

Low Solar Activity, Winter Flu Conditions, Pandemics and Sex Wars: A Holistic View of Human Evolution

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Abstract

The current spread of coronavirus has caught our modern world by surprise, which leads to widespread panic, fear and confusion. However, if we view the unfolding of these events from a scientific historical perspective of past human evolution, we may discover the reoccurring patterns of the environmental conditions that give rise to such epidemics. Hence, we can figure out better methods to prepare and react to the infectious agents that spread diseases that have shaped the course of human history before. Here, I propose a holistic view of human evolution, with an interdisciplinary approach that studies how cyclic variation in solar UV energy affects the evolution of viruses and shapes the symbiotic dynamics of human life on earth.

Keywords: Epidemics; cosmo-climatology; evolutionary biology.[†]

1. Introduction

In the *Nature* article, “How Pandemics Shape Social Evolution,” Laura Spinney (2019) reviews Frank Snowden’s book, *Epidemics and Society: From the Black Death to the Present* (2019), that looks at how infectious diseases have affected human culture. Spinney writes on the cyclic versus linear view of human historical progress in respect to dealing with epidemics:

When will we learn never to declare the end of anything? Only 50 years ago, two prominent US universities closed their infectious-disease departments, sure that the problem they studied had been

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solved. Now, cases of measles and mumps are on the rise again in Europe and the United States, new infectious diseases are emerging at an unprecedented rate, and the threat of the next pandemic keeps philanthropist Bill Gates awake at night.

So it's a shame that to make this point, Epidemics and Society, Frank Snowden's wide-ranging study on this rolling human reality, repeats the urban myth that in 1969, US surgeon-general William Stewart said, "It is time to close the book on infectious diseases, and declare the war against pestilence won." Even though Stewart never said this, it's clear that there was a pervasive, dangerously complacent attitude in the late 1960s. International public-health authorities were predicting that pathogenic organisms, including the parasite that causes malaria, would be eliminated by the end of the twentieth century. Snowden's broader thesis is that infectious diseases have shaped social evolution no less powerfully than have wars, revolutions and economic crises.

2. Solar cycles and pandemics

My recently published article, "Solar Cycles, Light, Sex Hormones and the Life Cycles of Civilization: Toward Integrated Chronobiology" (Barzilai, 2019), asserts a causal relation between solar activity cycles and the human sexual dynamics through the epochs of history. Here, I would like to further expand on this theory to propose the causal relation of viral pandemics and plagues and the central role they play in shaping human evolution through the epochs of history.

This article on astrobiology, "Sunspot Cycle Minima and Pandemics: A Case for Vigilance at the Present Time" (Wickramasinghe et al., 2017) suggests that past recurring cases of pandemics are caused by period of low solar activity:

Direct records of sunspots and the solar cycle have been maintained in astronomical observatories for about 1610AD, while indirect records derived from 14 C analysis of ice cores go back to about 900AD. Minima in the sunspot cycle present conditions conducive to the entry of viruses and bacteria to the Earth and also for mutations of already circulating pathogens. Three grand minima of solar activity on record – the Sporer minimum (1450-1550AD), Maunder minimum (1650-1700AD) and the Dalton minimum (1800-1830) have all been marked by a preponderance of pandemics – Small Pox, English Sweats, Plague and Cholera.

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The sunspot numbers recorded for the present period 2002-2017 include the deepest sunspot minimum (Cycle 23-24) since records began, and a trend to declining numbers throughout the cycle. The same period has seen the resurgence of several pandemics – SARS, MERS, Zika, Ebola, Influenza A. We consider it prudent to take note of these facts whilst planning future strategies for pandemic surveillance and control

Lists of conspicuous pandemic and epidemic events during the period 2002-2015:

*2010-2016 Scarlet fever (*S. pyogenes*)*

2015 Zika

2014 Ebola

2013 Influenza A H7N9

2012 MERS

2009 Influenza H1N1 (China, India, Sri Lanka)

2002 SARS

The Influenza subtype H1N1, which was involved in both the 1918/1919 pandemic and the epidemics in 1976/1977, reappeared in 2009 in India, China and elsewhere. In 2017 it was raging across Sri Lanka and neighboring countries. In 2013 the Influenza subtype H7N9 appeared first in birds and later spread globally.

