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Coronavirus and Enaction of Human-made Complexity Paradoxes

Nicola Labanca

1. Introduction

In this paper I discuss some key characteristics of current societies as more sharply emerging during the coronavirus pandemic. Going beyond the specificities of the virus, I argue that 'human-made complexity' represents the cultural milieu within which this pandemic is developing and focus on the technical and conceptual equipment this cultural context provides to manage extreme events, including pandemics.

Without entering debates concerning whether this equipment is being properly used or not in present circumstances, I highlight how societies frame and react to systemic challenges in the light of human-made complexity and associated implications. This leads me to identify a series of key logical paradoxes that are being permanently enacted. "Managing the unexpected", "isolating interconnection", "rational irrationality", "relying on invisibles" and "deadly vitality" are expressions to render the constituting antinomies. I then discuss how living within these paradoxes entails a kind of societal blindness to their inherent bipolarity and the possible generation of intolerable situations of stress and systemic crises. The final sections of the paper provide instead some food for thought on how to sidestep or escape these antinomies.

2. Assumptions About Human-made Complexity and Its Naturalization Processes

The contemporary moment can be named the *age of (complex) systems*[1]. This age generates a specific type of human-made complexity relying on naturalization processes occurring around information and computer technologies. It is experienced as a collective ritual administered by specific experts (i.e. biologists, ecologists, cyberneticians, engineers, physicists, etc.[2]) through given narrations (i.e. narrations generated around information and complex systems theories) that are embodied by all participants while using the material artefacts (i.e. information technologies constituting the materiality of complex systems) this collective ritual relies on.

For three reasons, this ritualized behavior is permanent and not episodic like a religious ritual. Complex systems technologies have become our naturalized environment. They have assumed a "radical monopoly"[3] over human actions and access to some of these technologies can nowadays be claimed as a key means to exercise the human right of freedom of opinion and expression[4]. Constant participation in the associated ritual may then be enforced by law[5]. In addition, there are fears and mimetic mechanisms that operate among participants by generating uncomfortable feelings and situations of danger and anguish in case of ritual exit.

[1] See Illich's illustration of the systems age as reported in Cayley (2005).
[2] The following paragraphs will discuss why *war* experts have also to be included in this list.
[3] The concept of radical monopoly is taken from Illich (1973).
[4] See e.g. what stated about *the internet* in 2011 report on the Promotion and Protection of the Right to Freedom of Opinion and Expression by the United Nations Human Rights Council as available at https://www2.ohchr.org/english/bodies/hrcouncil/docs/17session/A.HRC.17.27_en.pdf
[5] I refer to situations where the employment of information technologies becomes mandatory (e.g. in relation to contact tracing as enforced in countries like South Korea or China during the current pandemic) or to how digital technologies and associated calculation algorithms are generally used by governments worldwide for security reasons to limit free movement. In general, these are situations where the supply of resource flows (e.g. water flows, energy flows, information flows) as mediated by global supply networks and infrastructures constituting the materiality of contemporary complex systems becomes subject to mandatory regulations.

As happens with other naturalization processes generated around techno-science[6], the complex systems ritual relies on a double bind. On the one hand, it operates retroactively by transforming a newly created scientific abstraction (i.e. information in the case at hand) into an entity that has always existed in nature so that natural systems are being increasingly identified with information processors[7]. By doing so, it creates the illusion that technologies produced by relying on this abstraction just replicate natural processes, sometimes by activating them, as, for instance, in the case of the social imaginary that has developed around the circular economy[8], so-called artificial intelligence, and genetic science. These two social dynamics reinforce each other and permanently constrain people within specific social practices. Despite how the associated ritual tends to blur key distinctions, the type of social complexity created in this way remains nevertheless radically different from natural complexity.

3. Warning: Human-made Complexity Exhibited by Social Systems is Different from Physical and Ecosystems Complexity

Although formally exhibiting same phenomena of non-linearity, emergence, hierarchy and scale[9], the kind of complexity which is at stake with natural systems has nothing to do with social systems complexity generated through current global supply and information networks. The latter is produced through processes of deep and extensive homogenization and

[6] Labanca (2017) discusses for example similar collective rituals and naturalization processes generated around the energy concept and associated technologies.
[7] See e.g. Chiribella et al. (2011).
[8] See e.g. https://ec.europa.eu/environment/circular-economy/
[9] A general characterization of physical complex systems may be found for example in Broska et al. (2020). There, it is stated that "*Complex systems* can be characterized as a set-up of systems, which are determined by systems' elements, i.e. components, and their *numerosity* as well as their correlations […]. Interdependencies between elements can create *nonlinearity* via *feedback loops*. Because of a *lack of central control* these systems exhibit *spontaneous order*, which also leads to a certain level of robustness. The level of robustness can differ between the systems […]. The *emergence* of higher levels of organization through the interaction of systems creates a *hierarchical* structure of systems within complex systems. A biological organism is such a complex system, its elements, or components, are the organism's cells; likewise, cells are complex systems […]".

standardization that concern its material components and are completely absent in the former. Contrary to what happens with ecosystems flourishing, an intensification and complexification of activities is achieved within modern socio-technical systems through technologies and communication protocols that create a kind of underworld made of standardized currencies (e.g. information bits, energy units, time units, monetary values, etc.) on whose exchange the overt systems rely[10]. In addition, when it comes to explaining the deep uncertainties affecting the evolution of socio-technical systems, ecosystem thinking becomes practically useless. Complex systems principles drawn from the observation of physical phenomena cannot indeed tell anything about human violence, desires and the way in which these drive change within systems where humans are involved.

