

THE “PROTEIN WAR”: OPENING GAMBIT

“To understand life, you must understand proteins. These long, convoluted molecular chains—each assembled from a menu of 20 types of chemical links called amino acids—are the worker ants of biology. Proteins, in the guise of enzymes, catalyze almost all of the chemical reactions that keep bodies running. Actin and myosin, the proteins of muscles, permit those bodies to move around. Keratin provides their skin and hair. Hemoglobin carries their oxygen. Insulin regulates their metabolism. And it is a protein, SARS-CoV2 spike, that allows a certain type of coronavirus to invade human cells, thereby shutting down entire economies.”

*The Economist*¹

Proteins—plainly and simply—are among God’s most wondrous works. But there is an ongoing microscopic war now raging between these incredible organisms that threatens to sicken most, if not each, of us—or in the worst-case scenario—kill us.

As human hosts of these unseen proteins, each of us are walking, talking, coughing battlefields.

Despite this unseen battle, it is an exciting time to be alive! All of us, in one way or another, feel the pressure of being the battlefield site in these extraordinary times. But as I like to remind my students, it is not only a time of struggle and battle: it is also a time of unprecedented challenges and opportunities.

What are the contours of this battlefield? Today, I respectfully suggest, each of us are being pushed, tugged and prodded—simultaneously—by three largescale “macro” forces. Each of these, in turn, are separate (and yet interwoven) theaters of war that touch us all; like the multi-level chess game played between Spock and Captain Kirk on the *Starship Enterprise*.

The first of these forces, which I attempt to explain extensively in my other writings, is the constantly changing and exponential growth of technology (the so-called Fourth Revolution).

The second macro force, especially in the contemporary United States, is an unfolding *moral revolution* that seeks to undermine traditional Judeo-Christian values and constitutionally enumerated rights and make them subordinate to unenumerated rights invented by well-meaning (in many cases) but decidedly

¹ The Economist, “How proteins fold: DeepMind is answering one of biology’s biggest challenges,” *The Economist (Science and Technology)*, Nov. 30, 2020.

leftist-leaning elites, academics, judges and politicians (a right to privacy that encompasses contraception, abortion, child-rearing, choice of sexual partners, control over one's intimate private information and determination of how one faces death). As I have suggested before, it is a struggle between advocates of *covenant-based* rights granted by a Creative God, and *hierarchical-based* rights invested in human-derived abilities and privileges. At the heart of this struggle is the quest for *control*. Albert Mohler describes the contemporary threat here better than I can:

“That is one of the largest dangers present in the COVID-19 pandemic. The danger will intensify as we enter the new year and as a new presidential administration assumes the reins of power—and make no mistake, the Biden administration will not let a good crisis go to waste. They will extend governmental authority at the blatant expense of certain liberties, especially religious liberty. This they will do because they know that once they extend their authority, it will be very difficult to reverse.”²

I sincerely hope Mohler is wrong about this, but I have this uneasy feeling he is correct. Indeed, I could craft an entire writing around this moral revolution concept (for some of you, I've already said too much on the topic), but that is not my focus. Rather, I want to focus on the third warlike force—which operates at both the “macro” and “micro” levels—the ongoing invasion of our individual bodies by a pandemic virus at the cellular level.

Why do I call this biological conflict the “Protein War”? I have come to recognize over the last two or three decades, (as you will read below) that the interaction between proteins provide the main theater of battle in a conflict that involves (and engulfs) each of us. This battle is being contested at the individual, cellular level. Each of us, witting and unwitting alike, male and female, regardless of skin color or ethnic origin, regardless of political orientation, are soldiers and hosts on the protein battlefield.

