg Innovation Index. This Index scores countries using several criteria, including R&D intensity, manufacturing value added, productivity, high technology density, researcher concentration, and patent activity.*"

The Report makes clear that the U.S. must act across a spectrum of areas, including R&D, Education, and the Manufacturing Supply Chain, to maintain its global leading edge and to compete in the world of tomorrow. Without this focus, the U.S. will become irrelevant as the global economy moves on.

Despite allowing its share of Global Venture Capital to fall from almost 90% in 2000 to just over 50% today, the U.S. did maintain its global prowess in R&D. It still leads China and Europe, notwithstanding a lost decade of economic growth, as the following chart indicates:

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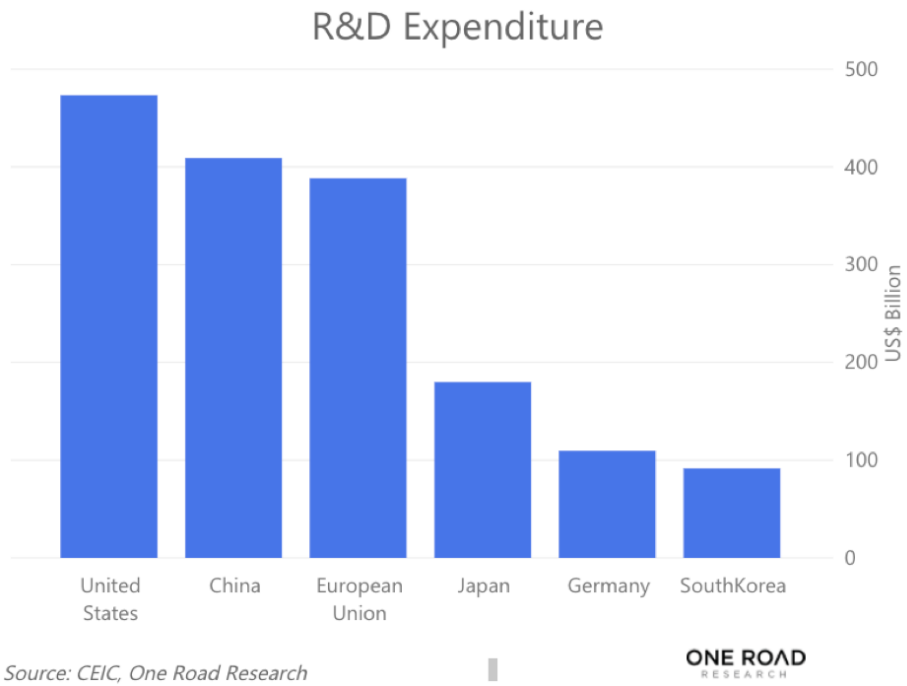

Chart Courtesy of One Road Research

This data finds corroboration in the U.S. R&D to GDP ratio, which stayed at high levels:

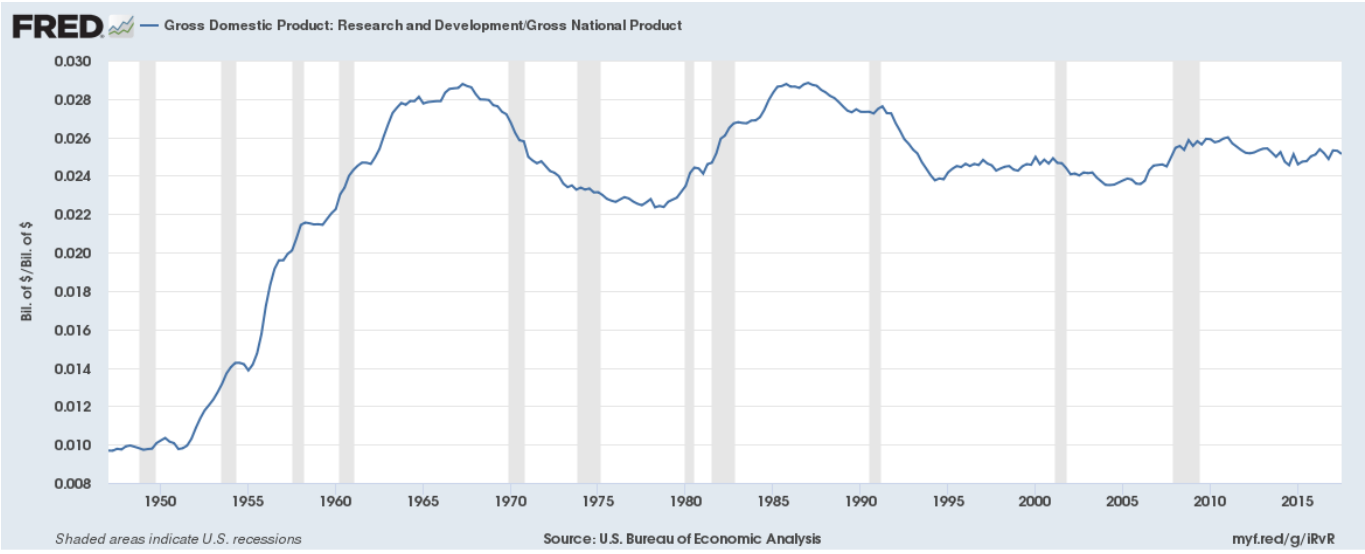

Chart Courtesy of Federal Reserve of St. Louis.

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For the US, given its continuing research prowess, strategically requiring technologies to find their way to U.S. manufacturing first would help restore its manufacturing competitiveness and leadership, providing the fundamental basis for increased investment and the ensuing growth it would create in the U.S. economy. And, by restoring the concept of National Security to the debate on the economy coupled with updating existing laws to provide the President more authority to limit the export of leading edge technology to other countries, the Federal Government provided the legal framework for ensuring this occurs. The result of just talking the talk already produced an acceleration in economic growth. Should the government continue down this path, the country likely would recapture the portion of global economic growth it ceded to the rest of the world over the past 20 years. This would significantly change the equation for the economic outcome 20 years hence.

With the U.S. now returning to its traditional focus on driving its economy, the global rivalry between countries and regions continues to heat up. In fact, The Race To Control Technology's Future, which the US appeared to willingly cede to other countries over the past two decades, returned with a vengeance over the past year. For countries which benefitted from the U.S. policies since 2000, the rules of the game changed overnight. And with this change and a return to the economic strategies and national interest policies that drove the U.S. economy from 1945 through 2000, countries now must build an indigenous technology capacity, else find themselves left behind. Intellectual property stands again as the centerpiece of national manufacturing prowess and economic growth. For the globe, change continues as a constant. And whether it is Hypersonics, Quantum Computing, or AI, the winners will continue to take a disproportionate share of Global Economic Growth, shaping the world of the future. (Data from US Census Bureau, Federal Reserve, US National Science & Technology Council, company reports, and public data coupled with Green Drake Advisors analysis.)

Commodities and the Long Cycle: Real Returns, Investing, and The Coming End to the Down Cycle

> "*Even in the corn-exchange of a country town on a market-day the equilibrium price is affected by calculations of the future relations of production and consumption; while in the leading corn-markets of America and Europe dealings for future delivery already predominate and are rapidly weaving into one web all the leading threads of trade in corn throughout the whole world. Some of these dealings in 'futures' are but incidents in speculative manoeuvres; but in the main they are governed by calculations of the world's consumption on the one hand, and of the existing stocks and coming harvests in the Northern and Southern hemispheres on the other. Dealers take account of the areas sown with each kind of grain, of the forwardness and weight of the crops, of the supply of things which can be used as substitutes for grain, and of the things for*

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which grain can be used as a substitute. Thus, when buying or selling barley, they take account of the supplies of such things as sugar, which can be used as substitutes for it in brewing, and again of all the various feeding stuffs, a scarcity of which might raise the value of barley for consumption on the farm. If it is thought that growers of any kind of grain in any part of the world have been losing money, and are likely to sow a less area for a future harvest; it is argued that prices are likely to rise as soon as that harvest comes into sight, and its shortness is manifest to all. Anticipations of that rise exercise an influence on present sales for future delivery, and that in turn influences cash prices; so that these prices are indirectly affected by estimates of the expenses of producing further supplies."

Book V: General Relations of Demand, Supply, and Value
Chapter III: Equilibrium of Normal Demand and Supply
Principles of Economics, 8th Edition
By Alfred Marshall, 1920

The history of commodity cycles stands as one that follows both economic cycles and inflation cycles. These commodity cycles can span just one economic expansion and recession or they can form a multi-year industry investment cycle. Typically, commodities move up and down with the economic cycle. However, every 15 – 20 years, the commodity industry must renew its capital base. This requires a sustained period of higher prices across economic cycles, as not only must producers increase output, but the companies that manufacture the equipment for the producers must expand capacity, which requires higher prices for the equipment manufacturers to justify increasing output. Thus, the higher prices from the equipment manufacturers increases costs for the producers, which then need even higher prices to justify expanding their production. This continues for 8 – 10 years until production across the entire supply chain increases enough to support future growth. Then the cycle ends, often viciously, with a massive crash in prices. The most recent cycle like this occurred from 1998 – 2008, when Emerging Market growth accelerated, driving demand for commodities. Ultimately, demand growth slowed but supply growth did not, as it often takes several years to bring major commodity projects online. Throw in a recession causing growth to shrink at the same time as new mines come online and, presto, commodities collapse. Oil will serve as the classic example during this cycle. Oil rose from a low of ~$12 per barrel in 1998 to a peak of $147 in July, 2008. It then crashed to less than $50 by the end of the year.