However, the most important difference between human-made complexity and natural systems complexity is represented by the role that "control" plays in the former. Social systems complexity has always been generated, among other things, by how societies have tried to control themselves from the outside. In the past, this has happened through imagined deities or by looking for universal laws to maintain and reproduce the natural order. Contemporary societies try instead to achieve control by establishing extensive communication and surveillance systems whereby it is assumed that imagined social development scenarios can be implemented, or that demand and supply of services can be constantly matched, or that social-ecological systems can be closely monitored. Though natural systems show that control cannot be exercised

[10] When focusing on the interface between this underworld, the upper world made of functions reproduced by people (e.g. walking, listening, speaking, but also products purchasing, text processing, etc.), it becomes interesting to observe how these functions are being progressively reproduced through computer run information by creating kinds of artificial prostheses. As discussed in Labanca (2017), this result is achieved by adopting arbitrary solutions to otherwise unsolvable allocation tasks that magnify some aspects of these functions and neglect others, allowing the mocking of them by running pieces of standardized computer software. Functions reproduction through these pieces of information inevitably entails a *discretization* and s*tandardization* of an otherwise continuum spectrum of unique functions that human beings and nature can generate. Human-made complexity seems to increasingly invite us to take arbitrary decisions in relation to these types of unsolvable allocation problems.

from the outside and prove their vitality precisely by adapting to unexpected exogenous changes, contemporary societies presume that they can transcend themselves by driving the increasingly complex socio-ecological systems they have created[11].

In this respect, it is for example very hard to understand how complex systems scientists and scenario developers typically pretend to apply phenomenological principles like those of resilience, adaptability, diversity and self-organization (as derived from the observation of natural systems that do not exercise any form of control outside their physical boundaries[12]) to develop exogenous management strategies relying on close surveillance of large, if not planetary, socio-technical systems[13]. These strategies are reminiscent of the behavior of persons who conduct themselves based on what they can observe in a mirror that constantly reflect their image (See Figure 1). This kind of human-made complexity seems to enclose people and their environment in a kind of hall of mirrors where the self-referencing and large-scale control practices developed to cope with unexpected events acquire a masturbatory character and, as explained in following sections, become inevitably destined to generate paradoxical situations.

[11] Global trends presently observed towards implementation of biosecurity measures most probably represent just one dimension of this multifaceted phenomenon.

[12] On this point see e.g. Maturana & Varela (1980). Considerations being presented here have matured after having attended a presentation held by Mario Giampietro. See the presentation entitled "The problems experienced by conventional scientific approaches because of complexity" as available at https://e3p.jrc.ec.europa.eu/events/workshop-extreme-events-and-energy-transitions-tackling-challenges-climate-change-integrating

[13] See e.g. Moench (2014). Strategies like the ones mentioned in the present paper are now being proposed to increase resilience of medical systems against future pandemics. See e.g. Tsipursky (2020).

Figure 1: Contemporary human-made complexity

Therefore, there are good reasons to think that attempts to create an external referent through auto-referential approaches drawn from ecosystems phenomenology can be both misleading and highly dangerous.

4. How We Lose Sight of This Key Difference

Three interlaced factors are mainly responsible for the blurring of key differences between contemporary social systems complexity and eco/physical systems complexity.

The first factor is a programmatic blurring of boundaries between living and not living beings. Complexity science is indeed rooted in cybernetics whose reductionist aim is the study and development of common communication and control mechanisms operating among and within machines, humans, and biological entities in general.

The second factor is represented by the ambivalent role played by 'information' and by how it has blurred boundaries between everyday life and laboratories. As explained in Poerksen (1995), information has undertaken a round trip started from everyday life during the second decade of the 20th century. At that time, information still only made sense through human action.

It had several meanings and could take additional ones depending on how it was used in a context by people. Its three basic meanings were generally related to *instruction* (in the domain of education), *inquiry, investigation* (in jurisprudence) and *message, report, evaluation* (probably in the area of institutional assignments). When it reached the laboratories of cyberneticians and biologists around mid-20th century, its meanings were completely reshuffled. There, information became a measurable and autonomous entity that can equally regulate the functioning of organisms and machines without needing any person who reads it. Its new and very abstract meanings became those nowadays associated e.g. with genetic information, information bits, information entropy. Subsequently, this cybernetic version of information returned to everyday life and was popularized as the constituent of everything in the world around us. In colloquial language, information has become in this way a kind of floating signifier without signified. It can nowadays acquire a variety of connotations depending on the associations it evokes, but it does not designate anything people can have experience of in everyday life because the place where it is defined is elsewhere.

Key differences between natural and human-made complexity have gone therefore out of sight by unduly positing an identity between information made and everyday life entities. This has been made possible by a neglect of boundaries and differences existing between laboratories and outside world that has involved both the material and the discursive level.

