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From Fighting against to becoming with: viruses as companion species

In 1346, the Black Death began to spread across Europe. Following improvements in navigation techniques and the establishment of contact between the American and European continents, the 15th and 16th centuries saw entire populations decimated by viruses such as smallpox. In 1683, Anton van Leeuwenhoek described what he called "animalcules", as seen through his microscope. More than a century later, in 1796, Edward Jenner developed the technique for vaccination against smallpox. In 1853, John Snow highlighted the role of water pumps in the spread of cholera, by careful investigation of different London neighborhoods.

In the 1860s, Louis Pasteur developed the idea that infectious diseases are caused by living organisms, which he called "germs", a theory taken up and validated by the work of Robert Koch, who, in 1876, identified the anthrax agent, *Bacillus anthracis*, against which Pasteur developed a vaccine in 1885. In 1892, Dmitri Ivanowski, who was working on the tobacco mosaic, proved the existence of tiny pathogens, identified in 1898 by the Dutch chemist Martinus Beijerinck and later renamed as "viruses". Between 1918 and 1919, the Spanish Flu caused twenty-five million deaths. It was not until 1937, and the invention of the electron microscope, that Ernst Ruska obtained the first image of a virus. Although in 1979 smallpox was considered to be permanently eradicated from the Earth's surface, in 1981, AIDS was identified as a new infectious disease. Its agent, the Human Immunodeficiency Virus (HIV), was isolated in 1983.

These dates mark the recent history of germs and humans, a history presented as a war, an arms race between species. Because of the success of germ theory, and through an obliteration of the more subtle interpretations of our relations with microbes, especially those developed by Pasteur himself, it is indeed through the metaphor of struggle that the relations between humans and microbes are most often not only presented, but also considered and analyzed. While the idea that bacteria can be classed as something other than dangerous pathogens is becoming increasingly widespread, in particular through emphasis on probiotics and the development of microbiota work in recent years, viruses continue to suffer from a certain form of ignorance which limits them to the role of mortal entities. Through their destructive and disruptive potential, viruses frighten and fascinate.

This metaphor has not changed, even though its uses have a profound impact on our ways of apprehending each other, whether in the field of science itself, in the theories and hypotheses developed by researchers, as brilliantly demonstrated by Evelyn Fox Keller (2002), or in the public and media spheres (Larson, Nerlich and Wallis, 2005). The use of metaphor, the assimilation of the virus as the foe which must be destroyed, and from which we must protect ourselves, has led, as Priscilla Wald has meticulously analyzed, to the construction of a constantly repeated narrative, the "outbreak narrative", structured around three major events: the emergence of infection, its spread via a global network of contacts, and ultimately its containment (or eradication as in the case of smallpox). These stories, far from being insignificant, affect our responses to the challenge of epidemics in a globalized world, and stigmatize individuals and populations, behaviors and lifestyles (Wald, 2008).

Yet the vast amount of data accumulated on certain viruses by many disciplines over the decades is matched only by our profound ignorance of them. Indeed, although some infectious viruses may be fairly well characterized, and although a whole corpus exists on a

handful of bacteriophage viruses that have become formidable tools for the development of molecular biology,¹ the diversity of these entities, their constitution, their ecology, their hosts and vectors, their characteristics and properties, not to mention their number, make them the most adaptable and the most widespread entities on Earth. If they are the ultimate parasites, then because they can rarely survive outside of their hosts, viruses are indeed everywhere, and most often totally harmless to humans. We thus develop unrecognized and complex relationships with them, which we are only just beginning to try to understand from a new angle.²

My participation in a colloquium on domestication offered the opportunity to work on these relationships and to renew our gaze on these entities. While the term domestication is generally used to describe our relationship with certain animals (for example, but not limited to, pets), and also with cultivated plant species, in this article I propose an interpretation of our relationship that is no longer based on the paradigm of struggle, but on one which leaves open the possibility of observing virus performance to show that, in turn, these affect the co-performances of humans and viruses.

