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ECONOMIC UPDATE

Number 8 · April 2020

Dear Newsletter Readers,

All of us are finding ourselves in an extraordinary situation with the COVID-19 pandemic and all that has changed in the past few weeks. First, our thoughts are with all of you during this difficult time. Our relationships are at the foundation of so much of what we do here at Ulbrich, and we hope everyone is finding a way to navigate these uncharted waters.

Ulbrich started our Economic Update Newsletter in September of 2019 to reach the many people all our companies interact with, including our employees, customers, suppliers, vendors and the community. We achieved this goal by building our email list to almost 5000 readers. With the rapidly changing landscape due to the spread of COVID-19 (Coronavirus), Ulbrich has decided to temporarily suspend our production and distribution of the monthly Ulbrich Economic Update.

We are grateful for our readers over the past few months and hope to start the newsletter back up as soon as possible. Ulbrich would have loved to continue the Economic Update, but other things must take priority in this difficult time. Please stay in tune to social media and the Ulbrich website over the coming weeks for other news and blog articles, as well as updates around the COVID-19 pandemic. Ulbrich will be doing our best to keep everyone informed during this dynamic situation.

Many of you have reached out to us over the past few weeks asking how we are doing and if things will continue to operate as planned. This is of course, an unsettling time, but Ulbrich is still fully operational and not expecting any supply chain shortages on the manufacturing side of things at this point. We are taking the necessary precautions, but will continue to remain open, as we are an essential business. For any questions on that, please contact your primary sales representatives. We do not know when this will end, but we will get through it, together.

Thank you for your time and continued readership.

I wish the best to you all,

Chris Ulbrich, CEO and Chairman

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ECONOMIC UPDATE

Number 8 • APRIL 2020

EXECUTIVE SUMMARY

STEEL: ARCELORMITTAL WILL IDLE BLAST FURNACES AT INDIANA HARBOR AND DOFASCO IN ONTARIO. U.S. steelmakers initially saw no impact on production from the pandemic, then the automakers announced an eleven-day shutdown. **Automotive** is 25% of U.S. steel demand and 40%-or more of sheet demand, so the 2nd Qtr and 3rd Qtr likely will see steel volume losses as well as pricing degradation. **The pandemic** is exacerbating the global glut in steel production and threatens to unleash a new surge in imports into the U.S, according to the AISI, which has urged Congress to continue to support the Section 232 tariffs on steel. Millions of tons of steel and aluminum produced during what is now the worst manufacturing slump on record in China have created a surplus of metal that will take months to shrink, even if the COVID-19 epidemic is contained and demand recovers later this year in China and beyond.

COMMODITIES: HARVESTING NICKEL FROM PLANTS, BOTANISTS TEST THE POTENTIAL OF PHYTOMINING. Some of Earth's plants have roots that act almost like magnets and flourish in metal-rich soils which hundreds of thousands of other plant species flee or die. Slicing open one of these trees or running the leaves of its bush cousin through a peanut press produces a sap that oozes a neon blue-green. This "juice" is actually one-quarter nickel, far more concentrated than the ore feeding the world's nickel smelters. This vegetation could be the world's most efficient, solar-powered mineral smelters. As a partial substitute to traditional, energy-intensive and environmentally costly mining and smelting, the world might harvest nickel plants. On a plot of land on the island of Borneo, an Australian research group proved the concept on small scale**. Fears that mass disruption in China** caused by the novel coronavirus outbreak would weigh on iron ore prices have not materialized, with the raw material for steelmaking up almost 7% over the past month. However, base metal prices generally continued to slump in March.

AEROSPACE: SPACEX WILL SEND ASTRONAUTS TO THE SPACE STATION FOR THE FIRST TIME IN MAY. It will be the first crewed launch from the U.S. to the platform since 2011. Elon Musk's company will launch a Falcon 9 rocket to transport NASA astronauts Bob Behnken and Doug Hurley in a first for the space agency as it looks to cut costs. Since the last U.S. space shuttle mission in 2011 (after 30 years of service), only the Russians have been going back and forth to the International Space Station.