Finally, a third factor is represented by the ritual enactments I discussed earlier. Permanent participation in the above-mentioned ritual generates a kind of collective blindness to existing contradictions between what is expected from ritual actions and what can be actually achieved through them. Ivan Illich has described this kind of blindness as akin to the ritual of the rain dance where, rather than questioning the underlying logic, participants attribute the failure

(i.e. the fact that rain does not come) to a dancing that is not properly performed. Societies engaged in complexification are living under the illusion of generating an indefinite and artificial multiplication of natural entities through cybernetic information and associated technologies. In the face of unexpected manifestations or disasters, they do not question the possibility of keeping this multiplication under control. Instead, they react by extending and fine-tuning information feedbacks to supposedly improve their control capability. This reaction can generate disasters as serious as those sought to be prevented and engagement in this kind of ritual can literarily drive people crazy.

5. Human-made Complexity Seen Through Its Extremes

Increasing complexification of socio-ecological systems[14] is responsible for the increasingly frequent materialization of large-scale correlations and dynamics that can put the survival of these systems at risk. Phenomena like climate change, pandemics, energy systems black-outs, financial crises, etc. can be included among those. Developments that have been occurring since the 1940s indicate that these systemic crises are being increasingly considered as events to which we inevitably have to adapt. Rather than focusing on *prevention*, societies have quite recently moved to developing strategies to *prepare* for inevitable systemic crises and have, at the same time, created the conditions that make these strategies more and more necessary. In the aftermath of the atomic bombing of Hiroshima and Nagasaki[15], we became conscious that humans can generate events capable of destroying themselves and have started implementing countermeasures based on extensive anticipatory surveillance. Another significant step has been made with the end of the Cold War during the 1990s when Western societies transitioned from a

[14] A description of what is meant by socio-ecological systems is provided e.g. in Glaser et al. (2008).
[15] See Arney (1991).

social imaginary of liberation from one main enemy (the so called "Evil Empire"), to an imaginary based on ideas of diffuse uncertainty, unpredictability, instability and vulnerability whose construction has been shaped also by the terroristic attacks of the 2000s. Patrick Zylberman has mapped this transition in the field of war from approaches based on risks calculations to those based on surveillance, alert systems and scenarios developed through imaginative exercises and games carried out by key stakeholders.[16] Since then, many other similar global strategies for a large variety of extreme events have been created including the Global Outbreak Alert and Response Network being developed by the World Health Organization since 2000 to respond to threating pandemics[17]. It is through such transformations that, among others, disease mutated into a national security threat[18].

These transformations mark the definitive entrance into a complex systems age that accepts the intrinsic vulnerability of societies. By adopting this posture, societies accept that rather than prevent extreme events or engage in precautionary strategies against calculated risks, they must prepare to face inevitable catastrophes. With complexity, societies somehow enter a new and paradoxical logic of war without an enemy. It is as if they must constantly live under the menace of a very dangerous enemy that cannot be known beforehand[19]. When you know that a catastrophe is coming, but you don't know exactly when, from where and how it will come, the only thing you can do is to try to prepare for what you imagine might happen while remaining

[16] I am drawing here from Zylberman (2013) and the interview available at https://www.iris-france.org/43427-la-politique-de-securite-sanitaire-du-monde-transatlantique-vers-ou-nous-mene-la-logique-du-pire/

[17] For an overview, see e.g. https://climate-adapt.eea.europa.eu/metadata/adaptation-options/establishment-of-early-warning-systems. For an interesting analysis of how techniques initially developed in the military and civil defense have been extended to other areas of government intervention and research in the US context, see Lakoff (2007) pp. 3-4.

[18] Lakoff (2007), p. 15.

[19] On this point see e.g. what is reported in Lakoff (2007), p. 2.

constantly alert by expanding your surveillance systems as much as you can[20]. Most probably, the ongoing expansion of scenario building exercises and of surveillance systems represents the reaction of control addicted societies to unpredictability and increased perception of vulnerability[21]. If this is the case, strategies and emergency measures being implemented as a reaction to the current pandemic have to be considered on a time horizon that goes well beyond the systemic crisis of the moment. What I discuss in the next sections shows that, rather than reactions to a single event, these strategies and measures reveal permanent paradoxes of contemporary human-made complexity.

6. Facing Pandemics by Enacting Human-made Complexity Paradoxes

a. Managing the Unexpected

Complex systems approaches are framing the actions and reactions by experts, governments, business and civil society during the current pandemic. Two aspects emerge in this respect very clearly. The first concerns the application by experts and governments of a logic of "flows-in and flows-out" that is based on the extensive employment of surveillance and monitoring systems and that is typical of complex systems approaches. Whether it is the question of "flattening the curve" of contagion or of deciding how many persons can have access to so-called intensive care in hospitals in case of infection, the underlying logic is that of the management of demand and supply, which is applied in many areas including on-demand

[20] Possibilities disclosed by current technologies are generally shifting the focus of techno-science from prediction to surveillance and algorithmic elaboration. This shift is particularly evident within behavioral science, but can generally be detected also in geography and in many other areas studying social processes. What is generally happening is also a progressive enlargement of spatial scales of the phenomena being addressed, e.g. through big-data. This enlargement is being necessarily accompanied by a progressive reduction in the possibility to predict the temporal evolution of addressed phenomena.

[21] On this point see again Lakoff (2007).

products manufacturing, energy systems management, etc.[22] Complex systems approaches typically reduce a given problem to one of resource flows management by identifying the system at stake with a kind of water supply network whose flows have to be controlled by selectively opening and closing its faucets.