In 2000, Joshua Lederberg wrote in the journal *Science*, "*Our most sophisticated leap would be to drop the Manichean view of microbes - 'we good, they evil.' Microbes indeed have a knack for making us ill, killing us, and even recycling our remains to the geosphere. But in the long run microbes have a shared interest in their hosts' survival: a dead host is a dead end for most invaders too. Domesticating the host is the better long-term strategy for pathogens*" (Lederberg, 2000: 287). Although Lederberg does not completely depart from the metaphor of the struggle in this excerpt - nor from the outbreak narrative described by Wald, going so far as to speak of "invaders" - domestication, presented as a quasi-military strategy, leads to a shift in the conceptualization of the relationships between pathogens and humans. The very use of the term implies for Lederberg the restitution of an agency to the microbes: they must domesticate humans, in the sense that they must learn to live with representatives of this species without destroying them totally, without annihilating them. They must adapt to them and to the resources they offer without overwhelming them. They must use them without destroying them.

Three viruses or types of virus are outlined below: the smallpox virus (*Variola major*), endogenous retroviruses and, finally, the viral archetype of our time, HIV. These three viruses or types of virus tell three stories, which reveal a generally ignored aspect of our relationship with pathogens, and surmount Lederberg's final obstacles, offering a history of reciprocal domestication for consideration. These three moments of reflection will then lead us to consider, in the wake of Donna Haraway, viruses as companion species (Haraway, 2008).

The Smallpox and the Spanish Conquest

The specific pathogenic virus/host relationship is subtle and extremely sensitive. It is ever-changing, and dependent on the performance of representatives of both species, as illustrated by the history of the Spanish conquest. One of the most incontrovertible examples of the dangerousness and destructive and disruptive potential of viruses and pathogens in general is,

1 See the Phage group's work, initiated by Max Delbrück.

2 For a philosophical approach to some of the questions posed by these entities, see the special issue of the journal 'Studies in History and Philosophy of Biological and Biomedical Sciences', coordinated by Thomas Pradeu, Gladys Kostyrka and John Dupré (2016).

without doubt, the one sadly offered by the arrival of Europeans in America, following the discovery of a new navigation route by Christopher Columbus in 1492. It is estimated that by the beginning of the 17th century, only one million of the eighteen million people who lived in Mexico before the Spanish Conquest had survived. The decimation of indigenous populations is of course explained by a complex set of factors. Firstly, by the way they were treated by the conquistadors, but also by their coming into contact with numerous pathogens, first and foremost smallpox.

Although the story of smallpox's introduction in Central America can be told in the context of an outbreak narrative and perceived as a human and viral invasion of a continent, against which the natives battled, there is another story to tell from the encounter between natives, colonizers and viruses. This second story has a more environmental context, and takes into account the long and shared history of Europeans and *Variola major*, and the properties of each agent. At that time, European populations were regularly affected by smallpox epidemics over several centuries. The repeated interactions of the virus with the populations had nevertheless allowed them to become progressively less susceptible to the virus. At an environmental level, the relationship between humans and viruses had been somewhat long established: the virus was part of the European environment, it was part of the community in the ecological sense (community understood as all species inhabiting a given space). On the other hand, the Amerindian populations shared no common history with the smallpox virus. Their brutal encounter with the Europeans was thus amplified by an equally brutal encounter with this virus (and others), making the latter an agent of the Spanish conquest.

The oft-mentioned question of the deliberate or unintentional dissemination of the virus,³ although controversial when considered within the framework of colonial relations, is interesting when thinking about the symmetry of the relationship between humans and viruses; microbes may well domesticate humans, as Lederberg says, but it seems that the latter have fully understood how their co-history could enable them to use the former, thus committing us to a concept of human/virus relations close to the notion of *mutualism*.

