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Recognizing the epistemic-frame in opportunity of the Zika pandemic.

Reconnaissant le cadre-épistémique dans l'occasion de la pandémie du Zika.

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La connaissance de la connaissance

Abstract

Reason takes a different particular form in each scientific discipline, and even another form in philosophy. The dialog between different disciplined forms, and between science and philosophy requires the reconstruction of the universal reason as a meeting place. In this report we communicate an actual dialog experience consisting in evidencing the contribution of the epistemic frame to our conception of the Zika pandemic and the relation of this frame with the so-called «surprises of Zika» which in fact challenges the standard epistemic frame.

Keywords

Subjectivity, biology, reason

Résumé

Raison prend une forme particulière différente dans chaque discipline scientifique, et même une autre forme dans la philosophie. La boîte de dialogue entre les différentes formes disciplinées, et entre la science et la philosophie nécessite la reconstruction de la raison universelle comme un lieu de rencontre. Dans ce rapport, nous communiquons une expérience de dialogue réel consistant à attestant la contribution du cadre épistémique à notre conception de la pandémie Zika et la relation de ce cadre avec les soi-disant «surprises de Zika» qui, en fait impugnate le cadre épistémique standard.

Keywords

Subjectivité, biologie, raison

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1. Introduction

The absence of epistemological awareness in the scientist has been repeatedly observed. Ortega and Gasset in his *Revolt of the masses* stated «In order to progress, science demanded specialization, not in herself, but in men of science. Science is not specialist. If it were, it would ipso facto cease to be true. Not even empirical science, taken in its integrity, can be true if separated from mathematics, from logic, from philosophy» (Ortega y Gasset, 1930). Husserl pointed out that the claimed objectivity of empirical sciences was only the result of the denial of the participation of the subject as Morin reminds us in his call for a Science with consciousness (Morin, 1984). Kant made clear the meaning of knowledge *:* «Understanding cannot intuit, and the sensuous faculty cannot think. In no other way than from the united operation of both, can knowledge arise.» (Kant, 1787). Thus, a «purely empirical science» is a science in as much science as it is associated with understanding.

It suffices to make an informal poll to reach the conclusion that today's biologists believe (and have been taught) that biology is a purely empirical science. The process of specialization that started at the same time than the industrial revolution has developed monotonically since then and has accelerated its rhythm since the envisioning of the «society of knowledge» (Bush, 1945), i.e., a society that obtains its largest profits mining accumulated knowledge. The situation by 1930 was already dim, we quote again Ortega y Gasset (1930) in his description of the specialist as an archetype of the mass «He even proclaims it as a virtue that he takes no cognizance of what lies outside the narrow territory specially cultivated by himself, and gives the name of "dilettantism" to any curiosity for the general scheme of knowledge. ... modern science, the root and symbol of our actual civilization, finds a place for the intellectually commonplace man and allows him to work therein with success. The reason of this lies in what is at the same time the great advantage and the gravest peril of the new science, and of the civilization directed and represented by it, namely, mechanization ... The solidity and exactitude of the methods allow of this temporary but quite real disarticulation of knowledge. The work is done under one of these methods as with a machine, and in order to obtain quite abundant results it is not even necessary to have rigorous notions of their meaning and foundations.» Clearly, the massive exploitation of scientific knowledge would only make things worse.

If we are to recover our complete human dimension a plan must be devised to regenerate wisdom and to counterbalance the deleterious effects of specialization. We need to recover the unity of reason and for this end we need a meeting place for the different (particular) forms of reason as they are exerted in the disciplines and furthermore, in the division of science and philosophy. Such a meeting place cannot be the instrumental reason (Horkheimer, 1947) which is precisely the component of reason that has been disciplined in correspondence with the diversity of circumstances. It needs then to be the undisciplined reason, the rebellious reasoning that search for the fundamentals : the critical reason. Is this plan/plot possible? Instead of a theoretically discussion of such an idea, a movement that would subsume it in the disciplinary realm of philosophy, I will tell the story of a practical experience that I have successfully repeated several times.

The Zika pandemic that began to develop in the Americas in the year 2015 and has reached most of the world by now. The world organizations, such as the World Health Organization (WHO), were taken by surprise. As a reaction to the perceived threat, WHO, and most governments, provided new funds to boost research on Zika and encouraged scientific journals to offer a fast track for the publication of the findings. The result of the stimulus has been an important flow of works, yet, to my knowledge, none of these works asked the questions : why Zika surprised us? why our expectations about Zika were wrong?