I have labeled this existential struggle, for lack of a more sophisticated term, the “Protein War”—denoting this uniquely contemporary struggle being waged simultaneously inside each of us and coinciding with the other macro-level global battlefronts. The most recent (and most evident) indication of this “Protein War” is

² I am grateful to my son-in-law, Ryan Curtis, for sharing Mohler's eye-opening article with me. See, Albert Mohler, “What Explains the Left's Hostility to Religious Liberty? It's All About the Sexual Revolution,” *albertmohler.com*, Dec. 2, 2020. [Article addresses the left-wing political angst in the wake of the most recent SCOTUS decision, especially targeting the concurring opinion by Justice Robert Gorsuch.]

the global spread of SARS-CoV-2 (the coronavirus that causes COVID-19³). The most virulent spearheading force of this pandemic involves the more infectious D614G strain mutation,⁴ one of more than 12,700 COVID mutations worldwide that have been uncovered thus far.⁵

Make no mistake about it, this is a very real war. Last Thursday alone, a record 2,879 deaths were attributed to this battle (a conflict that has claimed a total of over 14 million reported cases and 276,406 deaths over the year) in the United States alone. If these statistics are correct—and there is, no doubt, lots of disinformation in those figures such as cases counted as COVID-related that are attributable to other pre-existing diseases—one American is dying of the disease nearly every 30 seconds. But it is as though no other illness counts any longer: we have an ongoing epidemic of suicides, opioid-related deaths and STDs; new strains of influenza; an explosion of drug-resistant diseases; and heart disease that claims over 10,000 American lives every week or 600,000 yearly.⁶ That is not to diminish the threat posed by SARS-CoV-2, but to point out what should be obvious to many of you reading this piece—we have basically ignored these other diseases while, at the same time, using the pandemic to promote a climate of fear and as a fig leaf for expanding political control. Indeed, at least 30 million Americans are in a case of lockdown at this moment.

Yet, at the same time, hospitals are being swamped. That is undeniable. Our public health system is being stretched to the point of breaking. We are engaged in a unique war. And proteins are at the center of this war for survival.

Over twenty years ago now, (while I was still teaching at Alice Lloyd College) I began writing a Christian-based science fiction trilogy to warn my grandchildren and my college students about the dangers lurking beyond the horizon due to a rapidly changing technological world. My main storyline focused on a crossover viral disease from the animal world (a zoonotic disease) that traced back to an obscure military campaign in World War II and, in its future iteration, spread from a China-based bioweapons facility linked to the world's largest and most powerful megacorporation. The novel portrays a future world dominated by anti-Christian techno-elites, with my primary protagonists—a young Christian

³ The official name of the disease goes back to an announcement by the World Health Organization in mid-February 2020: “CO” stands for corona, “VI” for virus, “D” for disease, and “19” for 2019 (the outbreak year). SARS stands for “severe acute respiratory syndrome.” The virus itself is a beta coronavirus—the seventh known such virus to infect humans—that has its origin in bats and is similar to MERS-CoV and SARS-Cov.

⁴ Chris Smith, “Here’s proof that the coronavirus mutation responsible for the pandemic’s severity came from China,” *BGR*, Nov. 26, 2020. [Article asserts the D614G strain originated in eastern China then spread to Europe and the U.S.; it is more infectious than the Wuhan variant, effectively turning the outbreak into a pandemic].

⁵ Kate Kelland, “Mutations not making coronavirus able to spread more rapidly—study,” *Reuters*, Nov. 25, 2020.

⁶ Multiple news outlets report on COVID-19-related statistics on a daily basis. See, among others, Cassidy Vavra, “Covid becomes NUMBER ONE killer in US this week....” *The U.S. Sun*, Dec. 4, 2020.

couple and an elderly epidemiologist—racing against the clock to solve a medical mystery and eradicate the disease before it explodes into a worldwide pandemic.

My idea preceded the outbreak of the current SARS COVID-19 epidemic by at least two decades. At the time I finished the main body of the transcript: ubiquitous cellphones were still a decade in the future; the first drones were just on the drawing boards; personal computers sat on a desk or were carried in large, bulky containers and were confined to their floppy or hard disc software; there was no such thing as a “cloud,” or vast data storage facilities; malls were booming and the main place where you purchased things; electric cars were the stuff of dreams and cartoons; and, there were no private space companies conveying astronauts to the Space Shuttle and planning to settle colonists on Mars. At that time, the breakthrough and revolutionary biogenetic discoveries of the CRISPR Cas-9 enzyme—the ability to use protein-based “molecular scissors” to snip unwanted parts, or add additional material, in the DNA double helix—were still ten years away, as were bioengineered mastodons and *Synthia*.⁷ In those days, no one, in their wildest imagination could have envisioned a global disease that would “lockdown” entire countries, bring the strongest economy in the world to its knees, or lead (in part) to the electoral defeat of a sitting U.S. President.