However, for our purposes, the story of smallpox and the Spanish conquest presents one major drawback: the fact that it hardly removes us from the metaphor of war. After all, it is a story of conquest, domination, struggle, enslavement and death. In order to part with this metaphor completely, I offer another example of our relationship with viruses. This second example is very different from the first, in that it concerns a theoretically non-pathogenic type of virus.⁴ This detour via endogenous retroviruses will subsequently allow us to address, in the final part of this article, the archetypal virus of the end of the 20th century and, undoubtedly, part of the 21st: HIV.

Endogenous retroviruses and placentation

Retroviruses are RNA (RiboNucleic Acid) viruses that have the ability to transform their RNA genes into DNA (by means of an enzyme known as reverse transcriptase), so that they can be inserted into the host DNA and amplified by its cellular machinery. The result is the production of thousands of copies of the virus, or virions, released by the destruction of the infected cell.⁵ For reasons that may vary, but partly due to host cell defense mechanisms, some of these viruses are "trapped" in the host DNA. If this event occurs in a germline cell, it

3 By the use of contaminated blankets left in the vicinity of villages, for example.

4 I say "theoretically", because it would appear that some endogenous retroviruses could be involved in human pathologies (Blond, Cheynet, Mallet, 2001).

5 This, in simple terms, describes how a virus like HIV functions.

is then transmitted to subsequent generations. This concerns endogenous retroviruses, or HERVs (Human Endogenous Retroviruses), as opposed to exogenous retroviruses. Transfection of a germline cell, which may appear to be rare, has been sufficiently frequent in human history for endogenous retroviruses to account for 8% of our DNA (Belshaw et al., 2004; Griffiths, 2001). These DNA fragments may have no function. Some, however, have a major role in the development of mammals.

Syncytins are proteins encoded by endogenous retroviruses, which play a crucial role in placental development. They enable the differentiation of some cells and their fusion to form the syncytiotrophoblast, part of the placenta responsible for feto-maternal interactions and other functions of the placenta (Mallet et al., 2004; Dupressoir et al., 2009). They also possess immunosuppressive properties, thus playing a role in the immune protection of the fetus (Kämmerer et al., 2011). The different origins of syncytin in mice and humans implies that the infection of mammalian cells by retroviruses encoding these proteins has occurred independently several times throughout history. In genetics, this insertion of viral DNA, which is then used by the host, a process that involves co-evolution and lasting interactions between entities, is called *domestication*.

Viruses, far from being just pathogenic entities, have thus played a fundamental role in the evolution of mammals, enabling them to exhibit new performances. We *are* because, on several occasions in history, subtle DNA interactions have occurred and stabilized, born of repeated interactions between species that we now consider fundamentally distinct, when we do not overlook them completely. We cohabit with these viruses which are inserted deeply within our cells, into the nucleus, and which have fused their DNA with ours. DNA which, since the discovery of its structure in 1953, and at the height of the subsequent reductionist wave, symbolized and still symbolizes for many today, the very essence of what makes us human. It is here, however, that we must slow down.

Although the example of the endogenous retrovirus allows us to grasp the magnitude of the co-history of viruses and humans, it could nevertheless inspire, in comparison to the knowledge we have developed on smallpox, a somewhat misleading idea that humans are ultimately the passive receptors of endogenous viruses' omnipotence. Viruses can make us suffer, and can even kill us, but, ironically for the partisans of the metaphor of war, it seems that our very ability to give life, as we know it, is a property that we owe to them in part.

Power of life, power of death, could viruses be the new gods? Taking viruses seriously and recognizing their performance must not lead to neglecting that of humans. This can be seen when we address the question of potential culpability behind the spread of smallpox. Though of a more complex nature, it can also be seen in the immune defense mechanisms that have led to the stable insertion of viral DNA into our genomes. However, in order to restore their respective agencies to both humans and viruses, a *sine qua non* for domestication, I would like to address one last example: the very specific relationship between humans and HIV.

