



THE BROAD DIMENSION

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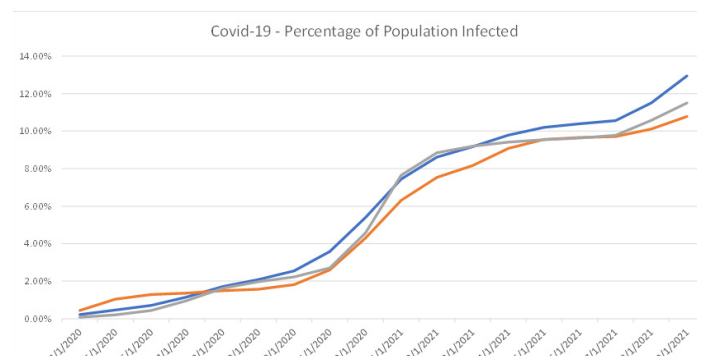
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Interesting Times

There is no truth in the idea that the expression “May you live in interesting times” is a Chinese curse, but it does sound like a piece of wisdom that Confucius should have said. These current times have certainly been “interesting”, and the idea of them being a “curse” is definitely not far-fetched. It was looking as though we were getting on top of the Covid-19 pandemic, but the Delta variant gave us a painful reminder of how adaptable viruses are and how adaptable we need to be.



The above chart shows the numbers of people infected by all variants of SARS-CoV-2 at monthly intervals, showing the figures for the US as a whole, along with numbers specifically for the California and New England regions. We now have to see what new variants might emerge and what effects the return to a somewhat more normal lifestyle and the oncoming of winter will have on infection numbers.



However, the virus hasn't been allowed to have its own way. The biotech and healthcare sectors rose to the challenge faster than almost anyone expected, assisted by research coming out of the nation's universities. Also, the changes in lifestyle forced on us by the pandemic had a temporary benefit related to the even more serious issue facing us, namely climate change. As things move back towards what we used to call "normal" and travel builds up again, carbon emissions are back on the rise. The university researchers are already working on methods for helping us negotiate these matters and healthcare issues are likely to remain high on the priority list as extreme weather events and habitat loss drives humans and wildlife closer together allowing more crossover infections to occur.

We have been seeing inflation at elevated levels, with recent monthly increases in construction material prices looking more like what we had been seeing annually in previous years. These increases have been driven by supply chain issues that, once again, can be traced back to effects of the pandemic. Shortages existed in the construction labor force before the pandemic hit and that situation has only worsened. All of these effects have been pushing construction prices up, increasing uncertainty, and slowing new investment. The level of uncertainty has been raised by the fact that the material cost changes mentioned earlier have included some dramatic spikes, making budgeting for projects more difficult.

Stagflation became the troubling situation in the 1970s as inflation remained high even though the economy was faltering, and central banks had to push interest rates to record highs to bring inflation back under control. The recent inflation rates and the economic recovery being slowed by the rise of the Delta variant has some economists forecasting a return of stagflation. Hopefully, that prediction will prove to be premature, and as vaccinations continue and infection levels drop again, we will see the supply chain issues melting away and the economy rebounding. Of course, with issues such as Evergrande and the increasing cost of energy, we have seen that Covid is not the only thing that can affect the markets.

There had been talk of people working from home (or telecommuting) for years, but nothing much happened until Covid suddenly forced almost all of us to do it. It seems that that is one change in work that will last in some hybrid form as offices reopen. But there are other changes to work that have received a boost from the pandemic conditions as well, and automation is one of those. That will make some jobs vanish while creating others, but it is showing that the idea of a lifetime job is becoming less likely for most people entering the workforce. Lifetime learning will no longer be just a good idea but become essential to keep our job skills up to date and relevant.



Recently (speaking from early October) we have been seeing a slowdown in the number of new Covid-19 cases and indications of a leveling off of inflation. While that doesn't constitute a trend, it is encouraging. There seems to be little doubt that we will be living through changing, challenging, and yes "interesting" times for many years, but it depends on your viewpoint as to whether you want to see that as a curse or as an opportunity.

Geoff Canham, Editor, TBD San Francisco

Biotech Boom

The Covid-19 pandemic has pushed biotech, and the life sciences in general, into prominence, and related laboratory space has been getting in short supply. Growth in the biotech and life sciences is expected to continue into the foreseeable future, driven by the knowledge that something like Covid can recur, along with an aging population that has more health needs and the ability to demand results. In an effort to meet these kinds of needs, collaboration between biotech companies has been growing.



The race to produce a vaccine for the SARS-CoV-2 virus has demonstrated how far the industry has advanced, enabling it to come up with not one, but 20 vaccines that have been authorized for use somewhere in the world, and there are about 300 more in various stages of trials. The ones that we are more likely to come across in the US are the Pfizer-BioNTech and Moderna vaccines, both of which use RNA technology which is fairly new to vaccine production although the technology itself has been



developing for about thirty years. RNA treatments are also being developed to prime the immune system against some forms of cancer. It has certainly proved its potential with this pandemic when, for example, it only took Pfizer and Moderna about two months to move from sequencing the coding for the virus to starting clinical tests of a vaccine.

Along with producing a vaccine, there has been a race to build diagnostic tools, and adapt medicines (such as Merck's pill) to combat the virus and its symptoms. All of that was achieved while the biotech companies were themselves having to deal with Covid-related restrictions and supply chain issues. They had to deal with clinical trials for some of their other products being stopped as hospitals overflowed with Covid patients, and many labs were forced to close.