AUTOMOTIVE: MORGAN STANLEY CUT ESTIMATES FOR U.S. AUTO SALES, PREDICTING A "DEMAND SHOCK". The Detroit car companies agreed to temporarily shut down U.S. factories to protect workers against the rapidly spreading coronavirus - an unprecedented work stoppage that will affect more than 150,000 factory employees. **Several automakers** said U.S. buyers of new vehicles will have the option to defer their payments, and customers with existing car loans could ask for payment rescheduling if impacted by shutdowns due to coronavirus. **Automakers in the United States** are raiding their parts bins to help save lives during the coronavirus outbreak. It's an effort that already was well underway but gained urgency when the President used the Defense Production Act to order General Motors to move faster as the nation confronts a shortage of critical medical equipment. Automakers have sprung into action while the coronavirus outbreak has halted their ability to build vehicles, leveraging their manufacturing scale, supply chain channels and production efficiency to help make respirators and ventilators instead. **General Motors**, trying to refashion itself as a futuristic company with technology to compete against Tesla, rolled out plans in March for 13 new electric vehicles during the next five years.

MANUFACTURING: AN EXPERT SPEAKS ON HOW CORONAVIRUS WILL IMPACT THE GLOBAL SUPPLY CHAIN. Coronavirus has posed tremendous global disruption in the end-to-end global supply chain. Nick Vyas, executive director of the Center for Global Supply Chain Management at the USC Marshall School of Business, answers questions about what to expect and estimates it will take the United States two to three months to go back to normal once the virus has passed through our country. When asked if there was a silver lining buried in the cloud of pandemic and what companies can learn from this situation, Vyas said that cost should not be the only consideration when establishing a company's supply chain; there have to be some mitigation strategies as well. He thinks this situation is a great lesson, and the country will have a better global supply chain network that is resilient, agile and reliable in the future.

INNOVATION: THE WORLD'S MOST INNOVATIVE ECONOMIES IN 2020 RANKS THE U.S. AT NINTH. Every year Bloomberg releases its "Innovation Index", ranking the 60 most innovative economies worldwide. Germany, South Korea and Singapore took the top three positions this year. **University of Central Florida researchers** are helping to close the gap separating human and machine minds. The UCF team showed that by combining two nanomaterials into a new superstructure, they could create a nanoscale device that mimics the neural pathways of brain cells used for human vision, a step toward developing neuromorphic computers. The trick to the innovation was growing nanoscale, light-sensitive perovskite (a calcium titanium oxide mineral) quantum dots on the two-dimensional, atomic thick nanomaterial graphene.

ECONOMIC UPDATE: APPENDIX TO APRIL 2020 REPORT

STEEL/ALUMINUM: CORONAVIRUS EPIDEMIC EXACERBATES GLOBAL METALS GLUT

China is the world's top producer and consumer of steel and aluminum, but with factories closed and the movement of people and freight restricted to slow the spread of the new coronavirus, China's demand for those metals has plummeted. Still, many of the country's steel mills and aluminum smelters continue to operate because stopping and starting equipment handling molten metal is expensive and risky. **Millions of tons of steel and aluminum produced during what is now the worst manufacturing slump on record in China have created a surplus of metal that will take months to shrink, even if the epidemic is contained and demand recovers later this year in China and beyond.** As a result, the global stockpile of steel and aluminum threatens to push down prices and put new pressure on producers in the U.S., Western Europe and elsewhere. Many of those companies were already struggling to earn a profit on steel and aluminum because of lower prices and weakening demand from manufacturers. Orders for flat-rolled steel from some mills in China are down 50% from a year ago. Some Chinese steel mills and aluminum smelters have cut back production in March, but analysts expect the reductions to be short-lived. As more workers in China return to their jobs in the coming weeks as quarantines are lifted, plant managers will be under pressure to ratchet up production and sell the output offshore to get cash to buy raw material inputs. China is a major supplier of minerals added to steel to give it certain characteristics, such as strength or flexibility. Prices of these resources rose sharply in January, when the coronavirus hampered refining and distribution of them, raising concerns about world-wide shortages if the epidemic continues much longer.