HIV and Politicization

HIV and its relationship to humans is extremely complex from an analysis point of view, because of the amount of knowledge and experience we have accumulated in recent decades. It was discovered in 1983 and sequenced in 1985. Along with basic research, epidemiological data, and also the establishment of blood sampling banks, the study of observation groups, and the study of the consequences of the various control and prevention strategies implemented over the last 30 years have all helped to mobilize a great deal of knowledge, including, but not limited to: virology, molecular biology, evolutionary biology,

phylogenetics, medicine, pharmacology, epidemiology, human and environmental ecology, history, geography, health economics and anthropology.

The euphoria that resulted from the discovery of HIV and the hope of a rapidly available treatment for patients infected at the beginning of the epidemic, have unfortunately been followed by years of doubt, uncertainty, suffering and stigmatization. New stories were created to replace the old outbreak narratives, characterized by the victory of humans and the end of the battle against a virus which had been silenced (Wald, 2008). But the end of the epidemic now seems out of reach. The stories of HIV, filled with the fantasies of the Western elite, have often been brutal and extremely violent in their desire to place the responsibility of an epidemic that no one could have predicted with others, from the African man and his unbridled sexuality, to the four Hs (hemophiliacs, Haitians, homosexual males, heroin users), not to mention a poor steward reduced to the status of patient zero, all sharing an obvious lack of morality (Treichler, 1987; Packard and Epstein, 1991).

At the same time, the designation of HIV as the cause of AIDS quickly led to the naturalization, or rather the biologization, of the disease, leading to the concentration of almost all action on scientific and medical research, and thus on the virus itself (to the detriment of a dynamic and ecological approach that recognizes the fundamental, and not just the contextual, role of the environment). International programs, motivated by the same thought process, aim for the eradication of the virus, but many have raised their voices to highlight the dangers and limitations of biomedicalizing the response to the epidemic (Nguyen et al., 2011).

Joshua Lederberg, again, draws up a slightly critical assessment of the efforts made: "AIDS and HIV have spurred the most concentrated program of biomedical research in history, yet they still defy our counterattacks. And our focus on extirpating the virus may have deflected less ambitious, though more pragmatic, aims, including *learning to live with the virus*, by nurturing in equal measure the immune system that HIV erodes. After all, natural history points to analogous infections in simians that have long since achieved a mutually tolerable state of equilibrium." (Lederberg, 2000: 5, my italics). Once again, although Lederberg cannot abandon the war metaphor (no matter how the Empire strikes back, the force always seems to be with the viruses), it nevertheless leads us down another path, that of "living with the virus", and invites us to draw links between ourselves the natural histories of other species, as well as introducing an element of humility to our mentality. But he does not invite everyone to the negotiating table. By bringing the subject back to the immune system, he remains imbued with a naturalism that sends HIV back to a biological entity and reduces the human to its physiological components.

Just as before, however, I would like to explore Lederberg's "learning to live with" approach and extend my reflections on the domestication of viruses, based on two sets of data. The first, from Jacques Pépin's book, *The Origins of AIDS*, in order to consider our relationship with HIV from a historical point of view. The second, from my own fieldwork on several clinical trials conducted on HIV in sub-Saharan Africa, in order to describe and analyze the hybrid community formed by humans and viruses.

The Origins of AIDS

In *The Origins of AIDS*, Jacques Pépin retraces the complex history of the emergence of HIV. HIV originates in the virus SIVcpz (genetically identical to HIV), present for several hundred years in the *Pan troglodytes troglodytes* chimpanzee species. While the infection of a human with the chimpanzee virus is an event that may have occurred during the hunting of this animal or its preparation as a source of food, the spread of the epidemic nevertheless required the concordance of various factors, the first of which is colonization. Phylogenetic

data make it possible to estimate that the common ancestor of the current HIV strains dates from 1921. This does not mean that chimp/human interspecies transmissions didn't occur before this date, only that the necessary conditions for an amplification of the number of infections were not in place: a hunter or his wife, contaminated at the time of hunting or cooking, would have infected each other and perished a few years later in their village without having had the opportunity to transmit the virus outside the family circle. In 1921, however, following the various waves of colonization, Africa had undergone profound social, political and medical transformations. Pépin explains that it has certainly taken two distinct transmission paths to generate the epidemic, which he carefully reconstitutes on the basis of a meticulous historical approach: a first phase, by parenteral transmission (that is, by needles and syringes which have been contaminated and poorly sterilized during vaccination or prevention campaigns, in particular against sleeping sickness, and/or during leprosy treatment campaigns during the same period.⁶ The increase in the number of individuals infected via this route in their own villages then makes sexual transmission and amplification more likely to happen.