According to this analysis of cycles of solar trends, we are now at a very high risk of a new pandemic, similar to the Spanish flu pandemics of 1918, which occurred in similar solar minima cyclic conditions to current events. The article, “Origin and Virulence of the 1918 ‘Spanish’ Influenza Virus” (Taubenberger, 2006) states:

The “Spanish” influenza pandemic of 1918–19 caused acute illness in 25–30 percent of the world’s population and resulted in the death of up to an estimated 40 million people. Using fixed and frozen lung tissue of 1918 influenza victims, the complete genomic sequence of the 1918 influenza virus has been deduced. Sequence and phylogenetic analysis of the completed 1918 influenza virus genes shows them to be the most avian-like among the mammalian-adapted viruses. This finding supports the hypotheses that (1) the pandemic virus contains genes derived from avian-like influenza virus strains and that (2) the 1918 virus is the common ancestor of human and classical swine H1N1 influenza viruses.

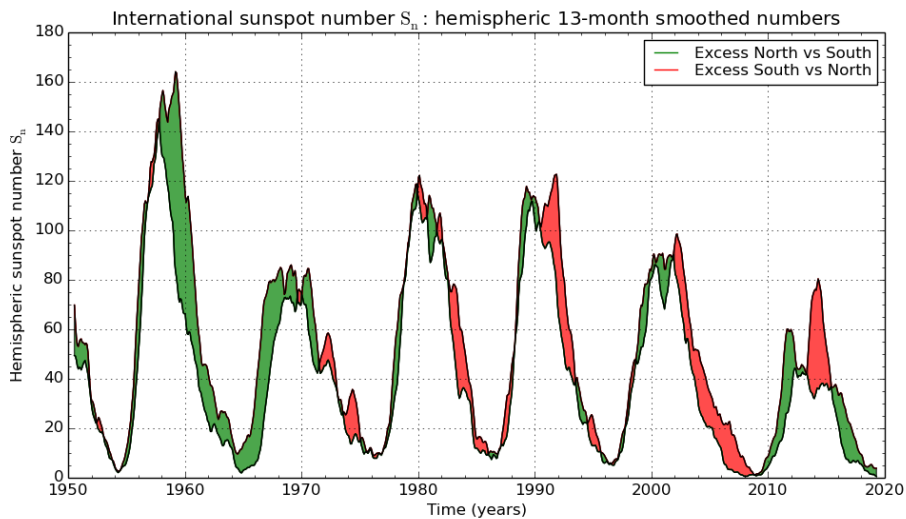
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In 2008 NASA published this report on a substantial drop in solar activity (Philips, 2009), which led to the 2009 Influenza H1N1 outbreak. NASA asserted that the solar conditions mirrored those leading to the environment of 1918 great pandemic:

2008 was a bear. There were no sunspots observed on 266 of the year's 366 days (73 percent). To find a year with more blank suns, you have to go all the way back to 1913, which had 311 spotless days. Prompted by these numbers, some observers suggested that the solar cycle had hit bottom in 2008.

Careful measurements by several NASA spacecraft have also shown that the sun's brightness has dimmed by 0.02 percent at visible wavelengths and a whopping 6 percent at extreme UV wavelengths since the solar minimum of 1996. These changes are not enough to reverse global warming, but there are some other, noticeable side-effects.

As we see in the following chart, solar activity has been in a declining trend since its peak the late 1950s. In the late 1970s this trend caused the HIV global pandemic, the SARS in 2002 and H1N1 outbreak in 2009, occurring with a global recession, and the 2019 Coronavirus epidemic, both near historically significant solar minimums. Actually, the optimistic view described by Spinney (2019) of humanity's victory over epidemics in the 1950s and into the 1960s, was the result of high solar activity leading to decline in the prevalence of epidemics.



