

COVID-19: a Darwinian not Hegelian pandemic

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I have often said that from the amoeba to Einstein there is only one step. Both work with the method of trial and error. The amoeba must hate errors, for it dies when it errs. But Einstein knows that we can learn only from our mistakes, and he spares no effort to make new trials in order to detect new errors, and to eliminate them from our theories. The step that the amoeba cannot take, but Einstein can, is to achieve a critical, a self-critical attitude, a critical approach. It is the greatest of the virtues that the invention of the human language puts within our grasp.

Karl Popper, “All Life is Problem Solving”

The discussion on the current pandemic seems to be inspired, as most public discussions about topic that are little understood, by an important and misleading tradition of Western thought as expressed with lucid effectiveness by the philosopher Friedrich Hegel: «The rational is real and the real is rational» (*Elements of the Philosophy of Right*, 1820).

Unfortunately, such belief or idea is false to say the least, and dangerous to use, on the merits of an emergency like the one that the COVID-19 pandemic represents.

Because if we self-deceive ourselves on the determinants of what is subjectively perceived and scientifically detected, we are doomed. More importantly we will make mistakes not by a produc-

tive trials and errors method but in a systematic way, paving a series of paths with false expectations and wrong judgments that will not provide any additional knowledge on a phenomenon such a pandemic. The behaviors of viruses and humans show, from their attempts to increase or reduce damage to the host, respectively, that they are neither rational, nor irrational, nor much less a social construction, nor an illusion, nor really complex; they are just “Darwinian”.

The psychodynamic removal of infectious diseases

During the last decades of his life, the microbiologist and Nobel Prize winner Joshua Lederberg, (1925-2008), spoke at every opportunity about his fears that emerging viruses (zoonotic viruses, which pass from other animals to humans) would, by far, represent the most serious threat to the future of humanity, and he preached that we were not culturally prepared to deal with them. In fact, despite what was discovered in the 1990s about the evolutionary dynamics of the spread of HIV, Ebola, Marburg, Dengue, etc., the epidemiology of infectious diseases was for Lederberg the last “refuge of the theory of special creation”. The prevailing reasoning and narrative on SARS-CoV-2 shows that the condition has not changed since. Listening to epidemiologists, virologists, mathematicians, historians, philosophers *etc.*, trying to explain what is happening or what is expected to happen in the case of the SARS-CoV-2 pandemic, one is led to believe that the theoretical background of the reasoning and of some theses expressed by them are tainted with pseudoscience. Because if it is said that lowering R_0 below 1 will progressively lead to zero infection, or that public health measures are aimed at interrupting viral transmission, suppressing the infection, *etc.*, all such statements will generate false expectations. Worse than that, since these unsubstantiated conceptual frameworks spread by “scientists”: they are pseudoscience.

On the contrary, the Darwinian theory of evolution does not contemplate such outlets. In other words, if Darwin was right then some fairy tales are being

told about COVID-19 while, if a clear “victory over the virus”, a “suppression of infection”, etc. would happen – in term of eradication of the microorganism – then Darwin would have been wrong. Indeed, what Darwinism foresaw was an evolutionary dynamic regarding the continuous struggle or arms race between our specie and the virus, whose existence cannot be precisely predicted and will instead fluctuate, as is already happening with reinfection clusters in Asia, for reasons that have little to do with the strategies used to contain transmission, which – incidentally – vary from country to country.

The evolutionary scenario of the pandemic

Because the Darwinian theory is perhaps perceived to be counterintuitive, or because the epistemology of medical science has gone historically and for practical reasons, through its own evolution, explicative models used by doctors do not go beyond the circle of proximate causes. Thus, many scientific discussions and most of current interventions dismiss the fact that we are faced with a series of biological selection dynamics, which are described as the situation is rather a new form of species fixism responding to an essentialist logic. For example, it is believed or allowed to be believed in daily press conferences, in countless interviews and in numerous articles by so called experts that “social distancing”, as they say using the wrong adjective (we are distancing ourselves physically not socially!), will lead to the extinction of the diffusion. In truth, this measure will only postpone the moment people will get infected, end up in hospital, overcrowd the ICU beds and some will die for lack of medical assistance. These restrictive measures are not meant to mitigate and much less control the viral infection, they are only decreasing the impact on the need of invasive ventilators and avoiding deaths which is an absolute result of course but has nothing to do with the viral spreading.

It is easy to understand, even without any readings of Darwin’s work, that zero contagion is an impossible target to achieve in natural condition for a viral disease such as this one. However, politicians

are already talking about how many immune or not at risk people can progressively be freed from their home shelters to keep the contagion down. Nobody is yet telling the public that this virus is here to stay, and it will make us dance (as some of the Imperial College reports predict) in the coming years at rhythms we don't know yet. No one is able to foresee the future evolution of this pandemic until truly effective drugs and/or vaccines will eradicate it.