Prior to colonization, an infected man leaving his village to go to the city (presumably Leopoldville/Brazzaville) and contaminating a sex worker is a very low probability event. The changes brought about by the arrival of settlers, including the migration of men to the cities to find work and the massive development of the sex industry in the following decades, changed the situation considerably, opening up a second phase of amplification via sexual transmission. Pépin also explains the emergence of a number of epidemic outbreaks, such as in Haiti, and he traces, on the basis of the properties of the viral strains as well as the socio-cultural data available, the different trajectories of the virus, and that of humans, in the world.

Far from the simplistic story of a jungle-like virus that spread by taking advantage of human loose morals, Pépin depicts the deep entanglement of humans and nonhumans, and shows how historical events, medical innovations, and social and cultural changes have allowed the spread of the virus, but also how it has adapted, mutated, and differentiated itself according to the properties specific to each strain. The emergence of HIV is above all a co-history of humans and viruses.

Antiretrovirals (ARVs) and the Domestication of HIV

This intertwining of humans and non-humans has, since 1981 and the CDC press release on the first cases of AIDS, never ceased to grow, and to become more complex. Nearly a century after the appearance of the founder strain, the epidemic, by its scale, its evolution, and its duration, made it possible to dramatically highlight a certain perpetuation and then institutionalization of the links between humans and HIV, engaging more and more actors.⁷ While the global North-South divide in access to treatment is still very wide today, it is reasonable to speak of a chronic epidemic in which, especially in the Global North, people can live several decades with HIV without developing AIDS. We now speak of People Living with HIV (PLWHIVs).

If we compare this idea to that of Lederberg, what it underpins far exceeds it, and is anchored in the daily lives of infected individuals. Focusing on the question of treatment based on data collected from fieldwork in Côte d'Ivoire, Burkina Faso and South Africa, I would like to show how this "living with" can be conceptualized in terms of domestication. From 2011 to 2013, I was, as a post doctorate researcher, part of a program aiming to analyze the scientific, clinical and individual reasoning that prevailed in the setting up and running of

⁶ Africa was also built up as a vast laboratory, especially for pasteurians (Latour, 1993; Tilley, 2011).

⁷ These include the foundation of UNAIDS in 1996, the Global Fund to Fight AIDS, Tuberculosis and Malaria in 2002, and PEPFAR in 2003.

a Randomized Clinical Trial (RCT) on the evaluation of early antiretroviral treatment of HIV-infected people.⁸ Through careful study of the protocol, one of our goals was to understand how investigators were conceptualizing the relationship between viruses and humans in order to act on them for the benefit of the patient.

The issue of early antiretroviral treatment can be presented as follows: there is a threshold of infection at which point it is generally agreed a patient should receive antiretroviral treatment.⁹ This threshold is partly determined by a benefit/risk ratio that balances the treatment's side effects, the risks of virus resistance to treatment, but also compliance with treatment.¹⁰ In the study, the aim was to lower the threshold for treatment, i.e. to place patients on treatment earlier on in the course of infection. Early treatment comes from a desire to eradicate the virus: asymptomatic patients, are given treatment to control their infection, but also to limit the contamination of new individuals.¹¹

During this research program, I was able to show how the trial constructed a complex device in which humans were reduced to a biological body, summarized into biochemical and physiological data and reduced to a standardized body. For the purposes of the RCT,¹² the human body was in fact assimilated to the environment of the virus. Only the characteristics considered by the investigators as relevant for analyzing the relationships between humans and viruses and monitoring their evolution were retained. In this device, antiretroviral drugs were used to modify this environment so as to make it unfit for the reproduction of the virus.¹³ By ingesting specific, targeted molecules, it is possible to "control" the virus population in the body, and in this sense to domesticate it, if we mean by domestication "the control of reproduction", but also from a behavioral point of view "the mitigation of dangerous virus behaviors". The RCT thus constructed a simple device: a biological body, viruses, and molecules that are injected into the body in order to control/domesticate the viral population.