U.S. imports of steel from China sank 22% in 2019 from the year before to about 544,000 tons and total steel imports fell by 17%. Tariffs have made many types of metal made in China uncompetitive in the U.S. But China's large steel-and-aluminum output drives up supply and weighs on prices around the world. Excess metal in China could create more competition for U.S. steel exports or enter the U.S. indirectly as imports from Canada and Mexico. The benchmark LME price for aluminum is down 10% from a year ago. Spot-market prices for hot-rolled sheet steel vary by market from about $587 a ton in the U.S. to $451 per tonne in Asia. The U.S. spot-market price has mostly fallen since topping $900 a ton in July 2018, three months after the Trump administration added tariffs on foreign steel. **Aluminum inventories in China increased by 62% to 1.4 million metric tons since the start of February. Inventories of finished steel at mills in China were 45% higher in late February than the same time a year ago.** Analysts expect those inventories to rise as aluminum marooned at smelters as the epidemic crested is routed into distribution warehouses. With demand inside China still in the doldrums, steelmakers have an incentive to export. Large shipments of construction-reinforcing bar from China recently turned up in Singapore and Hong Kong and Chinese sheet steel is being offered at discounted prices in Vietnam. The world's ability to absorb such shipments from China is strained by weakening industrial activity and the spread of coronavirus in other countries. The epidemic has taken hold in some of China's biggest trading partners, including South Korea and Japan. Scrap-steel prices have rallied in the U.S. amid rising demand from overseas markets in what steel-industry analysts are likening to a calm before the storm. With steel and scrap still stuck at Chinese ports and in warehouses, countries have stepped into the void ahead of the expected tsunami of metal from China.

STEEL: CHINESE TRADERS, MILLS HOLD HIGH INVENTORIES OF FINISHED STEEL, ALUMINUM INGOT

Fig 23 Traders steel inventory continued sharp increase

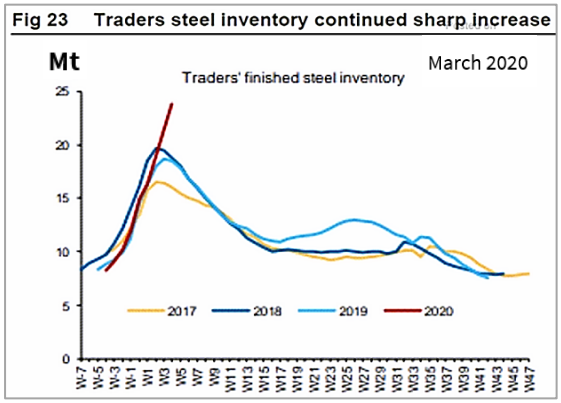
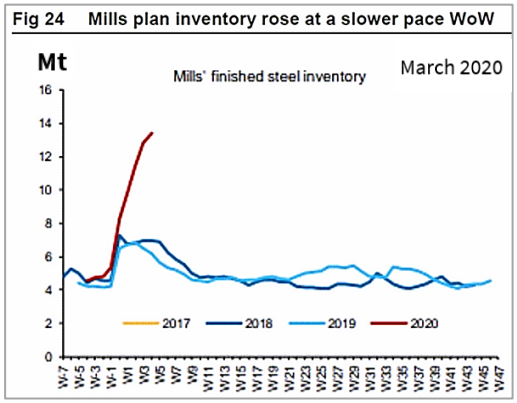
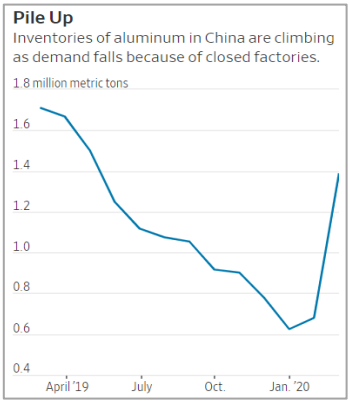