The other type of commodity cycle relates to the creation of money by governments. This can occur through two different approaches, but they both end with the same result. The first approach occurs when a government runs significant budget deficits on a regular basis to meet spending goals and prints money to fill the gap. This approach is followed by a number of African and South American countries.

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This inevitably leads to continuous high inflation, as the number of pieces of paper called money expand faster than the goods people can buy. Citizens resort to commodities, such as gold, or hard assets, such as real estate, to preserve their wealth. Velocity of money accelerates, as no one wants to hold the pieces of paper any longer than necessary. This further increases inflation. While the prices of these commodities may not rise in terms of other currencies outside the country in question, for the citizens of that country, inflation hovers like a black cloud following them everywhere they go. The other approach to printing money occurs when countries run up too much debt. If the debt stands truly outsized relative to their economy, countries default, slashing their debt, but hurtling their economies into bruising recessions. As politicians like holding office, they try to avoid this outcome if possible. And there exists a way to make this possible. Inflate your way out of the problem. Countries will print money to massively depreciate the value of their currency. This causes inflation to rise well above the interest rate they are paying on outstanding debt, thus decreasing in real terms, often significantly, the cost of interest and massively slashing the future value of the debt when it matures. This occurred during the 1970s in the U.S. when inflation exploded. A US Dollar in 1980 bought only as much in real goods as $0.33 did in 1970. In other words, a US Dollar's value fell by over 65%. However, if one held gold during the 1970s, gold prices went from $39 in 1970 to $595 at the end of 1980, actually hitting $850 at one point during 1980. In other words, gold rose over 15x, well in excess to the 3x for prices in the economy.

For investors, understanding whether Commodities sit in one of the regular, short cycles or in an extended cycle becomes critical. If a normal cycle, then a few years of upside will get wiped out by a few years of downside. Timing becomes critical. But if a long cycle, then the upside can extend for many years, which means ignoring short term fluctuations. The below chart provides some historical perspective on commodity cycles over the long term:

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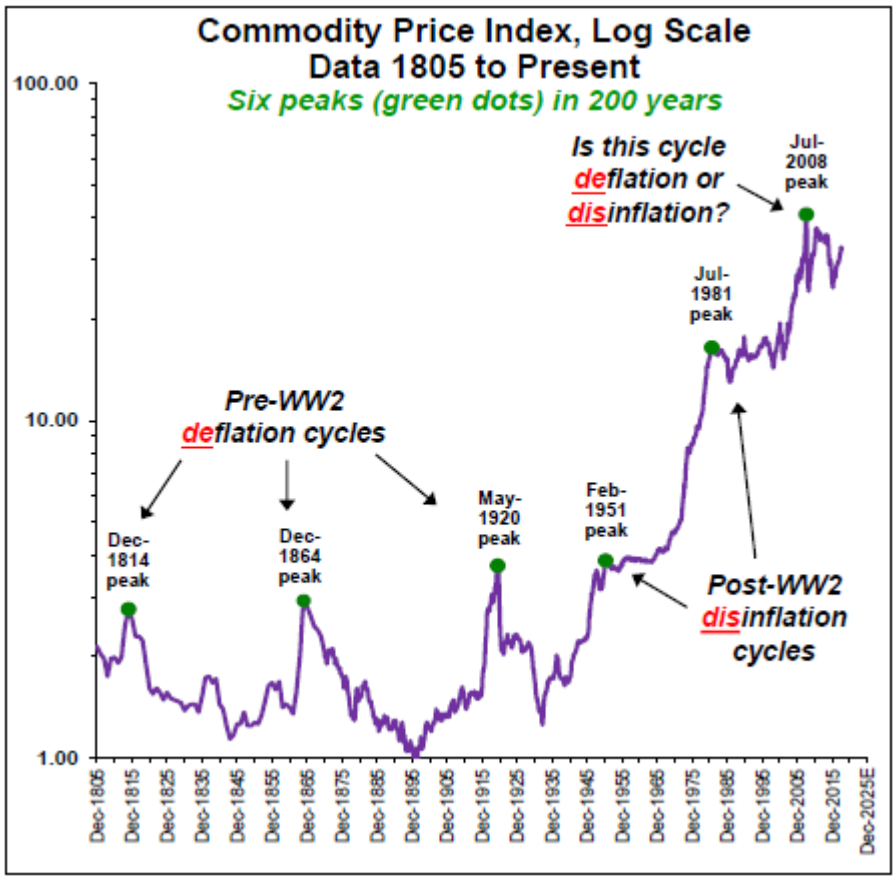