The ingestion of the treatment, however, is based on complex dynamics, reminding us that the patient is not only a biological body, but also a social individual with a life of their own, constrained by all kinds of needs. The treatment can therefore only be understood by placing the infected individual back into the domestic space, into their everyday interactions with their familial and professional surroundings (Bessette et al., 2001). In other words, the domestication of the virus through treatment implies both patient cooperation with a certain number of rules concerning the correct way to self-administer their treatment, and considerable changes to their daily life. Domesticating the virus is also learning that what contains it, constrains it, and also constrains us. Viruses and humans form what could be termed a hybrid community, which requires precise rules, including the regular and controlled intake of antiretroviral drugs.

Although this domestication can be read on an individual level, the consequences of the existence of this hybrid community and its evolution are much broader. In the fight against

⁸ "L'essai clinique comme espace de rencontre. Des logiques scientifiques aux expériences individuelles : construction des participants, biosocialité et expériences de subjectivation (Abidjan - Côte d'Ivoire)" ("Clinical trials as a meeting space. Scientific reasoning for personal experiences: the making of participants, bio-socialness and experiments in subjectification (Abidjan - Cote d'Ivoire)"), Program ANRS12242, coordinated by Frédéric Le Marcis (LADEC FRE2002) and Mariatou Koné (Cocody-Abidjan University).

⁹ This threshold is defined by the number of CD4 cells, which are one of the targets of the virus, and which have an important role in the immune response system. The lower the number, the weaker the immune system of the infected person.

¹⁰ Compliance is defined as patient respecting the dosages and the hours at which drugs must be taken.

¹¹ Patients undergoing ARV treatment generally have undetectable virus levels and are non-contagious.

¹² Depending on the discipline, but also according to the mechanisms in place to fight the HIV, the environment of the virus will be defined differently, therefore having varied consequences on the way solutions are proposed.

¹³ For more detail, see Brives, 2013, and Brives and Le Marcis, 2015.

HIV, the involvement of infected persons has been crucial at various levels, from the demand for rights to treatment (Epstein, 1998) to the creation of support groups for patients whose status is far from being systematically shared with others around them. The need to survive the HIV epidemic led to the politicization of patients and some of their relatives, which was reinforced by the arrival of antiretroviral drugs and the demand for what they promised to achieve (Nguyen, 2010) .

When, as part of the research program ANRS12242, we arrived in Abidjan to observe the trial, we sought to contact support groups, which are usually frequently available, in order to discuss with patients their participation in, or, conversely their exclusion from, the trial, and to evaluate the effects. However, it seemed that such groups did not exist for this trial. In investigating this state of affairs, we came to the conclusion that because the trial guaranteed access to treatment and to high quality healthcare, and, to a certain extent, protection from stigmatization, there was no need for infected patients to regroup. This partial depoliticization of individuals does not mean a return to a pre-antiretroviral period, but rather the establishment of new relationships with viruses.¹⁴ The depoliticization effect due to access to ARVs was also felt in South Africa, when we met with former contacts of Frédéric Le Marcis, who were part of the *Treatment Action Campaign* (TAC) in the early 2000s. They told us that they had left the movement after receiving treatment. In other words, the creation of a hybrid community thanks to ARVs led to the dislocation of the community of patients, who no longer felt so strongly the need to be together.

While the dream of WHO remains an outright eradication of HIV, as has been achieved with smallpox,¹⁵ the experience of millions of people leads us to think more in terms of domestication and coexistence.