The second aspect concerns how indications received from experts on measures to prevent contagion have changed with time (for example in relation to the need to use masks, or to keep given distances from other people, or to the contagiousness of the virus). Part of these observed and highly distressing changes are doubtless due to a still incomplete knowledge of the coronavirus, of its transmission mechanisms, etc. However, it should not escape attention that information to be provided by experts has also to obey the above mentioned managerial logic based on estimates of available resources and of the number of potential "consumers" these can satisfy. From that point of view, the fact that experts may decide to not indicate that masks can potentially help prevent contagion in a phase when their supply is not able to fulfill potential demand and encourage to employ them when the available supply has been rendered sufficient, becomes much more understandable.

Behind complex systems there is no *truth* to be discovered besides the socially constructed and variable constraints established within their supply chain. They generate a kind of sudoku game[23] whereby processed resources are allocated to people according to variable and sometimes hard to uncover rules, which are the outcome of a social construction reflecting how the different parts of the system have to fit to each other. What is becoming increasingly evident

[22] I owe this observation to Sajay Samuel in his enlightening text, "On Corona Days." For further information on the complex systems approaches being described here see e.g. Forrester (2013).
[23] On this point see Giampietro et al. (2012). Chapter 7.

during this crisis is that, if these rules establish that you be forced to go out of the game, you might be condemned to death.

This situation reflects a first paradox related to how people relate to the *unexpected* in the complex systems age. The *unexpected* has always represented both a source of creativity and destruction for individuals and collectivities. It is not accidental that the main research question complexity science aims to answer relates to how living beings cope with the unexpected[24]. By trying to find operative answers that can be equally applied to machines, humans, animals and societies, this science closely echoes questions that for centuries have created disquiet among philosophers who speculate on the dyadic relationships linking stability and change, identity and difference, potentiality and actuality[25]. What has radically changed since Aristotle is that at his time people were still assumed to relate to the unexpected with a feeling of hope, openness and a capability of being constantly surprised while coping with its pleasant or unpleasant manifestations. At that time, the unexpected still had a strong *exogenous* component.

Hope, care and sensibility have nowadays been substituted by *expectations* from science. The curious thing is unfortunately that, in the age of complexity, the unexpected becomes mainly *endogenous*. It mostly comes from the inside of societies due to how they have created global and increasingly interconnected socio-technical-ecological systems that make their management practically impossible, as small perturbations generated in any part of these systems can unpredictably and ever more frequently amplify and propagate through them. Despite science and the extensive technologies that have expanded monitoring and surveillance capabilities,

[24] See for example, Weick & Sutcliffe (2015).
[25] See Aristotle's *Physics*, *Metaphysics*, *Nicomachean Ethics* and *De Anima*.

policy makers cannot have certainties[26] on the evolution of complex systems. With complexity, we are, therefore, induced to live within the paradox of looking for strategies, procedures and mechanisms that can be individually or collectively operationalized to manage the unexpected, while it is complexification itself that is determining an ever more frequent generation of unexpected systemic events[27].

The adopted strategies generally consist of the following five elements: 1) development of scenarios by key stakeholders; 2) implementation of technological solutions enabling the detection of early warning signals of the forthcoming crisis; 3) increased support for basic research into the determinants of extremes; 4) identification and neutralization of critical situations emerging during the crisis; and 5) reconstruction[28]. The lamentable irony is that in a complex environment these strategies can cause disasters as grave as those for which they should prepare. As already noted, scenarios that can be conceived to face extremes can in no way be considered as the outcome of calculated risks. Moreover, the irony of extreme events is that, among all the scenarios that might be considered to be prepared to future events, they prompt the selection of the *worst-case* scenarios[29]. The more intense and disruptive the expected impacts of an event, the more important it becomes to be prepared for it, even in case the estimated chance

[26] This has become particularly clear since science and policy have started dealing with climate and other systemic dynamics that, by their nature, cannot be addressed through counterfactual approaches. Counterfactual approaches are intervention approaches whose effectiveness can be assessed by comparing what actually happened with what would have happened in the absence of the intervention. Unfortunately, these approaches cannot be applied in case of systemic dynamics because we do not have another planet earth to perform this comparison.

[27] One aspect of this paradox concerns the huge efforts usually spent to identify single events and responsibilities that might have triggered systemic crises (see e.g. efforts being spent to understand where and because of whom the current pandemic might have been originated). While leading to neglect that systemic crises emerge primarily because of strong and intricate couplings that constitute complex systems, these efforts induce to forget that the identification of triggering events in a complex environment might be impossible or even nonsensical.

[28] These elements have been derived from existing literature on management and complex systems (see e.g. Schoemaker, 2004), from https://www.iris-france.org/43427-la-politique-de-securite-sanitaire-du-monde-transatlantique-vers-ou-nous-mene-la-logique-du-pire/ and from Lakoff (2012).

[29] See what discussed on this point in Zylberman (2013). An example of how worst-case scenarios are usually implemented to be prepared to pandemics is provided also in Lakoff (2012).

of its manifestation will be assumed to be relatively small and preparation will prove extremely costly. Constantly living under the worst-case scenario might however entail the creation of very strong and intolerable social constraints put in place because of a devastating threat whose materialization remains uncertain.