Fig 24 Mills plan inventory rose at a slower pace WoW



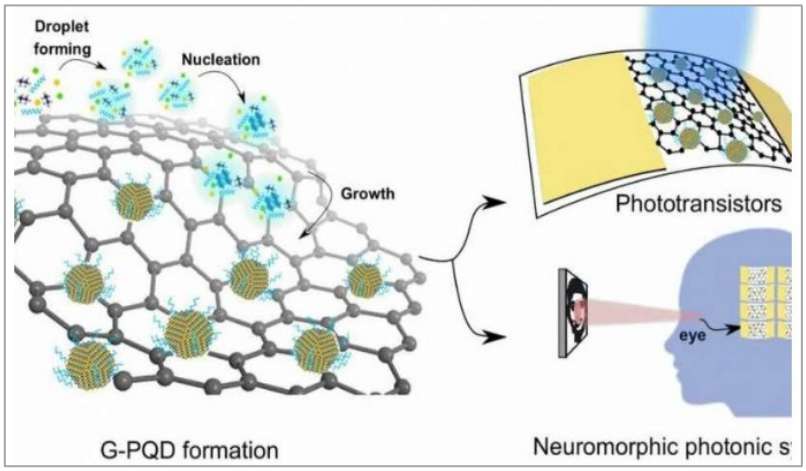


AUTOMOTIVE: GENERAL MOTORS SHOWS 13 ELECTRIC VEHICLES AS IT TRIES TO RUN WITH TESLA

General Motors, trying to refashion itself as a futuristic company with technology to compete against Tesla, rolled out plans in March for 13 new electric vehicles during the next five years. The company touted an exclusive new battery technology that could propel some of the vehicles as far as 400 miles on a single charge as it tries to capture electric vehicle enthusiasm that has brought wild growth to rival Tesla's share price. GM executives said the new vehicles would be built using modular chassis and drive systems for manufacturing simplicity. GM will be able to build trucks, cars, SUVs and even an autonomous shuttle based on the new systems. The global vehicles will include affordable transportation, work trucks, luxury SUVs and performance vehicles. CEO Mary Barra said GM will be able to build at a large scale, similar to its profitable full-size truck business. "We want to put everyone in an EV, and we have what it takes to do it," she said. Some of the new vehicles will be able to go from zero to 60 mph in as little as three seconds—performance that rivals electric vehicle sales leader Tesla. With fewer parts than petroleum-powered vehicles, electric vehicles will be much cheaper and simpler to build, reducing manufacturing costs, GM said. The company plans 19 different battery and electric motor and transmission combinations, compared with 550 internal combustion powertrain combinations available today. **The company said a joint venture with Korean battery maker LG Chem will use a low-cobalt chemistry to drive down battery costs to below $100 per kilowatt hour.** Executives said the next generation of GM's electric vehicles will be profitable. Barra said the new vehicles can increase sales and market share, and the batteries and drive units could be licensed to other companies to bring in more revenue. She said the company plans to sell more than 1 million electric vehicles in North America and China by the middle of the decade. To get there, GM will spend more than $20 billion developing the vehicles through 2025. Electric vehicle sales will have to grow substantially both worldwide and in the U.S. for GM to meet its targets. Last year manufacturers sold just over 236,000 fully electric vehicles in the U.S., about 1.4% of total new vehicle sales. The GM announcement comes at a time when the global economy is slowing, in part due to the coronavirus outbreak. Consulting firm LMC Automotive has reduced its 2020 U.S. new vehicle sales forecast from 16.8 million to 16.5 million. LMC expects all automakers to sell 17 million fully electric vehicles by 2030, or about 16% of worldwide demand. It will be 25% to 30% of the market in Europe, 20% in China and 8% in the U.S., less than what GM is predicting.

INNOVATION: RESEARCHERS DEVELOP DEVICE THAT MIMICS BRAIN CELLS USED FOR HUMAN VISION

University of Central Florida researchers are helping to close the gap separating human and machine minds. The UCF research team showed that **by combining two promising nanomaterials into a new superstructure, they could create a nanoscale device that mimics the neural pathways of brain cells used for human vision.** "This is a baby step toward developing neuromorphic computers, which are computer processors that can simultaneously process and memorize information," said Jayan Thomas, an associate professor in UCF's NanoScience Technology Center. "This can reduce the processing time as well as the energy required for processing. At some time in the future, this invention may help to make robots that can think like humans." The trick to the innovation was growing nanoscale, light-sensitive perovskite (a calcium titanium oxide mineral) quantum dots on the two-dimensional, atomic thick nanomaterial graphene. This combination allows the photoactive particles to capture light, convert it to electric charges and then have the charges directly transferred to the graphene, all in one step. The entire process takes place on an extremely thin film, about one-ten thousandths of the thickness of a human hair. Because of the nature of the superstructure, it shows a light-assisted memory effect similar to humans' vision-related brain cells. The optoelectronic synapses developed are highly relevant for brain-inspired, neuromorphic computing. This kind of superstructure will definitely lead to new directions in development of ultrathin optoelectronic devices. Neuromorphic computers can simultaneously process and store information to allow vision. Currently, computers store and process information in separate places, limiting their performance.



MANUFACTURING: FIVE QUESTIONS ON HOW CORONAVIRUS WILL IMPACT THE GLOBAL SUPPLY CHAIN

With fears about the novel coronavirus (COVID-19) impacting the economy and global supply chains, *Phyics/Org* spoke to Nick Vyas, executive director of the Center for Global Supply Chain Management at the USC Marshall School of Business. Vyas is an assistant professor of clinical data sciences and operations and director for USC Marshall's master's program in global supply chain management.