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In addition, major historical pandemics and plagues, such as the Justinian plague of 536 CE during the cold period called the Dark Ages, and the Black Death of 1350s, are related to low levels of solar activity:

Winter was coming. In AD 536, the first of three massive volcanic eruptions ushered in a mini ice age. It coincided with an epidemic of the plague, the decline of the eastern Roman Empire, and sweeping upheavals across Eurasia.

Now we have the first evidence that the disruption to climate continued a lot longer than a decade, as was previously thought. The extended cold period lasted until around 660, affecting Europe and Central Asia, and perhaps the rest of the world too. (Sarchet, 2016)

The Black Plague in the fourteenth century occurred during the Little Ice Age, a period of cooling that began after the rise of civilization from the Dark Ages into the Medieval Warm Period. Starting in the thirteenth century, global cooling began due to low solar activity over the next centuries (1200-1450). This also led to the invasion of Mongol hordes in a series of devastating wars of conquest, murder, and rape that destroyed much of Chinese and Islamic civilizations as well as Russia in Eastern Europe. This is described in this article, “Little Ice Age Wetting of Interior Asian Deserts and the Rise of the Mongol Empire” (Putnam, et al., 2016):

Wetter-than-present conditions characterized the core of the inner Asian desert belt during the Little Ice Age, the last major Northern Hemispheric cold spell of the Holocene. These wetter conditions accompanied northern mid-latitude cooling, glacier expansion, a strengthened/southward-shifted boreal jet, and weakened south Asian monsoons. We suggest that southward migration of grasslands in response to these wetter conditions aided the spread of Mongol Empire steppe pastoralists across Asian drylands.

Now that the relation between low solar activity and pandemics has been demonstrated, we shall continue to explore the possible mechanism that causes these effects.

3. Cosmo climatology: effects of solar activity on our climate

Henrik Svensmark, director of Center for Sun-Climate Research in the Danish National Space Center, has discovered a way in which low solar activity affects our climate. This is caused by decline in solar shielding of

cosmic radiation that reaches earth, leading to greater cloud cover, leading to more winter conditions that bring greater levels of precipitation, as described in the article “Cosmoclimatology: A New Theory Emerges (Svensmark, 2007):

The title reflected a topical puzzle, that of how to reconcile abundant indications of the Sun's influence on climate, with the small 0.1% variations in the solar irradiance over a solar cycle measured by satellites. Clouds exert (on average) a strong cooling effect, and cosmic-ray counts vary with the strength of the solar magnetic field, which repels much of the influx of relativistic particles from the galaxy. The connection offers a mechanism for solar-driven climate change much more powerful than changes in solar irradiance.

4. The effect of UV solar radiation on regulating germs in the atmosphere

The reason that flu pandemics usually occur during winter is that solar radiation causes both greater humidity in the air, which serves to dampen particles floating in the air into the ground, and also strong UV radiation kills germs and viruses in the atmosphere, reducing the risk of infection. The article, “Inactivation of Influenza Virus by Solar Radiation” (Sagripanti & Lytle, 2007), proposes that high solar activity during the summer is responsible for low cases of influenza:

Influenza virus is readily transmitted by aerosols and its inactivation in the environment could play a role in limiting the spread of influenza epidemics. Ultraviolet radiation in sunlight is the primary virucidal agent in the environment but the time that influenza virus remains infectious outside its infected host remains to be established. In this study, we calculated the expected inactivation of influenza A virus by solar ultraviolet radiation in several cities of the world during different times of the year. The inactivation rates reported here indicate that influenza A virions should remain infectious after release from the host for several days during the winter “flu season” in many temperate-zone cities, with continued risk for reaerosolization and human infection. The correlation between low and high solar virucidal radiation and high and low disease prevalence, respectively, suggest that inactivation of viruses in the environment by solar UV radiation plays a role in the seasonal occurrence of influenza pandemics.