In addition to the intrinsic uncertainties of scenarios, there are uncertainties associated with the information provided by surveillance and early warning systems. These can make this information highly inadequate to decision making, notably when decisions concern actions that might affect the survival of whole nations or of the entire planet[30]. A very serious danger of this complexity is therefore either that actions with devastating effects are undertaken based on unfounded information or probabilities, or that increasingly frequent and devastating events suddenly emerge without detection or foreknowledge. Societies should more honestly reflect on the actual possibility of being prepared for global disasters in a complex systems world where a sneeze[31]in Italy can quickly cause a catastrophe in New Zealand; and where the next pandemic might have ten or twenty times higher mortality rates.

[30] In 1956, four independent events happened in a short period of time and risked to set in motion the NATO plan to unleash a nuclear attack (a radar picked up a flight of jet aircraft over Turkey, one hundred soviet MiGs were reported over Syria, a British Canberra bomber was downed in that area and the Soviet fleet sailed through the Dardanelles). All these events were luckily discovered to be independent and benign by a concerned general before the activation of the NATO plan might have been possibly detected by Soviets monitors and generated a dangerous escalation in the American and Soviet alert systems (see Arney, 1991, p. 108).
In January 1976, the Centers for Disease Control (CDC) in US reported that a soldier at Fort Dix had died of an unfamiliar strain of swine flu and that there were several other cases of same flu. After a CDC meeting held on March 10, CDC officials decided for a technical option that had never been available for similar events before: vaccination of the entire US population. Fields trials of the vaccine were launched in April. By June the epidemic had not yet appeared, but the vaccination program began on October despite major logistic problems. On October 11, three elderly vaccine recipients died soon after receiving their shot. By December 40 million citizens had been immunized despite in the meanwhile it had become clear that the expected epidemic would have not come. Health officials reported multiple cases of Guillain-Baré Syndrome, a sever neurological condition among vaccines and the Times editorialized: "Swine Flu Fiasco" (see Lakoff, 2007, pp. 6-9).
In 2009, the closure of schools and the mass prophylactic administration of Tamiflu in response to a novel influenza virus (H1N1) brought costs, risks and disruptions outweighing those wrought by the virus itself (see Barker, 2012).
[31] A "sneeze" metaphorically explains how a small perturbation can quickly propagate within strongly coupled complex systems. A sneeze can also literally generate a viral load which propagates coronavirus from a country to another through the transmission chains of present complex systems.

b. Isolating Interconnection

Global supply chains and information networks constituting contemporary complex systems are not only highly interconnected but also physically separate people from others and from their local environment. The internet brings people together virtually while favoring physical isolation from next door neighbors. The TikTok generation is separated from "Instagram" people, grandparents are isolated from grandchildren, just as cities are separated from the nearby countryside. While enabling forms of socialization where individuals remain constantly apart, social practices associated with these networks are generating, besides undeniable benefits, hypermobility, deep inequalities, and polarizations within social groups and territories together with new forms of surveillance.

The potentially disastrous consequences of these *antinomic dynamics* (of increased separation and increased interconnection) are now coming to the foreground and the current pandemic is just one of them. Somehow the present pandemic might also have created the best conditions for their long-term consolidation. The atomized interconnectivity enabled by present communication technologies might be ideal to re-start markets growth and associated intensification of material, energy and persons flows in a world where people have to stay continuously isolated from each other. It is, in principle, even possible to conceive a very dangerous situation of positive feedback loops between systemic crises and expansion of what might be named "a distancing interconnectivity". An initial push towards distancing interconnectivity as achieved for instance through biosecurity measures, teleworking, digitalization of health services, etc., could enable the intensification of global flows which would then provoke further systemic crises. It is not fanciful to assume that the managed prolongation of the pandemic, besides hopefully saving lives, can increase the possibility of

these mutual reinforcements. At the same time, it should not escape attention that increasingly isolating interconnection goes exactly in the opposite direction of changes needed to prevent intensification of systemic crises, these changes being generally represented by an *intensification of local* and meaningful productive and re-productive social interactions that, while reducing social distancing, can *reduce large scale* material exchanges.

c. Rational Irrationality

Human-made complexity leads societies to a world where rational and selfish behaviors may accumulate to produce outcomes which are opposite to what is expected. These perverse situations emerge during crises when people adopt selfish behaviors that can put collective survival at risk. So-called panic buying of personal protective equipment and toilet paper as often observed during the current pandemic are examples of this kind. Such "rational" and selfish behaviors by populations might also adversely affect societies when a vaccine for coronavirus is produced. In this case the hope can only be that current fears, the climate of urgency and competition created around on-going research for a vaccine and the huge economic interests at stake will not determine the type of situations being discussed here.