Biotech traditionally accounts for only about 2% of the GDP, but it can be dealing with issues that have major effects. For instance, there have been more deaths in the US from Covid than official U.S. combat deaths in World War 2, the Civil War, World War 1, Vietnam War and the Korean War combined, and there have also been the societal and economic disruptions. Viruses do not respect borders and we have seen how trade agreements and supply chains can be affected by a pandemic. One other concern is that terrorists might take advantage of this kind of situation and deliberately introduce infection to specific regions.

Biotech companies are all trying to think through the problem from their own vantage point and attempting to see how quickly they can take their platform and switch it up to meet the potential challenges.

The massive efforts to develop vaccines, deploy test kits, develop highly predictive antibody tests, repurpose existing anti-viral drugs, and develop new drugs have been causing billions of dollars to flow towards many biotech companies. Of course, as this disease disappears from the headlines, the interest, concern and investments are likely to wane somewhat too. But Covid has shown that it is not going away easily, with the Delta variant having pushed new infection numbers up again and Long Covid becoming a problem.

Biotech is working on many other new and novel treatments as well, such as dendritic cell therapy that is a method for retraining the immune system and its T-cells to provide potential for treatments for cancers, muscular sclerosis, and rheumatoid arthritis, among other autoimmune ailments.

Also, there are the developments in genomics, which is heading towards more tailored treatments for the individual patient. There may only be minuscule changes in DNA from one person to another, but those changes can lead to substantial differences in healthcare needs. Genomics is giving us better data-driven treatment regimes.



It has been suggested that biotech companies reset about every three years, but that turnaround rate could be speeding up. New research and new products will normally mean alterations and upgrades to existing facilities, along with the potential for new ones, and adaptability is always needed to be built in. One of the lasting effects of the Covid disruption is the concept of working from home, and that is likely to revise the traditional ratio of laboratory space to offices from around 50:50 to something like 70:30. All of this means that the biotech industry is likely to have a strong, ongoing, demand for design and construction services.



Universities in a Changing World

Universities are places of learning, research and innovation, and we are going to be in need of all three of those in the coming years. Universities themselves have had to be innovative in handling the restrictions caused by the ongoing Covid pandemic, but many of them had already developed their remote online learning systems. Places such as MIT had been posting lectures on YouTube and offering courses through online platforms such as edX.org for years and were well prepared when in-person lectures could not be held.

The future will undoubtedly move to more of a hybrid system, with online classes making courses available to a far broader audience, but with in-person teaching remaining available for those who learn better that way



or where the subject matter demands it. People do things different ways, including learning, and the hybrid approach should make it easier for a person to find the education that works best for them.

The research work that universities carry out is likely to have even more far-reaching impacts as the world continues to battle the Covid-19 pandemic and faces up to the much more serious climate change crisis. The likelihood of keeping the Earth within the 1.5-degree Celsius temperature rise target seems to be disappearing from sight in the rearview mirror of our gasoline-fueled automobiles. If lifestyle changes are not going to do the trick by themselves, then we are going to be forced to face up to the reality of living with the changes we have created, along with trying to develop methods that will mitigate some of the worst effects.

There are already research projects underway in universities around the world, modeling the likely climate changes that will occur. They are then assessing what crops and farming systems will work with those climates and the potentially fierce weather conditions that result. Research in genetic modification of crops to survive in the changed climate is likely to become a survival system in many parts of the world. Careful modeling of the effects of such genetic modifications should help ensure that the proposed solutions do not end up compounding the problem.

Research institutions, such as universities, have been assisting industry for decades with the development of alternative power sources, such as solar, hydrogen, wind, wave, and tidal power production systems, weaning us off of the fossil fuels that have been building up the carbon dioxide and other greenhouse gasses. But if we stopped using fossil fuels instantly, the existing greenhouse gasses, especially carbon dioxide, are not likely to dissipate from the atmosphere for centuries by natural means.

Planting more trees to capture the carbon dioxide is an obvious choice for reabsorbing the carbon from the air. Another idea involves planting a fast-growing crop that absorbs lots of carbon, then burning that crop as fuel and capturing and storing the resultant carbon (bioenergy with carbon capture and storage, BECCS). However, avoiding a monoculture environment that destroys existing habitats is another important issue. We also need to ensure that the new trees do not simply become fuel for more forest fires that return the carbon to the atmosphere along with other pollutants. There seems to be plenty of material there for PhD theses, and there is a commercial incentive for growing more trees with the advances in timber structures, even in high-rise construction.

Technology to remove carbon from the air (direct air capture, DAC) is being worked on in universities around the world. Where the captured carbon can also be reused there is added benefit and finding ways to make such capture self-financing will probably be essential to its adoption. One potential use of the captured greenhouse gasses is in reducing the carbon footprint of concrete construction.



The students participating in such research have a vested interest in the results, because they and their children are the ones who will have to face the increasing effects of climate change. There may be no magic bullet for the problems facing the world, but university research is helping to point the way to a less desperate future. The number of universities working on these problems will also mean that a variety of solutions will emerge, giving options that hopefully will include ones that are acceptable to the local populations where they will need to be implemented.

All of this essential research and development work will inevitably lead to the refurbishment of existing teaching and laboratory spaces in the universities, along with new purpose-built structures. And all of these structures will aim to be net-zero or even net-negative, of course.