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The following quote from the blog post, “The Reason For The Season: Why Flu Strikes in Winter” (Foster, 2014), further elaborates on the scientific findings that “The Flu Likes Cold, Dry Weather”:

For many years, it was impossible to test these hypotheses, since most lab animals do not catch the flu like humans do, and using humans as test subjects for this sort of thing is generally frowned upon. Around 2007, however, a researcher named Dr. Peter Palese found a peculiar comment in an old paper published after the 1918 flu pandemic: the author of the 1919 paper stated that upon the arrival of the flu virus to Camp Cody in New Mexico, the guinea pigs in the lab began to get sick and die. Palese tried infecting a few guinea pigs with influenza, and sure enough, the guinea pigs got sick. Importantly, not only did the guinea pigs exhibit flu symptoms when they were inoculated by Palese, but the virus was transmitted from one guinea pig to another.

Now that Palese had a model organism, he was able to begin experiments to get to the bottom of the flu season. He decided to first test whether or not the flu is transmitted better in a cold, dry climate than a warm, humid one. To test this, Palese infected batches of guinea pigs and placed them in cages adjacent to uninfected guinea pigs to allow the virus to spread from one cage to the other. The pairs of guinea pig cages were kept at varying temperatures (41°F, 68°F, and 86°F) and humidity (20%-80%). Palese found that the virus was transmitted better at low temperatures and low humidity than at high temperatures and high humidity.

Radiologists have also discovered that artificial far-UVC radiations can be usefully applied to eliminate viral and bacterial infectious agents from the air, causing minimal damage to the skin, inventing the groundbreaking medical device of *Far-UVC* light: A new tool to control the spread of airborne-mediated microbial diseases:

Airborne-mediated microbial diseases such as influenza and tuberculosis represent major public health challenges. A direct approach to prevent airborne transmission is inactivation of airborne pathogens, and the airborne antimicrobial potential of UVC ultraviolet light has long been established; however, its widespread use in public settings is limited because conventional UVC light sources are both carcinogenic and cataractogenic. By contrast, we have previously shown that far-UVC light (207–

222 nm) efficiently inactivates bacteria without harm to exposed mammalian skin. This is because, due to its strong absorbance in biological materials, far-UVC light cannot penetrate even the outer (non living) layers of human skin or eye; however, because bacteria and viruses are of micrometer or smaller dimensions, far-UVC can penetrate and inactivate them. We show for the first time that far-UVC efficiently inactivates airborne aerosolized viruses, with a very low dose of 2 mJ/cm² of 222-nm light inactivating >95% of aerosolized H1N1 influenza virus. Continuous very low dose-rate far-UVC light in indoor public locations is a promising, safe and inexpensive tool to reduce the spread of airborne-mediated microbial diseases. (Welch, et al., 2018)

5. Red queen hypothesis: sexual origins of social conflict

As the integrated chronobiology (Barzilai, 2019) article suggests, the low solar activity environment also causes social and political conflict driving the course of our sociocultural evolution. The 1918 Spanish flu pandemic coincided with WWI, the communist revolution in Russia in 1917, and the formation in the Nazi-Socialist party in Weimar Germany in 1919. We have been experiencing similar trends in recent years with the rise of far-right nationalist and far-left communist political movements throughout the world, leading to a conflict between inclusive globalism trends and xenophobic nationalist figures.

These political movements express opposing social attitudes, as communism seeks to unite all of the human race under one empire that dissolves national and ethnic boundaries, is ideologically conflicting with Nazi-Socialism that seeks for one race to establish dominance and even eradicate other ethnic groups. However, both ideologies seem to similarly arise in period of increasing social tensions that lead to conflict and phase transitions in human social organization. This in-group versus out-group dynamics may be a product of sexual drives as a means of social evolution in reaction to changing environmental conditions.

