

SOLIDARITY AFTER NATURE: FROM BIOPOLITICS TO COSMOPOLITICS

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ABSTRACT

What is sustaining the divide between nature and nurture, even though sciences like epigenetics have been challenging it for at least two decades? Evelyn Fox Keller asked this question and considered it a logical problem rooted in terminological confusion within the sciences. In this article, we propose a complementary diagnosis of the problem: the nature-nurture divide is (re-) mobilized when society faces questions of inclusion and solidarity. With examples stemming from the fields of insurance and health care, immigration policy and epigenetics, we demonstrate how the nature-nurture divide is performed through techniques of classification for a politics of solidarity. We identify a common *operation* to these different examples that we coin 'biopolitical imputation'. We use this term to draw attention to how (Western) societal institutions, including science, create solvable problems out of complex situations, defining human actors and their agency along the lines of the nature-nurture divide as a *moral* guide. We argue that the tenacity of the nature-nurture divide is therefore not only a logical problem needing better scientific concepts, but also a cosmopolitical problem asking for a more profound reflection on the ontology and ethics of solidarity in order to move beyond the biopolitics of nature versus nurture.

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Introduction

Why is the dichotomy between nature and nurture so tenacious? A lot has been said and written about the historical roots of the dichotomy between nature and nurture (N/N); why the dichotomy makes no sense and why we need to move conceptually beyond it (e.g. Descola, 2013; Keller, 2010; Latour, 2004a; Lock, 2013). Asking why the dichotomy or duality is so tenacious is a slightly different question: it opens an inquiry into what *sustains* the duality. This, in spite of scientific evidence and conceptual propositions that challenge the duality today. We were inspired to consider this question by Evelyn Fox Keller's (2010) book *The Mirage of a Space Between Nature*

and Nurture. Keller is puzzled by the fact that scientists and commentators alike continue to frame research problems in terms of the relative contributions of nature and nurture to a phenotypic trait. She is puzzled because scientific evidence, in particular from epigenetics, has already exposed the mirage: it is but a mirage, and we need to think differently about the inner workings of our cells, tissues and bodies in relation to their respective environments.

Keller's book provides a brief, yet interesting explanation for the tenacity of the nature-nurture divide. She analyses specific confusions and misuses of technical concepts such as heritability and trait variance, explaining how these inform (and result from) badly formulated research problems in science. Keller thus seems to imply a circularity or feedback between the wrong questions informing the wrong concepts and vice versa. If this is the case, should we not be asking as well why this feedback is being sustained? In this article, we propose a sociological and complementary answer to Keller's question about the tenacity of the nature-nurture divide. We bring together existing literature and our own previous work on insurance, healthcare, asylum policies and the life sciences (epigenetics) to show how these institutions and practices translate fundamental questions of responsibility and solidarity into technical classifications and problem-solving devices. Areas where solidarity and responsibility are at stake are of particular interest because they reveal the extent to which what can be classified as 'nature' has moral authority (Daston, 2002; Daston and Vidal, 2004). Daston has shown how our ideas of 'nature' have guided moral principles in the West, and that conceptions of nature, morality and law have co-varied historically. Shklar (1990) has shown that our notions of solidarity and justice hinge upon the perceived contrast between choice and necessity - a contrast that in turn is assigned a meaning according to prevailing views of what 'nature' is.

Our aim is to put the focus on current areas of policy intervention in science and in society where nature and nurture gain a specific meaning and morality. We start with a brief discussion of Keller's analysis and how it has provided the key questions for our own approach. Next, we discuss some examples from social policy, such as insurance, healthcare and immigration policies that result in morally coded problems of inclusion and solidarity in terms of nature versus nurture. We then turn to epigenetics to consider how such morally coded problems tend to be reinforced in scientific research designs. Next, we formalize our argument and introduce the concept of *biopolitical imputation* as an operation that is common to our different examples. Biopolitical imputation translates *fundamental questions about inclusion and solidarity into a technical problem* attributing agency, causality and responsibility according to the nature-nurture divide. In line with scholarship on the history of science and politics (Daston and Vidal, 2004; Latour, 2004a; Lock and Palsson, 2016; Meloni, 2016; Shklar, 1990), we show that the determination of agency is bound up with the moral and moralizing division between nature and nurture. Our aim is not to provide a general theory that would apply over all social policy domains in different national settings. Our selective examples are meant to show the existence of routinized institutionalized solutions that are based upon the (re-)making of the nature-nurture divide to settle questions about inclusion and solidarity. Our central argument is that the *tenacity* of nature versus nurture follows from the constant mobilization of techniques to assign politically and morally 'valid' causes to human actors, in order to evaluate and justify the inclusion of those humans in communities of rights and solidarity.