What do epidemiologists know about evolution?

Since the early 1990s, a relevant literature on evolutionary epidemiology has been produced, which public health epidemiologists, doctors, etc. have rarely considered.

The principle that inspires these studies is that the evolution of epidemics and pandemics is controlled by chance and by mutual selective pressures between infectious agents and hosts. We ignore for convenience the effects that the virus could have on the genetic structure of human populations which, in the most catastrophic outcome, would have to be discussed in a few dozen human generations from now. In fact, each pathogen acts as a set of geographically distributed populations, where the phenotypes that replicate more effectively due to the physiological environment of the hosts and the ecology outside the host, prevail locally.

Viruses are not atoms, all identical to each other, as it seems implicit in the discussions at hand and in the assumptions by most mathematical models drawn. From this point of view, the replication of the microorganism depends on the competing genetic variations, the biological reactions (immune first) and the host behaviour (also induced by the virus), as well as from the public health measures (also partly conditioned by the virus).

Viral populations will evolve based on characteristics such as virulence, infectivity, pathogenicity, etc. that are the most advantageous for their reproduction.

Despite the prevailing narrative of the subject, natural selection does not favor those who are stronger, weaker, faster, etc.; it is merely the result

of differential reproduction/replication dynamics under an evolutionary pressure.

The RNA is a dancer and we have to adapt ourselves

What is overlooked in the discussions is that RNA viruses have the ability to evolve quite rapidly because they mutate with increased frequency (very high when they lack genome correction procedures, as in the case of influenza viruses), giving rise to sub and quasi-species characterized by different genetic-molecular profiles that are expressed in the hosts. The human individual at risk interact with the virus given a genetic background unique to them and according to the phase of the human life cycle (children, adolescents, adults, elderly, etc.), the comorbid pathologies, producing no, minor or major disease severity.

Depending on the selective pressures or chance, strains with different levels of virulence or with different reproduction rates will first prevail locally and then travel inside the host to further colonize by competition distant hosts/ecosystems.

An additional alarming consideration should be made on the so called predator like strain, *i.e.* strains that in some contexts may prevail over the more benign ones because they are favored by the transmission rate. This hypothesis was used to explain the origin of the Spanish flu strain (H1N1) or the *P. falciparum* for malaria. There are several human ecosystems on the planet, with a high density of people and without proper sanitation measures, which could have favored, and will favor in the future, the emergence of predatory strains of Sars-CoV-2.

Therefore, the scenario we are witnessing is that of a major Darwinian event. The human population and those of other mammals allow, through specific receptors such as the angiotensin-converting enzyme type 2 (ACE₂), the virus to enter the cells of the host to give rise to a replicating evolution phase, from which mutated viral particles, *i.e.* those more efficient in transmitting and multiplying, will continuously infect and multiply. To be prepared for the future of this pandemic we should also hypothesize that the mechanisms of viral circulation could change. Given that COVID-19 is an animal

virus, there are certainly reservoirs, and it cannot be excluded that active viruses could circulate in the blood stream and with time (evolution is a synonymous of time) find an arthropod vector insect that would carry it and transmit it to humans. One can consider these as nightmare scenarios, but evolution depends a lot on such constraints.

The selection of antibodies and brains in the great Darwinian horizon

Beside this wide circulation of the virus that takes place under the guidance of chance and natural selection, another Darwinian process takes place within the host that is strategic from an evolutionary point of view, namely the clonal selection of lymphocytes that respond to the microorganism. The immune system works, in fact, based on Darwinian logic, something we know at least since 1960 circa.

Therefore, when we discuss antibody response, immune memory, vaccines, etc., we reason, even if it is never made explicit, in a framework of Darwinian processes.

By the same principles and evidence produced in the past five decades we know that our behaviours, as well as our memory and learning skills, are products of neural processes controlled, like in the case of the immune system, by a Darwinian logic that Gerald Edelman and Jean Pierre Changeux explained very well.

In short, what we will learn from the current battle will be the result of hypotheses, expectations, experiments, experiences, *etc.* that will be selected, in the continuous activity of our brains, putting them to the test and preserving those that will solve the problem that nags us. There is “a grandeur”, as Darwin would have put it, in this view of the pandemic. It would be culturally important and stimulating to take this tragic opportunity to question ourselves on the relationships between microorganisms and hosts in a scientific-cultural system that is a little wider than every day’s numerology and opinionated theorems.

We must take this dreadful opportunity to enrich the

culture in general with ideas that are more useful and plausible than those normally heard and repeated over and over in communication and dissemination. The great geneticist Theodosius Dobzhansky used to say that «nothing in biology makes sense except in the light of evolution». Such saying could be now updated in: «Nothing in biology, medicine and public health (let’s stop here for now) makes sense except in the light of Darwinian thinking».

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