Chart Courtesy of Barry Bannister, Stifel Nicolaus & Company

As the chart shows, US commodity cycles spend years going nowhere or down, then explode to the upside. They also, since the creation of the Federal Reserve in 1912, seem to move in approximate 25 – 30 year cycles. Most also can be associated with wars and/or post-war inflations, that inflate away the real value of debt. The peak in 1920 occurred after World War I. The peak in 1951 occurred after World War II. The peak in 1981 occurred after the Vietnam War and at the tail end of the Cold War. And the 2008 peak can be, at some level, associated with the wars in Afghanistan and the Middle East, where the US spent over $1 trillion combined. Based on the above cycles, the next secular move in Commodities should begin sometime between 2025 and 2030. However, typical downcycles only last 10 – 12 years, before basing. Major commodity bottoms occurred in 1932 – 1933, 1962 – 1963, and 1993 – 1994. Typical bases take 3 – 5 years after a bottom before the next major upcycle ensues. Given this, 12 years after 2008 would indicate some sort of bottom in 2020 – 2022, that would represent the End to the Down Cycle, which would extend through 2025 – 2027. Such timing, for a new upcycle to

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begin, would coincide with the massive unfunded liabilities of the U.S. government, in the form of Social Security, Medicare, and Medicaid, coming due. (While not "debt" in the traditional sense of the word, they represent payments the government must make and in that sense are "debt-equivalents".) These liabilities, at multiples of GDP, represent amounts that can never be paid in real terms. And, as noted above, when governments cannot pay their debts, they either default outright or default via massive inflation that reduces the real value of the liabilities. For the US, default via inflation would follow historical precedent as noted above and for earlier periods of debt such as the Civil War and The War of 1812.

With a recession likely in the 2021 to 2022 time frame, Commodities could put in a low during the recession that represents the bottom for the Long Cycle. After a several year period in which Commodities base, Investors could then look forward to a new secular Up Cycle that would drive Real Returns. In the meantime, typical cyclical moves lasting several years to the upside followed by several years to the downside likely will ensue. With Commodity Cycles long and the accumulation of real assets taking time, Investors should possess a large opportunity to accumulate assets ahead of the next Up Cycle. They could then look forward to many years of Real Returns as the Long Cycle turns in their favor. (Data from public sources and Stifel Nicolaus & Company coupled with Green Drake Advisors analysis.)

Manyana, Support Your Battlebot, Pending Pending Pending, and The Nano World

Finally, we close with brief comments on Manyana, Support Your Battlebot, Pending Pending Pending, and The Nano World. First, despite revisions to the law, Mexican oil production continues to fall. Production in 2018 is expected to drop another 150,000 barrels per day, after falling every year for the last five years. Despite promises to turn things around, we see Manyana dominating for the foreseeable future. Second, 3D Additive Manufacturing continues to advance. Desktop Metal developed a potentially revolutionary 3D Metal Printing Machine that can lower costs dramatically. For example, the company's machine can lower the cost of creating a Backstop for a Battlebot from over $600 using conventional machining to less than $60, a ten-fold reduction. With this type of breakthrough, we say Support Your Battlebot. Third, Pending Home Sales fell year-over-year in August for the 8th month in a row. As we warned in early 2017, a slowdown in Housing stood ahead. With interest rates continuing to act as a drag on the sector, we see Housing saying: Pending Pending Pending. And Fourth, research at UNSW's School of Chemical Engineering in Australia discovered an inexpensive way to make filters that can filter heavy metals out of water. This is critical for large areas in Asia and Africa with contaminated water that is estimated to impact almost 800 million people. Inexpensive filters could give them access to safe drinking water for the first time. The scientists found that when aluminum is added to liquid gallium at room temperature it produces nano-sheets of aluminum oxide. These aluminum

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oxide filters cost as little as $0.10 to produce compared to over $100 for standard filtration products. Given the continuing nano-revolution in material science, we see The Nano World ahead.

In Closing

Should you have any questions on how the above issues or the items discussed in our accompanying cover letter impact your family's financial position or your business's future as well as the potential actions you could take in response, please do not hesitate to contact us. We welcome the opportunity to discuss this with you.

Yours Truly,

Paul L. Sloate
Chief Executive Officer
& Senior Advisor

Steve Rodia
President
& Senior Advisor