Then there are the similar, more permanent, though not sufficiently discussed effects generated by increasingly isolating interconnection. The solution of non-cooperative games[32]

[32] As reported at https://en.wikipedia.org/wiki/Prisoner%27s_dilemma, "The **prisoner's dilemma** is a standard example of a game analyzed in game theory that shows why two completely rational individuals might not cooperate, even if it appears that it is in their best interests to do so […]".
Two members of a criminal gang are arrested and imprisoned. Each prisoner is in solitary confinement. The prosecutors lack sufficient evidence to convict the pair on the principal charge, but they have enough to convict both on a lesser charge. Simultaneously, the prosecutors offer each prisoner a bargain. Each prisoner is given the opportunity either to betray the other by testifying that the other committed the crime, or to cooperate with the other by remaining silent. The possible outcomes are:

- If A and B each betray the other, each of them serves two years in prison
- If A betrays B but B remains silent, A will be set free and B will serve three years in prison

represented by the Nash equilibrium is usually used to explain how, contrary to the Smithian presumption that selfish behavior leads to collective wellbeing through an invisible hand, individually rational behaviors can produce a collectively bad outcome. Non-cooperative games are a kind of congestion game[33] where rational and selfish players act according to rules that disallow knowledge of the decisions taken by other players and thereby damage themselves and the collectivity.

Increased complexification of sociotechnical systems is what can nowadays create the situations modeled by these games. To address this kind of irrational rationality by adding visibility (e.g. through additional data flows) is the paradox of solving the problem of human-made complexity by adding complexity. Human-made complexity cannot unfortunately produce any kind of collective intelligence. This should raise serious doubts about the possibility that trends towards increasingly isolating interconnection encouraged by the pandemic can foster the kind of politics, collective learning processes, and social activities that help societies face the global challenges looming on the horizon.

d. Relying on Invisibles

When referred to contemporary complex sociotechnical systems, it is very hard to reject Rosa Luxemburg's thesis of the original accumulation of capital[34]. This thesis tells us that the imperative of systems' growth and expansion prompted by capital relies on the free

- If A remains silent but B betrays A, A will serve three years in prison and B will be set free
- If A and B both remain silent, both of them will serve only one year in prison (on the lesser charge).

Because betraying a partner offers a greater reward than cooperating, all purely rational self-interested prisoners will betray the other, meaning the only possible outcome for two purely rational prisoners is the worst possible for both.

[33] These games simulate situations described by the *Braess' paradox* where adding one or more roads to a network can slow down the overall traffic flow through it.

[34] I owe this insight to Robert (2009). See section of chapter 4 discussing how to re-establish the broken relationship between the emerging forms of complexity and their base.

appropriation of natural resources and of non-capitalist modes of life made of subsistence practices and material cultures whereby populations have managed to carry on under conditions of relative autonomy for millennia.

Delegation mechanisms whereby global supply chains are nowadays realized together with their wide geographical coverage and intricacy renders this appropriation invisible to most of the people integrated therein. Their extractive nature is typically obvious when looking at the peripheries of these chains where the extraction of primary material resources used to fabricate supplied products takes place or when new opportunities emerging for the global market alters the material culture of involved communities[35]. Growth driven extraction of economic values from goods and resources freely available within nature and cultures does not however only takes place in peripheries. It is also evident in the cities and resources of so-called developed countries, where the extraction of shadow work[36] is a necessary support for the production and use of industrial products. In general, shadow work concerns all those informal activities still entailing a certain degree of autonomy, gratuity, and human care for other people and the natural and technical environment, as for instance activities ensuring physical health as carried out by nurses, cleaning ladies, etc., or activities carried out by people providing maintenance of machineries, local farmers, physicians, and, more generally, activities linking the body of people to other people and the body of people to the earth.

The current pandemic is making visible these invisible foundations of the modern economy. It is even possible to hypothesize that the visibility of these foundations (and that of

[35] These alterations can lead to increased activity and are not necessarily affecting involved communities for the worse. You might however think of what happening with Coltan extracted from mines in Congo and used worldwide for high-tech devices.

[36] Shadow work can be defined as "that entirely different form of unpaid work which an industrial society demands as necessary complement to the production of goods and services" (see Illich, 1981, pp. 99-100).

the human potential constituting them) increases with the number of social practices that are reconfigured to compensate for the interruptions caused by a virus. However, measures implemented to counteract the pandemic will likely cast these foundations back in the shadows. Thus, the actual starting point to conceive serious alternatives to present ways of life and any truly preventive measure against future extreme events will be hidden precisely when they are most needed. This paradoxical situation results from integrating the above- mentioned practices into the abstract and reified entities that are the key contribution of techno-science and constitute complex systems (e.g. monetary values, energy units, time units, information bits, molecular codes and combinations thereof). Rather than being retreats as the very peculiar abstractions they are[37], these entities are taken to be equivalent to any of the other actual entities people deal with during their everyday life.

Human-made complexity generates therefore a paradoxical inversion between materiality and immateriality. Increased complexification of social systems takes place by giving further reality to immaterial abstractions and this happens by rendering the role of material and bodily entities increasingly invisible within these systems even though the reliance on them grows in proportion. The increasingly material invisibility that subtends the expansion of the visibly immaterial should be carefully considered in public policy, as for instance, when governments pump cash into economies to counter the expected impacts of coronavirus[38].

e. Deadly Vitality

[37] As pointed out by Robert for monetary values, although presenting themselves as objective data, these abstractions represent exteriorization phenomena, kind of co-ordination agreements among a multiplicity of individual acts. As such, they are hence not provided with an "ontological autonomy". Robert mentions in this respect the example of the shape of the "flame of a candle" which can exist only as long as there is a material flow that dissipates within. See Robert (2009).