What is the impact of the novel coronavirus on the global supply chain? Nick Vyas: Coronavirus has posed tremendous global disruption in the end-to-end global supply chain. When we think about supply chain disruption, consider the products you use every day. Each product entails many elements before it reaches you: the raw material, the manufacturing, packaging, transportation and distribution. Each one takes a journey using ocean, rail, air and road before being made available to your store or doorstep. Imagine each of these steps having its own complex supply chain network connected globally. Once you take one of the nodes out of commission, you will impact the entire value chain. In the case of COVID-19, it has affected all of the nodes connected through the China-centric network. Take toilet paper, for example. Demand has skyrocketed, but shelves are empty due to production capacity and lead times constraints. The raw material used to make the tissue paper you buy at the store is linked by a sophisticated network. The factory where it's made might not have enough labor or truck drivers to get the raw material to the factory or product into warehouses, and from there onto shelves. This is what we mean when we say that the end-to-end global supply chain has been affected.

When will we see the impact on the broader global economy? Nick Vyas: We already see it. At the Center for Global Supply Chain Management, we looked at this about eight weeks ago when the disruption was still localized in China. We saw a supply chain disruption beyond the planned Lunar New Year shutdown. This unplanned shutdown caused a rapid chain reaction throughout the world. This is now a global pandemic and a growing crisis for the financial markets. There are various scenarios—some average to worst. It appears that there will be a significant impact in the short term to the global economy.

What are the long-term changes we're likely to see? Nick Vyas: What is likely to happen with COVID-19 is that we'll start to see a decoupling from some long-term supply chain dependencies from the China-centric supply chain network. Initially, the trade war set the stage to begin the process, and COVID-19 might be the last straw that will force the supply chain redesign. As part of the redesign, I think we'll be seeing a lot more appetite to bring the supply chain close to customer demand with on-shore or near-shore. Mexico will likely play a more significant role than it has in the past if its government can stabilize and deal with its drug violence and political corruption issues. We will also see a lot more focus on supply chain resiliency and risk mitigation and global supply chain management in international settings; all the things we teach in our program. We will also be seeing a push for more diversification. If there were more diversification of supply chain nodes across the globe, we would not see the impact of disruption we see now.

How long before things go back to normal? Nick Vyas: It will take us two to three months once the virus has passed through our system. China appears to have stabilized the spread, but data transparency is a big issue. We can see the impact through the third quarter before the supply chain stabilizes and normalizes. Longer-term goals—such as decoupling from China with a more diversified supply chain network—will take a few years at least.

What is the silver lining here? What can companies learn from this situation? Nick Vyas: The takeaway here is that cost should not be the only consideration when establishing your company's supply chain. There have to be some mitigation strategies as well, where essential commodities have several pathways to markets. You have to build these into your company's global strategy. You have to think through certain what-if scenarios, so you're not caught off guard. Companies need to be proactive instead of reactive. We, as humans, have become globally connected. With the help of a very sophisticated supply chain network, household customers can receive their services and products right away. In this process, we removed access to excess inventory and slack capacity. This phenomenon took away elasticity to market demand such that there is no room for any disruption, whether caused by natural disaster or pandemic event. We've become dependent on each other's capacities, or lack thereof. COVID-19 is a perfect example. When this started, everyone thought this was a "China-only" issue. We didn't collaborate in a way that could have helped proactively, or engage in a way that could have prevented the spread, or collaborate on potential mitigation plans. At the Center for Global Supply Chain Management, we're optimistic that this will pass, and we will come back to normalcy with much better resiliency. For now, we think this situation is a great lesson, and we will have a better global supply chain network that is resilient, agile and reliable in the future.