For example of the of war for empire as a means to achieve sexual recombination of genes across different population groups, it has been established through genetic science that great conquerors in history, such as the powerful Mongol leader Genghis Khan, have used their empires to father many children with numerous wives and concubines to spread their seed through their great territories. This has been described in the article on Genghis Khan's genetic legacy's competition (Callaway, 2015):

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The Mongolian leader left a strong footprint in the Y chromosomes of modern descendants — but he was not the only one.

Millions of men bear the genetic legacy of Genghis Khan, the famously fertile Mongolian ruler who died in 1227. Researchers have now recognized ten other men whose fecundity has left a lasting impression on present-day populations. The team's study points to sociopolitical factors that foster such lineages, but the identities of the men who left their genetic stamp remains unknown.

The case for Genghis Khan's genetic legacy is strong, if circumstantial. A 2003 paper led by Chris Tyler-Smith, an evolutionary geneticist now at the Wellcome Trust Sanger Institute in Hinxton, UK, discovered that 8% of men in 16 populations spanning Asia (and 0.5% of men worldwide) shared nearly identical Y-chromosome sequences. The variation that did exist in their DNA suggested that the lineage began around 1,000 years ago in Mongolia.

This suggests that social tensions between human groups that lead to geopolitical conflicts and even world wars, may arise by sexual dynamics of in-group versus out-group genetic populations. Hence, these sociocultural militarist trends may originate in the evolution of sexual reproductive strategies that evolved in reaction to viral epidemics in our biological history. Sex wars that rise in reaction to changing environmental conditions evolved as a biological adaptation to parasitic infections, may have originating in mutating viruses and bacteria attacking a specie population (during periods of low solar activity). The Red Queen hypothesis explains the origins of sex as a product of the need for sexual recombination of genes in a specie's populations in order to combat mutating infectious disease agents:

*Most organisms reproduce through outcrossing, even though it comes with significant costs. The Red Queen hypothesis proposes that selection from coevolving pathogens facilitates the persistence of outcrossing in spite of these costs. We utilized experimental coevolution to test the Red Queen hypothesis, and found that coevolution with a bacterial pathogen (*Serratia marcescens*) resulted in significantly more outcrossing in mixed mating experimental populations of the nematode *Caenorhabditis elegans*. Furthermore, we found that coevolution with the pathogen rapidly drove obligately selfing populations to extinction, while*

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outcrossing populations persisted through reciprocal coevolution. Thus, consistent with the Red Queen hypothesis, coevolving pathogens can select for biparental sex. (Morran et al., 2011; Brockhurst et al., 2014)

The mutual role that sex wars and pandemics play through human history can be well illustrated during the dreadful period of Black Plague, in which germs were also used for biological warfare by the Mongols in the rage for global conquest to establish a huge empire:

On the basis of a 14th-century account by the Genoese Gabriele de' Mussi, the Black Death is widely believed to have reached Europe from the Crimea as the result of a biological warfare attack. This is not only of great historical interest but also relevant to current efforts to evaluate the threat of military or terrorist use of biological weapons. This theory is consistent with the technology of the times and with contemporary notions of disease causation; however, the entry of plague into Europe from the Crimea likely occurred independent of this event. (Wheelis, 2002)

6. Human evolution, retroviruses and punctuated equilibrium

The classical Darwinian theory of evolution suggests the evolution is a gradual process of accumulation of mutations through natural selection and the competition for survival of the fittest individual organisms. However, this view was contested during the period of low solar activity during the 1970s from two rising fronts.

In 1972, paleontologists Niles Eldredge and Stephen Jay Gould published a landmark paper "Punctuated Equilibria: An Alternative to Phyletic Gradualism," developing their theory by studying fossil records. They revolutionized our conception of evolution by stating that it is composed of periods of prolonged stability, called *statis*, punctuated by sudden events of significant evolutionary change, in which species split into new distinct species, rather than by gradual transformation.