Today, the typewritten pages of my masterpiece sit in a box upstairs gathering dust.

Sigh.

An agent in the Christian publishing world (after telling me how promising the manuscript was) did absolutely nothing to push my work forward and so I let it languish. But I can't really throw him under the bus: my own inertia is really to blame. I hope to use on-line publishing in the days ahead to get my idea out there, but (as they say in Kentucky) the horse has already left the barn.

I don't mention the manuscript for you to feel sorry for me. I also am going to resist the temptation to use the experience as a warning for each of you to seize the moment when God gives you a special idea or assignment.

It is what it is.

I have come to recognize, without knowing it at the time, that (in those days) I was describing the opening salvos of the “Protein War.”

Indeed, during my research for how my fictional future disease would operate inside the human body, I was forced (reluctantly) into the world of proteins, and with that, a cursory and non-professional understanding of how important proteins are to human life.

I have been keenly interested in the topic of proteins ever since.

⁷ In 2010, a synthetic species of bacterium—*mycoplasma laboratorium* or *Synthia*—was created in a laboratory; since the genome is novel, it is considered to be the first truly synthetic organism.

What are proteins? In our time, scientists have identified more than 200 million proteins⁸; each constituting the molecular machines in all forms of earth-based life and each built from smaller molecules called amino acids and capable of building, transforming, and interacting with other molecules. These proteins *do most of the work of life*.⁹ As biochemist Neil King observes: “Proteins are the most sophisticated molecules in the known universe.”¹⁰ Some of these proteins have ten to twenty amino acids; others have thousands. (If you have a protein a hundred amino acids long, for example, that means you have twenty choices for the first amino acid, twenty for the second, and so on; that is twenty-to-the-hundredth-power possible combinations—a number so large it eclipses the quantity of atoms in the visible universe.¹¹)

These proteins, present in each of our bodies and all living entities around us, are the microscopic focal points of the warfare I am talking about. I think it may be useful to present this ongoing battle between proteins in terms we can understand. Using more familiar terms and concepts associated with human warfare, I’d like to depict protein-level operations within the framework of three battlefield principles (for the sake of brevity).

First principle: the early advantage in any form of warfare goes to the offense, especially those forces employing new weapons’ systems that give the invaders a temporary battlefield edge. Since the dawn of human existence, our survival as viable living entities has depended on the abilities of our respective bodies’ protein-based immune systems to detect and repel foreign invaders such as viruses. How does that happen? Typically, when our systems first detects a foreign virus, it triggers a response on two levels: a notification by “call to arms” genes in infected cells—which produce proteins called “interferons” that signal neighboring cells to slow the ability of the invading virus to make millions of copies of itself (this typically lasts 7-10 days and buys time for the second group of cells to act); and, the second level of response, “call for reinforcement” genes, which produce their own special secreted proteins called “chemokines” that emit biochemical “come here” alarms (prompting antibody-making B cells and virus-killing T cells to race to the source of alarm).¹²

⁸ One source puts this number at 180 million amino-acid sequences, but only 170,000 of them have had their structures determined. See *The Economist* article.

⁹ Matthew Hutson, “Scientists Advance on One of Technology’s Holy Grails,” *The New Yorker*, Sep. 18, 2020. [Article covering contemporary developments in protein design including machine learning].

¹⁰ Matthew Hutson, “Scientists Advance on One of Technology’s Holy Grails,” *The New Yorker*, Sep. 18, 2020. [Article covering contemporary developments in protein design including machine learning].

¹¹ *Ibid.*

¹² Sharon Begley, “‘It’s something I have never seen’: How the Covid-19 virus hijacks cells,” *STAT*, May 21, 2020.

Mounting simultaneous efforts to disable these two-fold protein immune responses is the usual target of viruses such as influenza and other SARS-related viruses.