[38] For an interesting description of monetary policies being currently implemented see e.g. https://www.ampcapital.com/europe/en/insights-hub/articles/2020/april/magic-money-tree-qe-and-money-printing

Human-made complexity most probably consists of mutually reinforcing homeomorphisms which are artificially established and maintained among the realms of economics, physics, biology[39] and, more recently, information science. In the complex systems age, the concept of life is operationalized by science through ideas of molecular codes and processes of homeostasis where biological organisms emerge from self-organizing dissipative structures according to mechanisms which are homeomorphic to those whereby the input and dissipation of energy enable the emergence of convection cells within heated water or the value of commodities is generated within markets. Everything becomes a matter of circulation, interconnection, stability and instability.

As discussed by Nicolas Rose[40], in the age of complexity, viruses, pandemics and associated biosecurity concerns contribute to generate a scientific vision of life and the human body as made of sub-cellular processes. Similarly, Kezia Barker[41] argues that in the biosecurity context generated by viruses and pandemics, life becomes "molecularized" and characterized and constituted through circulation and interconnections established among molecules and micro-organisms. In this perspective, the distinction between emergence of life and emergence of disease becomes very hard to be drawn, as "being healthy may not simply mean being free from pathogens, but a matter of immunocompetence; that is the ability to live with a variety of other organisms that are always in circulation"[42]. Diseases emerge and dissipate as viruses circulate, drift, mutate, evolve and re-assort. Because diseases occur through "a continuous mixing and

[39] This hypothesis is taken from Mirowski (1989).
[40] See e.g. Rose (2007).
[41] See Barker (2015).
[42] See Hinchliffe (2001).

enmeshing – of bodies, environments, hosts, viruses"[43] the divisions between life-forms and the divisions between conditions of health and disease are blurred by the circulatory model.

This circulatory view where life and diseases emerge from mobility and interconnections automatically leads to the typical uncertainty regime and control approaches associated with complexity. Due to this kind of complexity, generation of microbial disease becomes highly unpredictable and this situation calls for the implementation and constant maintenance of the emergency strategies to manage the unpredictable. The move to this complex systems perspective entails then a process of internalization already discussed. Rather than being an external threat disease becomes an internal threat. Rather than an exogenous factor, disease becomes endogenous. This aspect is particularly important in the light of the mutual reinforcement existing between capital circulation in markets, matter circulation in physical networks and molecular codes circulation within and among biological bodies. As pointed out by Barker, a focus on bodies as hosts of disease reveals how circulation of capital, circulation of physical bodies and circulation of disease can reinforce each other in several ways. The increased circulation of capital which is linked to the manipulation and circulation of animal bodies (as happening for instance with intensive farming) can indeed generate the conditions for disease emergence. This fact points to an existing contradiction and possible counterproductive character of biosecurity practices that are informed by neoliberal approaches and focus on sorting and reinforcing desired circulations by enclosing them within "disease-free conduits"[44]. Rather than an external threat, disease generation is also an internal threat and a distinction between disease production and distribution can therefore become impossible because circulation

[43] Barker (2015), p. 359.
[44] Barker (2015), p. 358.

has its own productive potential. The creation and extensive diffusion of disease-free conduits might therefore serve to generate the very problem they apparently aim to solve.

The mutual reinforcement that can occur among capital circulations, physical bodies circulation and microbes circulation can become even more perverse. As stated by Barker, "by removing problems of scale, flowing easily across territorial boundaries and trade barriers, and through the ever-generative rationalities of anticipatory action, enjoying a constant and limitless captive market, [viruses and microbes] might well be regarded as the ideal commodity"[45]. Capital circulation is therefore not necessarily impeded by viruses and pandemics. Under specific conditions, the persistence of viruses might even enhance this circulation. The amount of technologies and profits involved in a construction of a technocratic answer to ever more frequent viral events are hence sufficient elements to be concerned about the biosecurity exercises that are being carried out during the current pandemic. When life becomes just a matter of increasing circulation, either secured within virus-free conduits or not, it inevitably becomes source of ever more frequent diseases. The paradox of the circulatory view associated with social complex systems vitality lies in how this vitality can suddenly and unexpectedly turn into death of the whole system.

7. Little Inspirations to Escape Extremes by Escaping Human-made Complexity

a. Proportions Re-established

As Jean Robert has pointed out[46], to have a tsunami you need a sea that is sufficiently large. You cannot have a tsunami in a pond or in a lake. A tsunami needs hundreds or thousands of kilometers to achieve its momentum. In the same way, extreme events like pandemics need

[45] Barker (2015) p. 361.
[46] Robert (2009). See the concluding section of chapter 3.

very extensive and closely interconnected networks to spread out. The condition *sine qua non* for the generation of an extreme event in a system is represented by its achievement of given critical dimensions. Jean Robert refers in this respect to the concept of social morphology as introduced by Leopold Kohr[47] to frame systemic problems as problems generated by disproportion within modern societies. He notes how, in the same way as horses and human beings could not survive if their size were two or three times bigger, social institutions and associated service infrastructures cannot function properly if too big because they end up generating problems that cannot be dealt by their members. Kohr's theory of social morphology represents a warning about the fact that most of the greatest threats for societies are generated by issues of excessive dimension that cannot be dealt by people. It can therefore be argued that, rather than by increased interconnection, a wiser approach to prevent current and future extremes is represented by some kind of re-scaling and down-sizing of service infrastructures to allow that most of the problems generated by these infrastructures can be easily dealt with at the level of household, district or city.

b. Re-Composition

Human-made complexity generates invisibilities and inversions between worlds made of abstract flows of information, energy, material resources and the world people can experience through their body and their senses. At the same time, it determines a condition of interconnected isolation while re-designing geographies of cities, rural areas and their mutual relationships. These separations have to be recomposed through a return to *earth* that can bodily re-connect people to people and people to their environment. This return to earth passes necessarily through

[47] See Kohr (1957).

a revised relationship with food and rural areas that should be informed by principles of increased autonomy and new notions of usage.