AEROSPACE: SPACEX PLANS FIRST MANNED FLIGHT TO SPACE STATION IN MAY

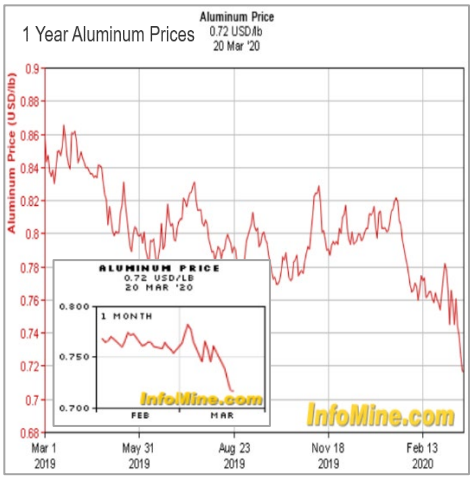
Elon Musk's SpaceX will send astronauts to the International Space Station for the first time in May, NASA said, announcing the first crewed launch from the U.S. to the platform since 2011. The tech entrepreneur's company will launch a Falcon 9 rocket to transport NASA astronauts Bob Behnken and Doug Hurley in a first for the space agency as it looks to cut costs. "NASA and SpaceX are currently targeting no earlier than mid-to-late May for launch," the US space agency said. **Since the last U.S. space shuttle mission in 2011 (after 30 years of service), only the Russians have been going back and forth to the ISS.** SpaceX has made the trip 15 times since 2012 but only to refuel the station. In March, Musk's Crew Dragon capsule made a round trip to the ISS, which is in orbit more than 250 miles (400 kilometers) above Earth, with a mannequin on board, before returning to the Atlantic after six days in space. It is not the only private company servicing NASA: Boeing has also won a contract and is developing its own Starliner capsule.

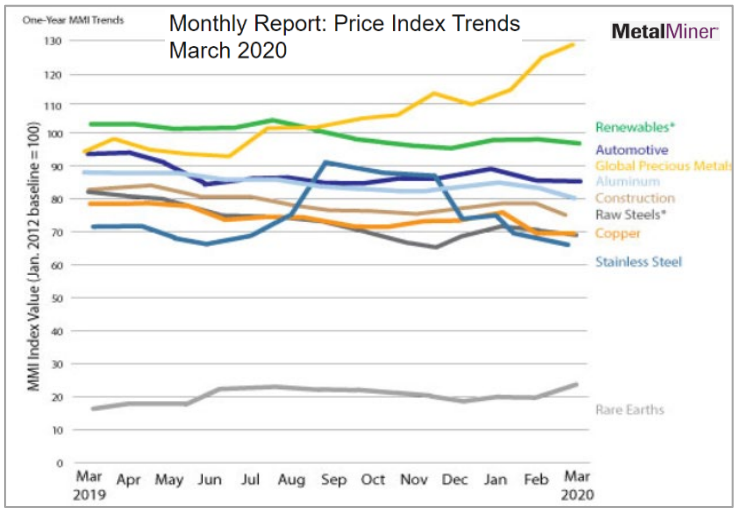
COMMODITIES: HARVESTING NICKEL FROM PLANTS - BOTANISTS TEST THE POTENTIAL OF PHYTOMINING

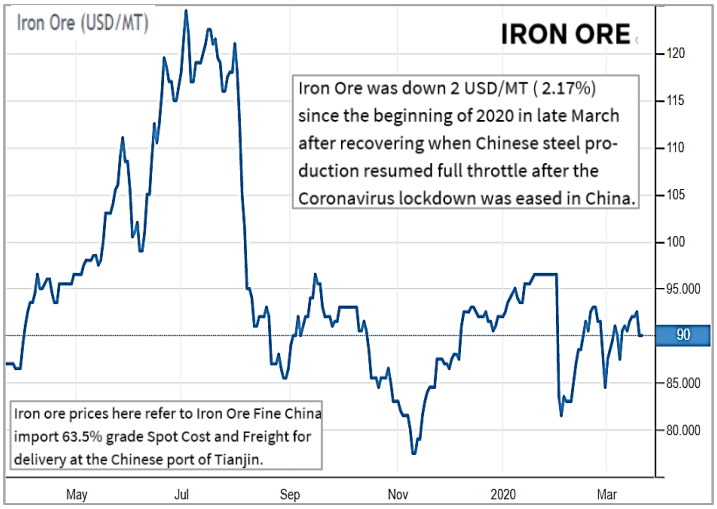
Some of Earth's plants have roots that act practically like magnets which flourish in metal-rich soils that make hundreds of thousands of other plant species flee or die. Slicing open one of these trees or running the leaves of its bush cousin through a peanut press produces a sap that oozes a neon blue-green. **This "juice" is actually one-quarter nickel, far more concentrated than the ore feeding the world's nickel smelters.** The plants not only collect the soil's minerals into their bodies but seem to hoard them to ridiculous levels. This vegetation could be the world's most efficient, solar-powered mineral smelters. As a partial substitute to traditional, energy-intensive and environmentally costly mining and smelting, the world might harvest nickel plants. On a plot of land on the island of Borneo, an Australian research group proved the concept on small scale. Every six to 12 months, a farmer shaves off one foot of growth from these nickel-hyper-accumulating plants and either burns or squeezes the metal out. After a short purification, farmers could hold in their hands roughly 500 pounds of nickel citrate, potentially worth thousands of dollars on international markets .Now, as the team scales up to the world's largest trial at nearly 50 acres, their target audience is industry. In a decade, the researchers hope that a sizable portion of insatiable consumer demand for base metals and rare minerals could be filled by the same kind of farming that produces the world's coconuts and coffee. Phytomining, or extracting minerals from hyper-accumulating plants, cannot fully replace traditional mining techniques, but the technology has the additional value of enabling areas with toxic soils to be made productive. Smallholding farmers could grow on metal-rich soils, and mining companies might use these plants to clean up their former mines and waste and even collect some revenue.