I will try to answer these questions by showing examples of the particular form in which the epistemic-frame (Piaget & García, 1989) currently in use in biology is not appropriated for understanding the life matters involved in the epidemy, and furthermore, that the epistemic-frame corresponds not to science but rather to technology. The method consists in showing precisely where the observations are transformed into facts, and how these facts are contradictory with the accepted body of science, including very close biological facts. Thus, from observations to conclusions there is a wide hiatus crossed not by reason but rather by resource to habits, introducing not only subjectivity but irrationality as well.

2. The Zika pandemic

2.1 Briefing about Zika virus

Zika virus (ZIKV) is a *flavivirus* of the *flaviviridae* family. It was first isolated in a sentinel monkey in the forest of Zika, Uganda, in 1947 (Wikan & Smith, 2016).

The *flavivirus* are RNA-viruses are composed of about 11,000 nucleotids (Wengler & Castle, 1986) and lack replication controls (Steinhauer *et al.* , 1992). In turn, this produces high variability of the virions, hence, viruses are better considered as quasispecies represented by populations of great diversity (Borderí a *et al.* , 2011). The rate of mutations for *flavivirus* is of about one mutation per copy (Ciota & Kramer, 2010).

The most common form of reproduction of ZIKV consists in a succession of replications in the tissue of a mammal (say human beings) followed by replications in a mosquito (*Aedes aegypti* and *Aedes albopictus* are the best known vectors of ZIKV). This particular form of life, in perpetual adaptation to two rather different hosts, is common to all the *flavivirus* transmitted by mosquitoes or ticks and operates as a particular selection mechanism (Villordo & Gamarnik, 2013 ; Villordo *et al.* , 2016). Dengue viruses (a close relative of ZIKV) losses the capability of infecting human cells after as little as five passages trough C6/36 (*Ae. albopictus* cells) in the laboratory (Villordo *et al.* , 2016).

2.2 Epidemic outbreaks

The first serious epidemic by ZIKV was registered in 2007. Wikan & Smith (2016) indicate «Before 2007, virological and immunological evidence suggested that although Zika virus was distributed widely in Africa and Asia, Zika fever was not a disease of substantial concern to human beings because only 14 cases had been documented worldwide, consisting of 13 natural infections and one laboratory-acquired infection».

The Zika epidemic outbreak of 2007 in the Pacific islands was slowly spreading disease (Gatherer & Kohl, 2016 ; Petersen *et al.* , 2016) and the associated neuronal damage was not detected timely (Cauchemez *et al.* , 2016). About 90% of ZIKV infections in the human being result in cases that do not require medical assistance, the remaining cases are mostly characterized by a febrile syndrome. Yet, it is important to understand that the epidemiology is changing. Wikan & Smith (2016) explains «The early clinical picture of natural human Zika virus infection was of a short duration, self-limiting, mild febrile illness that was accompanied by a maculopapular rash. In the first reported substantial outbreak of Zika virus infections, in Yap State in 2007, the disease was associated with rash, fever, arthralgia, and conjunctivitis, but no hospital admissions or deaths were reported. Similarly, the cases in Cambodia in 2010 and Philippines in 2012 were resolved without any hospital admissions. The cases in Thailand between 2012 and 2014 for which full clinical details were available were all classed as mild, with fever and rash as the main symptoms, and sore throat, muscle and joint pain, and headache as other reported symptoms. ... The outbreak in French Polynesia was associated with about 70 cases of severe presentation including Guillain-Barré syndrome, and other more severe pathological abnormalities have been associated with Zika virus infection, including meningoencephalitis in the Pacific Islands, and myelitis in Guadeloupe».

The epidemiology of ZIKV changed again by 2015 when the virus spread swiftly through the Americas (Petersen *et al.* , 2016). microcephaly in newborn children exposed to ZIKV as a fetus was first doubted (Tetro, 2016) but later confirmed by several studies, for example (Brasil *et al.* , 2016). ZIKV can also be transmitted sexually (Foy *et al.* , 2011 ; Barzon *et al.* , 2016). The persistence of the virus in the human depends on the biofluid or tissue in consideration and it goes from 10 days in blood (Osuna *et al.* , 2016) to more than six months in semen (Barzon *et al.* , 2016).