The second revolution was formalized by renowned evolutionary biologist, Lynn Margulis, also during this period, offering a new revolutionary theory of *symbiogenesis*, causing different individual organisms to unite through symbiotic or parasitic relationship into a single greater complex new organism. Her now accepted theory of endosymbiogenesis states that complex eukaryotic cells were formed by symbiosis of ancient prokaryotes that led to

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the mitochondria, functioning as the energy producing organelles in our animal cells.

This new paradigm of rapid evolutionary transformations can now be explained through the discovery of retroviruses that enter a cell, and have the ability transform their RNA into the DNA of that cell, through a reverse transcription process, hence changing the genome of that cell. The article, “Retroviruses Shows That Human-Specific Variety Developed When Humans, Chimps Diverged” states the theory that retroviruses are a meaningful component in the giant leaps required for human evolution:

The idea of a relatively sudden genetic change that alters evolution isn't new. Scientists, such as the late Stephen Jay Gould, proposed a mechanism called “punctuated equilibrium” more than two decades ago. This idea, not yet completely accepted by scientists, proposes that evolution has depended more often on sudden and unexpected changes in genomes rather than a simple Darwinian paradigm of gradual evolutionary change due to extremely long-term natural selection. (University of Georgia, 2002; see also Gemmell et al, 2015)

Another article, “Transposable Elements and an Epigenetic Basis for Punctuated Equilibria” (Zeh, et al., 2009) proposes that retroviruses and epigenetic switches play a vital role in the punctuated equilibrium theory of human evolution:

Evolution is frequently concentrated in bursts of rapid morphological change and speciation followed by long-term stasis. We propose that this pattern of punctuated equilibria results from an evolutionary tug-of-war between host genomes and transposable elements (TEs) mediated through the epigenome. According to this hypothesis, epigenetic regulatory mechanisms (RNA interference, DNA methylation and histone modifications) maintain stasis by suppressing TE mobilization. However, physiological stress, induced by climate change or invasion of new habitats, disrupts epigenetic regulation and unleashes TEs. With their capacity to drive non-adaptive host evolution, mobilized TEs can restructure the genome and displace populations from adaptive peaks, thus providing an escape from stasis and generating genetic innovations required for rapid diversification.

7. Conclusion

A holistic view of human evolution as a product of sexual reproductive strategies evolved in reaction to changing environmental conditions and changing parasitic threats can form a new paradigm to explain and deal with current epidemics that threaten our modern civilization. This interdisciplinary perspective, integrating energy trends and their effects on biological processes, can provide the ultimate theoretical framework required to better treat these epidemics from a holistic viewpoint.

Medical authorities accustomed to reductionist Western science that is mostly focused on biological organic systems, have hence invested their resources of fighting contagious epidemics to developing vaccines when these dangerous arise. However, the development process of specific vaccinations and other treatments to cure these agents can demand very long periods, in which the epidemic can already cause great numbers of fatalities. Therefore, in addition to these reductionist methods, a holistic approach that seeks to understand the underlying evolutionary mechanism that leads to greater environmental risk of spreading pandemics can result in better results in dealing with these conditions.

As referred to before, new advancement in radiology can supply some required general solutions, as proposed in the article, “Germicidal Efficacy and Mammalian Skin Safety of 222-nm UV Light” (Buonanno et al., 2017), suggesting we can utilize artificially produced light to counter the spread of viruses, when solar light is too low during cold and dry winter-like conditions:

We have previously shown that 207-nm ultraviolet (UV) light has similar antimicrobial properties as typical germicidal UV light (254 nm), but without inducing mammalian skin damage. The biophysical rationale is based on the limited penetration distance of 207-nm light in biological samples (e.g. stratum corneum) compared with that of 254-nm light.

This opens exciting new frontiers in the mutual progress of philosophy, science and medicine to better the human condition, as the Enlightenment philosopher, Francis Bacon, the father of empirical science, who proposed, “an entirely new system based on empirical and inductive principles and the active development of new arts and inventions, a system whose ultimate goal would be the production of practical knowledge for ‘the use and benefit of men’ and the relief of the human condition” (Internet Encyclopedia of Philosophy, 2020).

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