So, what is different about the SARS-CoV-2 virus? This virus, uniquely, blocks the ability of the first level of defenders to respond but allows—in fact encourages—the second set of defending proteins to launch, a pattern never seen before with other viruses.¹³ The result is essentially no brakes on the virus’s replication, but a surge of inflammatory molecules in the lungs. As one recent medical study puts it: “in 12 years of studying IFITMs (interferon-induced transmembrane proteins—the “call to arms” mechanism mentioned above), we’ve never encountered a virus that can use IFITMs for its own benefit.”¹⁴

What new weapons’ system is involved? A SARSCoV-2 virion (a single virus particle measuring some 89 nanometers in diameter) is a sphere of protein protecting a ball of RNA, the virus’s genetic code. Although our human cells can produce as many as 40,000 kinds of proteins, the genetic code of a SARS COVID-19 virus is much more limited: it contains information for the production of 27 proteins.¹⁵

By now, most of you have seen graphic representations of such a virion, covered by spiky protrusions, which are, in turn, enveloped in a layer of fat (that is why soap does such a good job at destroying the virus). The virus’s protein spikes (the “S” protein) attach themselves to a receptor protein on the surface of cells (called ACE2)¹⁶—these proteins typically play a role in regulating blood pressure—setting off chemical changes that effectively fuse around the cell and virus together. This allows the virus’s RNA to enter cells.¹⁷ The host cell’s protein-making machinery is hijacked and translates its RNA into new copies of the virus.

The following infection is a race between the virus and the immune system. If an infection damages the lungs sufficiently, oxygen cannot be delivered to the rest of the body (patient requires a ventilator). Secondary infections set in. Fevers—intended to cook the virus to death—may instead degrade the body’s own proteins. The immune system may create small proteins called “cytokines” to hinder the virus’s ability to replicate; in some cases, a hyper-inflammation results—the so-called “cytokine storm.”¹⁸

¹³ *Ibid.*

¹⁴ Eileen Scahill, “Study finds specific proteins inhibit or enhance virus that causes COVID-19,” *PHYSORG (Biology news)*, Dec. 7, 2020.

¹⁵ Scienmag staff, “Folding of SARS-CoV2 genome reveals drug targets,” *Scienmag (Latest Science and Health News)*, Nov. 2020. The genetic code of the SARS-CoV2 virus is exactly 29,902 characters long, strung through a long RNA molecule.

¹⁶ The virus attaches to a receptor on respiratory cells called “angiotensin-converting enzyme 2” (or ACE2).

¹⁷ Neel V. Patel, “How does the coronavirus work,” *MIT Technology Review*, April 15, 2020.

¹⁸ *Ibid.*

Second principle: successful invasions—whether at the human-to-human level or at the microscopic protein level—involves deception and counterfeit. To infect a human host, viruses must gain entry into individual human cells, then use the cells' inner machinery to produce copies of themselves. For SARS-CoV-2, the “key” to gaining entry into a receptor “doorknob” ACE2 respiratory cell is the spike “S” protein; the “S” protein employs sticky and precise amino acids to unlock the protein and, by the microscopic equivalent of subterfuge, enters the cell and fools the inner machinery into making copies of its own RNA.¹⁹

One of my core beliefs is that there is a counterfeit principle that permeates every dimension in the universe. I speak frequently about this concept in my College of the Ozarks classes and allude to it in many of my writings. The principle (it seems to me) operates also at the protein-to-protein level by fooling and tricking the body's immune system into accepting a virus intent on using the host to replicate diseased RNA variants to infect others and thereby spread the disease. Of course, no host system accepts these invaders willingly.

At the macro level the principle is just as operative: all military commanders are familiar with one of Sun Tzu's most famous maxims; “Warfare is the art of deception.”²⁰ In the Chinese classical sense, war is not necessarily heroic or noble—indeed it is a great evil—so the goal of a virtuous man is to win a war without fighting, by stealth.

We have turned dishonesty into a virtue. The victory of the Allies in World War II, for example, was achieved (in part) by a series of deceptions. This principle of deceit stretches from the spiritual realm (Jesus called Satan “the father of lies”);²¹ to what some view as fundamental political strategies. Every political science student knows Niccolo Machiavelli's “the end justifies the means” and I reminded my students in Modern Russian History class that an essential tactic used by Lenin to deflect criticism from his true political purposes was *mashirovka*—a strategy in which deception is essential. The use of deception to achieve political or religious ends is not confined to Chinese military strategists or historical dictators. It is alive and well in American presidential elections, in the tools used by today's high-tech titans and, I respectfully submit, in media attempts to create a climate of fear with the pandemic. We encountered much the same principle during my Criminal Justice and Terrorism class, when discussing the permissibility of Muslims to lie (to use deceit) in four circumstances: first, when he or she is

¹⁹ Stephanie Pappas, “Scientists figure out how new coronavirus breaks into human cells,” *Livescience*, Mar. 11, 2020.