The mechanisms involved in the immunological system do not completely identify ZIKV and cross reactions with other *flavivirus* have been reported (Dejnirattisai *et al.* , 2016). This is a notorious mechanism within *flavivirus* already verified in dengue (Dejnirattisai *et al.* , 2010) and West Nile Virus (Hrobowski *et al.* , 2005) that gives rise to the «antibody dependent enhancement of infection» (Dejnirattisai *et al.* , 2016) responsible of hemorrhagic dengue. This mechanism must be suspected of being common to all the *flavivirus* since they present a number of proteins in common in their capside as well as similar regulatory functions (Munoz-Jordán *et al.* , 2005). To a good degree it is fair to say that the body recognizes *flavivirus* but not so easily the particular one being present.

2.3 The surprise of Zika

Because it was a mild and slowly developing disease ZIKV recieved no attention until it was suspected of being associated to microcephaly in Brazil. On February 1st 2016 the Emergency committee of the World Health Organization (WHO) declared a «Public Health Emergency of International Concern». The declaration was later followed by requests of increasing funding for research on ZIKV and other measures.

A surprise corresponds to a mismatch with our expectations, hence we must ask, is ZIKV so unusual or, on the contrary, are our expectations wrong? Blaming the virus is the easy and selfindulgent method that advances no knowledge, so we must consider the second possibility first. How were our expectations formed?

Knowledge in this matter has been constructed in two steps : First, a biochemical (genomic) classification of *flavivirus* was constructed based upon common chemical features of the quasiespecies that were accessible to our current technology. Thus, dengue, yellow fever, Japanese encephalitis, ZIKV are labels that refer to their chemical (partial) identity. The identity is necessarily partial since diversity is what characterizes virus quasiespecies.

Second, establish a function from the label into the information obtained by several forms of experiments and observations. There is no conceptualization in this scheme, it responds directly to experience and organizes experience according to the chemical label. We silently propose that the future is a slight variation of the past, in this form any change represents a surprise, we expect no changes because the label has not changed. The existence of such function must be challenged, for example, we have seen that dengue population selected by several passages in C6/36 have impaired the ability of replicating in human cells. Statements such as «dengue reproduces in human cells» is then severally questioned in as much as the true value of the statement depends on the population and/or preparatory manipulation. Another striking result is the answer to the question: can *Culex sp*. mosquitoes transmit ZIKV? (Ayres, 2016). Several studies were performed, their conclusion were: NO for the mosquitoes in our region (Aliota *et al.* , 2016; Huang *et al.* , 2016; Fernandes *et al.* , 2016) ; adn YES (Guo *et al.* , 2016). All of these works involved a few individuals the same mosquito species (*Culex quinquefasciatus*) and sampled once (three cases) or twice (one case) the virus population which was later replicated in Vero cells (green monkey cells) (NO results) and C6/36 (YES result). The details in Aliota *et al.* 2016 are not given. All of them appear to consider that location (country) is a relevant factor and none of them consider the preparation of the (statistically not-significant) one-sample of virus as a possible factor, despite that earlier work has indicated that preparation method is a very significant factor that can decide the outcome of the experiment (Villordo *et al.* , 2016). We must conclude that the question: can *Culex sp*. mosquitoes transmit ZIKV? is ill posed, it arises from a faulty epistemic-frame. The segmentation of science makes scientists ignorant even of results in their own field that are relevant for their investigation, moreover, the experimental design is faulty (improper use of statistics) but follows established protocols as Aliota *et al.* (2016) indicate.

3. Conclusions : Life is complex.

Life forms are not fixed in time, life is about change. The forms in which life manifests depends not only on the organism itself but on its environment (the complement of the organism in the Universe) as well. Life is about interactions and reciprocal influences that we call adaptation. Life is subject to random (not deterministic) influences. The logic of life is the logic of self-reproduction. The paradigm disclosed in this note ignores what life is and reduces life to an all encompassing chemical fiction. We call this fiction the biotechnological frame because its function is to allow the development of technologies in the laboratory that, by virtue of the all encompassing chemical identity of life, can be transferred, without further need of understanding, outside the laboratory, this is, to the market. The identified frame corresponds not to science but rather to technology. The mechanization feared by Ortega y Gasset is now present almost everywhere, with its particular forms in every instance.

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