Conclusion: Reciprocal domestication and companion species

In her wonderful book, Donna Haraway introduces us to our companion species, and reminds us that domestication is always a matter of reciprocity (2008). Emilie Hache illustrates this with her use of the title of one of Haraway's chapters, "If I have a dog, my dog has a human", stressing the desire of the American philosopher not to place the accent on non-human animals but on the relationship between humans and non-humans (Hache, 2015). While Haraway, as an accomplished biologist, includes microbes from the very first pages of her introduction, and also cites bacteria, fungi¹⁶ and protists, she does however overlook viruses. There are perhaps many reasons for this oversight, but it is nonetheless symptomatic of the difficulty that these entities, situated on the fringes of our categories of thought, pose to us. Yet, if dogs have helped in the making of humans, in the construction of civilizations through the different tasks they have taken on, what about the viruses? They have mixed their DNA with ours, made it possible for us to conquer new territories by favoring certain populations, and contribute daily to politicization in all its forms, as well as to the way we live, feel and experiment.

Through the scale and duration of the epidemic, HIV allows us to take the measure of this reciprocal domestication and its effects, if we leave behind the rhetoric of eradication. When discussing companion species, Haraway uses the very pretty expression, "*becoming with*". This makes sense when we stop naturalizing our relationship with viruses, and take a

¹⁴ For an extensive and more complex development of this argument, see Brives and Le Marcis, 2015.

¹⁵ Proof of the importance of understanding viruses not alone but in their complex relationships to humans. HIV and *Variola major* are two fundamentally different viruses, with which we have established distinct relationships. What was possible for the former was hardly conceivable for the latter.

¹⁶ See Anna Tsing's beautiful article, "Unruly edges: Mushrooms as companion species", 2012.

serious look at what they are doing to us, at what we become with them. As for the acronym PLWHIV (People Living With HIV), which implies a certain amount of passivity, the mere observation of the omnipresence of a virus within human cells, circulating in our bloodstreams, leads me to believe that PBWHIV, People Becoming With HIV, is a better term. It has the advantage of restoring the respective agencies to the different human and non-human entities, recognizing them as more than simple puppets of a powerful Mother Nature.

This is not to deny or ignore the problems those with HIV face. We say we take viruses seriously, but only the threat they leave behind, reinforced by decades of terrifying stories of contagion, is the subject of sustained attention. As well as foolish dreams of eradication, the consequences of surveillance networks and biosafety rhetoric (Lakoff and Collier, 2008) go beyond the scope of discourse and impose themselves on our actions. In the name of the fight against viruses, decisions are made which are sometimes violent and often disruptive. To speak of domestication, of *becoming with* viruses, is in no way a means of neglecting or denying the sufferings that they can inflict, but rather a way of recalling that they reveal, and not create, inequalities and violence. This shift points the way to new paths towards the development of a more ecological conception of our future, both individual and collective, and towards imagining other possible futures.

References:

Bessette, Dominique, Bungener, Martine, Costagliola, Dominique, Flori, Yves-Antoine, Matheron, Sophie, Morin, Michel, Setbon, Michel et Yves Souteyrand (eds.), 2001, *L'observance aux traitements contre le VIH/sida. Mesure, déterminants, évolution*, Paris: ANRS collection sciences sociales et sida.

Belshaw Robert, Pereira Vini, Katzourakis Aris, Talbot Gillian, Paces Jan, Burt Austin, Tristem Michael, 2004, Long-term reinfection of the human genome by endogenous retroviruses, *PNAS*, 101(14): 4894-4899.

Brives Charlotte, 2013, Identifying ontologies in a clinical trial, *Social Studies of Science*, 43 (3): 397-416.

Brives Charlotte, Le Marcis Frédéric, 2015, Réimaginer des communautés? Les conséquences du traitement précoce contre le VIH/sida en Côte d'Ivoire, *Terrain*, 64: 84-103.