²⁰ For an interesting article examining Sun Tzu's maxim in the light of modern military and political deceptiveness, see John Gray, “What Sun Tzu Knew,” *NewStatesman*, 29 Jan. 2020.

²¹ John 8:44.

practicing *kitman* (deliberately telling part of the truth or hiding one's beliefs); *taqiyya* (self-defense or to achieve an obligatory goal); *tawriya* (concealing truth or creative lying, even lying under oath); and, *muruna* (the "flexibility" to blend with the enemy and surroundings to achieve a greater Muslim purpose).

Indeed, these days, it is increasingly difficult to sort out the truth from the disinformation and counterfeit everywhere prevalent around us. I have come to recognize this: the opposite of truth is not so much bold lying as giving the appearance of truth.

Third principle: the defense will always be playing catch-up but may enjoy brief snatches of success. At the protein-to-protein level, the primary defensive weapon in the weeks ahead will be vaccines. Researchers now are testing 58 vaccine candidates in clinical trials on humans, and at least 86 preclinical vaccines are under active investigation in animals (seven vaccines have been approved for early or limited use; none in the US have been approved whereas one has been approved in the UK).²² In the United States, Operation Warp Speed (OWS, a government-private industry initiative by the Trump administration) has significantly accelerated the normal development cycle for vaccines, with a goal to deliver 300 million doses of safe and effective vaccines by January 2021.²³

OWS has funded, on one hand, vaccines that employ more traditional research and development methods. In the past, these vaccines have taken years to get to the field of battle. They are cheaper, easier to store and will be, arguably, safer to use. For that reason, they are projected for more widespread use in developing world countries.²⁴ These vaccines seek to train the human body's immune system to recognize the disease-causing part of a virus and, for that reason, either contain a weakened virus or purified signature proteins of the virus. They teach cells to make proteins to trigger a response that produces antibodies. AstraZeneca's Covid-19 vaccine candidate and the Novavax vaccine fall into this category, as does the Johnson & Johnson candidate. Unsurprisingly, India's Serum Institute (the world's largest vaccine producer by volume), with the collaboration of the Bill & Melinda Gates Foundation, will begin to manufacture and distribute these vaccines, once approved.²⁵

²² Carl Zimmer, et.al., "Coronavirus Vaccine Tracker," *The New York Times*, Dec. 5, 2020 (update).

²³ OWS is a partnership among components of the Dept. of Health and Human Services (HHS), including the Centers for Disease Control and Prevention (CDC), the National Institutes of Health (NIH), and the Biomedical Advanced Research and Development Authority (BARDA), and the Department of Defense (DoD). Major grant awards for candidate vaccines include: Johnson & Johnson's (Janssen); Moderna; AstraZeneca (with the University of Oxford); Regeneron; Novavax; Pfizer; and, Sanofi and GlaxoSmithKline. See, HHS, "Fact Sheet: Explaining Operation Warp Speed, *hhs.gov*, accessed Dec. 7, 2020.

²⁴ See, among others, Karen Gilchrist, "Bill Gates says six Covid vaccines could be available by spring 2021," *CNBC*, Dec. 8, 2020.

²⁵ *Ibid.*

The role played in this “Protein War” by multi-billionaire Bill Gates and his foundation is particularly interesting. His involvement has become a lightning-rod for numerous conspiracy theorists and anti-vaxxers. Gates is a passionate advocate for sharing such vaccines with the less fortunate around the world and suggests the rich should not get preferential treatment when it comes to access to the new vaccines. A noble thought indeed. I’m sure that Bill and Melinda will stand last in line for the new vaccines and wait until everybody else is vaccinated first ...