Nickel is a crucial element in stainless steel. Its chemical compounds are increasingly used in batteries for electric vehicles and renewable energies. It is toxic to plants, just as it is to humans in high doses. Where nickel is mined and refined, it destroys land and leaves waste. In areas where soils are naturally rich in nickel, typically in the tropics and Mediterranean basin, plants have either adapted or died off. New Caledonia in the South Pacific has been a major source of nickel, and botanists know of at least 65 nickel-loving plants there. Such plants are the most common metal-craving vegetation; others suck up cobalt, zinc and similarly crucial metals. With new electronics spurring surging demand for rare minerals, companies are exploring as far as outer space and the bottom of the ocean. "Smelting plants" sounds about as incongruous as carving oxygen. Vegetation on a small plot of land in Sabah, Malaysia, can yield hundreds of pounds of nickel citrate every 6-12 months. **Proponents of phytomining see the greatest potential in Indonesia and the Philippines, two of the world's biggest nickel ore producers, where hundreds of mines shovel topsoil into smelters.** Currently, the most common way to extract nickel for electronics requires intense energy — often derived from coal and diesel — and creates heaps of acidic waste. A typical smelter costs hundreds of millions of dollars and requires increasingly scarce ore that is at least 1.2% rich with nickel, while plants on a small nickel farm could be harvested every six months on land where the nickel concentration is only 0.1%. After two decades, the roots would struggle to find enough nickel, but the land would have been sucked dry of its toxic metals, and fertile enough to support more common crops.

METALS: COMMODITY PRICES — NICKEL, ALUMINUM, COPPER, IRON ORE; MONTHLY PRICE TRENDS







COMMODITIES: IRON ORE FUTURES RISE AS CHINA KEEPS CHURNING OUT STEEL

Fears that mass disruption in China caused by the coronavirus outbreak would deflate iron ore prices have not materialized, with the raw material for steelmaking up almost 7% over the past month. The industry's top four miners can extract iron ore for less than $15/tonne. With a spot price around $90, up about one quarter from November lows, they will be churning out billions of dollars of cash. The relative strength of iron ore, coal and other bulk commodities owes much to China's draconian measures to contain the virus. Another prop for prices has been the lack of scrap steel collection in China because of the industry's reliance on migrant workers. This has forced mills to use more primary materials, such as iron ore, in their furnaces at a time when shipments from Australia and Brazil have been weak because of heavy rain.

Our first concern is the safety and well-being of our employees and their families and friends. This includes our readers and our communities. We look forward to reaching out to each of you and republishing the Economic Update at a later date. In the mean time, stay safe and healthy. God bless our country and our world as we continue to fight against the coronavirus, together.

Chris Ulbrich | *Chris Ulbrich, CEO and Chairman*

CONTACT US WITH ANY SPECIFIC NEEDS

Ulbrich Stainless Steels & Special Metals, Inc., has highly trained and experienced engineers, product managers, metallurgists, and sales executives available to assist you in all aspects of material selection and production of your stainless steel or special metals requirements.

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Ulbrich's Economic Update is prepared monthly by Charles Finnegan for the exclusive use of Ulbrich Stainless Steels & Special Metals, Inc. This issue and previous Economic Updates are archived on Ulbrich's website: **www.ulbrich.com/blog**

Charles was a Senior Vice President of procurement in the metal container industry, with a career spanning nearly four decades. He specializes in steel and aluminum procurement and utilizes his expansive knowledge of the steel and aluminum industry in the production of this detailed monthly update for Ulbrich and the company's valued employees and partners.