Dupressoir Anne, Vernochet Cécile, Bawa Ollivia, Harper Francis, Pierron Gérardn Opolon Paule, Heidmann Thierry, 2009, Syncitin-A knockout mice demonstrate the critical role in placentation of a fusogenic, endogenous retrovirus-derived, envelope gene, *PNAS*, 106: 12127-12132. doi:10.1073/pnas.0902925106.

Epstein, Steven, 1998, *Impure Science, Aids, activism and the politics of knowledge*, University of California Press.

Griffiths, David J., 2001, Endogenous retroviruses in the human genome sequence, *Genome Biology*, 2(6): reviews1017.1-1017.5.

Hache Emilie, 2015, If I have a dog, my dog has a human, *Canadian Journal of Continental Philosophy/Revue canadienne de philosophie continentale*, 19(2):7-21.

Haraway, Donna, 2008, *When species meet*, Minneapolis: University of Minnesota Press.

Kämmerer U., Germeyer A., Stengel S., Kapp M., Denner J., 2011, Human endogenous retrovirus K (HERV-K- is expressed in villous and extravillous cytotrophoblast cells of the human placenta, *Journal of reproductive immunology*, 91:1-8. doi:10.1016/j.jri.2011.06.102

Keller, Evelyn Fox, 2002, *Making Sense of Life, Explaining Biological Development with Models, Metaphors and Machines*, Cambridge, MA: Harvard University Press.

Lakoff, A., Collier S. (Eds.), 2008, *Biosecurity Interventions Global Health and Security in Question: Global Health and Security in Practice*, Columbia University Press.

Larson, B. M. H., Nerlich, B. and Wallis, P., 2005. Metaphors and Biorisks: The War on Infectious Diseases and Invasive Species. *Science Communication*, 26(3): 243-268

Latour Bruno, 1993, *The pasteurization of France*, Harvard: Harvard University Press.

Latour, Bruno, 2015, *Face à Gaïa*, Paris: La Découverte, Coll. Les Empêcheurs de Penser en Rond.

Lederberg, Joshua, Infectious history, *Science*, 288(5464):287-93

Mallet, F., Bouton, O., Prudhomme, S., Cheynet, V., Oriol, G., Bonnaud, B., et al., 2004, The endogenous retroviral locus ERVWE1 is a bona fide gene involved in hominoid placental physiology, *PNAS*, 101(6): 17311736. <http://doi.org/10.1073/pnas.0305763101>.

Nguyen, Vinh-Kim 2010 *The Republic of Therapy. Triage and Sovereignty in West Africa's Time of AIDS*. Durham and London, Duke University Press, 2010, 237 p.

Nguyen Vinh-Kim, Bajos Nathalie, Dubois-Arber Françoise, O'Malley Jeffrey, Pirkle Catherine M., 2011, Remedicalizing an epidemic, from HIV treatment as prevention to HIV treatment is prevention, *AIDS*, 25(3):291-293.

Packard Randall M., Epstein Paul, 1991, Epidemiologists, social scientists, and the structure of medical research on AIDS in Africa, *Social Science and Medicine*, 33(7): 771-783.

Pépin Jacques, 2011, *The origins of AIDS*, Cambridge: Cambridge University Press.
Pradeu Thomas, Kostyrka Gladys, Dupré John, 2016, Understanding Viruses, *Studies in History and Philosophy of Biological and Biomedical Sciences*,

Tilley Helen, 2011, Africa as a living laboratory, Empire, development, and the production of scientific knowledge, Chicago: The University of Chicago Press.

Treichler, Paula A., 1987, AIDS, homophobia and biomedical discourse: An epidemic of signification, *Cultural Studies*, 1(3): 263-305.

Tsing Anna, 2012, Unruly edges: Mushrooms as companion species, *Environmental humanities*, 1 : 141-154.

Wald, Priscilla, 2008, *Contagious, cultures, carriers, and the outbreak narrative*, Durham and London: Duke University Press.