But these vaccines using traditional methods are not the ones generating all the buzz. More recent attention and excitement has focused on a completely novel type of vaccine—an entirely new defensive weapon system against infectious diseases—messenger RNA vaccines (mRNA). In the U.S. the FDA will hold hearings this week on whether to grant emergency approval to the first of these (the *Pfizer* candidate).²⁶ The speed with which these vaccines have been developed, run through human testing and can be mass produced, is amazing. As you can imagine, the main target for this new defensive arsenal of vaccines under development is the spike “S” protein. Today’s two leading candidates to treat COVID-19—*Moderna’s mRNA-1273* and *Pfizer-BioNTech’s BNT162b2* (*BioNTech* is a German firm)—have gone through phase 3 clinical trials, with an effective rate of 94.5 percent and 90 percent, respectively.²⁷ These vaccines do not use a live virus, instead instructing our cells to make a harmless piece of the spike “S” protein (after two injections in the upper arm) into muscle cells, where they will trigger the body’s immune system (at both levels) to respond. The problems: mRNA-based vaccines have never been approved for human use and is a new, relatively untested over time, technology; both mRNA candidates require extreme cold storage and a large logistical tail; and, there will be side effects. (Both vaccines require two injections to be effective and there is some speculation that the side effects will be severe enough to cause many recipients to stop after the first jab). Uncertainties include duration of effectiveness and whether a person, once inoculated, will still be able to transmit the disease to others around them.

In recent days there have been other exciting breakthroughs on this defensive battlefield in the “Protein War.” As Imogene and I returned from our holiday travels a couple weeks ago, news began to break about *Google’s DeepMind* and its breakthrough scientific discovery, using a proprietary AI (machine learning) algorithm called *AlphaFold2*, to predict protein-folding

²⁶ See, among others, Thomas M. Burton and Jared S. Hopkins, “FDA Says Pfizer/BioTech Vaccine Meets Success Criteria,” *The Wall Street Journal*, Dec. 8, 2020.

²⁷ Sanjay Mishra, “Here’s How Pfizer’s and Moderna’s Breakthrough COVID-19 Vaccines Work,” *ScienceAlert (The Conversation)*, Nov 18, 2020.

sequences.²⁸ This advance has been hailed by some as the “Holy Grail” of biological research efforts. Why? Because the malleable nature of proteins mean that they fold, crumple and rearrange themselves in dizzying, unpredictable ways that make assessments based on their structure, at any given time, virtually impossible. *DeepMind’s* announcement, which has been challenged in recent days by some scientific leaders, *if true*, is the culmination of 50 years of research. Such discoveries hold the promise of amazing advances in the days ahead for the “Protein War.”

Again, it is an incredible time to be alive.

Love life.

Do everything you can to give your good proteins a chance in the microscopic war going on within you.

Safely enjoy your family during this Christmas season.

To be sure, any number of legal challenges lurk on the horizon. Can employers require their workers to be vaccinated if the workers have, in their minds, legitimate reasons to not be inoculated? Can a government—at any level—require its citizens to be vaccinated? Can airlines, trains and buses refuse transportation to those lacking proof they are vaccinated? Are we moving toward a vaccine-oriented “social credit system” similar to that employed by the Communist Party leadership in China to reinforce its control? How will you prove you are vaccinated? By digital means made known to contact tracing apps and their algorithms? (Cyberterrorists are already poised to pounce on vaccines and their “cold chain” supply network.)²⁹ By tattoos on some part of your body? (If so, are we edging toward the final days “mark” mentioned in the book of Revelation?)

Future pandemics await, lining up like planes on the runway.³⁰

At times like these, and in decisions like these, I always remember my venerable old high school science teacher. His name was Ralph Mills. If I close my eyes, I can see him now, standing near the windows. His favorite quote: “Never be the first to take up the new, nor the last to shake off the old.”

Good advice indeed.

²⁸ See, among others, the *Economist* article; “Artificial intelligence finds solution to one of biology’s biggest challenges,” *STAT*, Nov. 2020; and, Martin Coulter, “DeepMind protein-folding breakthrough provokes debate over hype,” *Business Insider*, Dec. 2, 2020.

²⁹ Gordon Corera, “Coronavirus: Hackers targeted Covid vaccine supply ‘cold chain,’” *BBC News*, Dec. 2020.

³⁰ See, among others, Sarah Newey, “The next pandemic: New diseases could spread undetected in some of world’s most connected cities,” *The Telegraph*, Dec. 2, 2020.