The fact that farmers and people generally involved in agricultural activities to sustain bodily life are often subject to level of exploitations bordering enslavement represents an astonishing aberration. Our personal relationship with earth and the territory needs to be completely revalued by enabling higher level of autonomy and lower level of instrumental use of natural and human resources compared to those currently generated by global markets. Intensive and homogenizing agriculture practices would have to leave the floor to material cultures and modalities of life that can re-design urban and rural areas by re-configuring their relationship to generate higher integration and intensification of mutual and socially useful exchanges. Artificial separations between demand and supply, producers and consumers, governors and governed which contribute to current situations of political and environmental stress must be re-composed and their re-composition most probably requires that the societal role of agriculture is fundamentally revised so that local farmers and farming can gain higher autonomy and dignity.

c. Fragility

Ideas of control as currently materializing from the planetary to the atomic scale need also to be radically revised. Energies and intellectual efforts should be devoted to imagine how the acknowledgment of the impossibility of driving global change can modify human action and its impact on our environment. A wider acknowledgement of this impossibility might for example serve to create higher awareness about the fragility of human life and environment, about the inevitable and constant risks to lose own dears, about inevitability of and need to give sense to death and pain, and hence about the necessity of having more care for all beings around

us and of relating to them with a sentiment of hope, respect and not appropriation due to the uniqueness they represent. It could serve to inform less leaning forward and less future oriented policy approaches that are more focused on preservation and history. It could serve to rediscover the Epimethean ethos of hope and trust in the goodness of nature against a Promethean ethos of planning and control[48].

8. Closing

Human-made complex systems consist of relational entities constituted through information flows. Within them, stasis as well as material and energy storage represent an inefficiency while survival is a question of being equipped to be informed and quickly adapt to the latest changes of an ever-changing environment. The hypermobility induced by the mutually amplifying cycles of monetary, material and information flows generate a blind industriousness where the production of single means enables the achievement of a multiplicity of ends rendering these means necessary irrespective of their actual usefulness or harmfulness for people. Governments, notably those that seem to better keep the pandemic under control, appear eager to re-start and reinforce capital, goods and people circulations augmented through a biosecurity paradigm. Either a vaccine for coronavirus will be finally produced or not, it is not unlikely that already existing biosecurity measures will have to be strengthened to create virus-free conduits wherethrough these circulations can increase in a context of augmented insulation from the external environment. These measures will probably produce effects of life suspension not so different from those nowadays experienced by world populations for the first time because of the lockdown.

[48] See Illich (1971).

The suspension through insulation represents a perversion of another type of life suspension that deserves careful consideration. The former type of suspension is a manifestation of the expansion of biopolitical regimes aiming to regulate every aspect of private and public life. Coronavirus is just one of the systemic events whereby this expansion is being realized. No matter whether they are supposed to produce or to prevent global disasters for humanity, climate change, the transition to renewable energies, or cyber and bio-terrorism might for example also induce stricter biopolitical control of people's actions. No less jeopardized are the dominant social imaginaries that rely on an ethics of work and ideas of freedom that function by integrating individuals' desire and the possibility of self-realization into competitive markets. For many decades, these ethics and ideas have contributed to progressively reduce human life to production and consumption activities and have legitimized the expansion of enabling biopolitical interventions.

In such a context, a political claim to suspension, inactivity and contemplation could instead at least partially deactivate biopolitical power and pave the way for a politics that prevents a temporary interruption of production activities from putting societies' survival at risk. It is probably under a suspension perspective that notions of sharing and usage without appropriation of natural resources might take hold within new types of communities revealing the fundamental role suspension can play to open up new possibilities for societies and well-being.

As pointed out by Giorgio Agamben, a proper human life is the one that makes human beings' works and functions inactive and by doing so opens up new possibilities. "Contemplation and inactivity free humans from any biological or social destiny and from any predetermined

task and make them available to those absences of work that we usually call 'politics' and 'art'"[49].

The suspension enforced during the current pandemic has partially encouraged this contemplation and deactivation. As such, it could still contribute to disclose new possibilities for the future. If this will be the case, this will have been unfortunately achieved through forced reclusion, isolation and sufferance. If, as maintained by Aristotle and reminded by Illich[50] and Agamben, the greatest good for humans consists in the happiness arising from contemplation of themselves and of their potentiality to act, it should instead be hoped that societies will manage to create conditions that can render moments of deactivation desirable as a celebration of the human condition.

[49] Author's translation of the sentence available in Italian in Agamben (2018), p. 1279
[50] See the concept of *conviviality* understood as austere playfulness in Illich (1973).

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