We think this analysis should prompt a larger discussion on solidarity, politics and the relation

between science and society. In the final section, we will draw upon the work of philosopher Isabelle Stengers (2006, 2011) and sociologist Bruno Latour (2004a, 2004c) to start such a discussion. We characterize the challenge of a politics of solidarity beyond nature and nurture as a cosmopolitical challenge.

‘Nature versus nurture’: terminological slippages in the sciences of genetics

Among the many works that deal with the nature-nurture divide as a problem, Keller’s (2010) book *The Mirage of a Space between Nature and Nurture* is of special interest to us for three reasons: First, the originality of her approach is that she is interested in the *tenacity* of the problem. For Keller, causal explanations of individual traits in terms of a trade-off between nature and nurture have been shown time and again to be biologically invalid. Hence, she is puzzled by the fact that scientists and commentators alike *continue* to frame research problems in terms of the relative contributions of nature and nurture to a trait.

Our second reason to pay special attention to Keller’s book is the focus she puts on science. She starts with the observation that current biological developments, in particular epigenetics, defy the nature-nurture divide on biological grounds: epigenetics shows that biochemical components such as enzymes and proteins regulate the activity of DNA. Epigenetics has shown these regulatory processes to be themselves sensitive to environmental cues and events. Hence, a strict separation between the relative contributions of genes or nature on the one hand, and environment or nurture on the other is scientifically inaccurate and unhelpful to describe and understand processes of mutual interaction between genes, gene regulators and environments. Parsing out what the share is of genes and environmental factors respectively is not the right question, and Keller insists that it leads to the wrong answers. Moving conceptually and practically beyond the naturenurture divide in science means that different questions need to be formulated, in such a way that science can answer them. Before proposing such an alternative venue, Keller wants to know how the duality came into being in the first place.

This brings us to the third reason why Keller’s account is of interest to us for developing our own argument: Keller emphasizes the metaphysical assumptions of the naturenurture divide with respect to substance and causality, even though she diagnoses the *tenacity* of the duality as a logical problem (and not a metaphysical, historical or political one). In line with many accounts on the history of science, Keller situates the emergence of the divide in the late nineteenth century with the developing theory of particulate genetics. Before that, both ‘nature’ and ‘nurture’ were used in texts written by William Shakespeare, John Locke and John Stuart Mill, among others, but in an entirely different manner: nurture formed part of nature in the course of the development process: nature needed additional nurture. The scope of application of the two terms was demarcated by the moment of birth. Furthermore, both terms were interpreted as ‘influences’ without a strong *causal* theory on heredity. According to Keller, the shift in meaning assigned to the terms ‘nature’ and ‘nurture’ came precisely when the meaning of ‘hereditary’ and ‘inheritance’ came to mean more than the inheritance of title or property. In the writings of Darwin and his cousin Francis Galton, ‘hereditary’ came to be equated with ‘innate’ and the body became a vehicle of inheritance (see also Lewontin et al., 1982). The distinction between nature and nurture in

temporal terms became a separation of two substances in spatial terms: two substances with their own laws and causality. Importantly, nature, with the gene as a central unit, came to be considered as the stronger and more determinate cause over and above the weaker and malleable cultural or social influences. The causal separation thus also implied a fundamental asymmetry between the contribution of causes in the development of traits. Keller notes how the conception of nature as an overruling cause in human difference led the way to (and was itself informed by) racism and eugenics.

From a historical point of view, the nature-nurture debate was concerned with the extent to which the 'race' or gene pool of a population could be improved (eugenics). Eugenicists claimed that they could gradually filter out 'weaklings' from the gene pool by discouraging particular people from having children or through forced sterilization. The definition of a 'weakling' is obviously not a scientific matter and the concepts of nature and nurture provided answers to the political question of who is entitled to life, inclusion and solidarity. In other words, the nineteenth century bourgeois elite, including Francis Galton, had the power to define 'weaklings' and the 'feeble minded' in biological terms, supported by a conception of nature as being more determinant for human difference than nurture. In this line of thinking, breeding out the feeble-minded is the only possible way to correct nature and education is not worth investing in. Having indicated this historical context, it is here that Keller (2010) draws a line:

I suggest [...] that - for the particular purpose of understanding the origin and persistence in the separability of nature and nurture (my original question) - the issue of eugenics might logically, even if not historically, be put aside (p. 30).

Keller thus isolates the persistence of the nature-nurture divide as a different problem than the historical emergence of the divide. Although we will contest such a strict separation later, Keller's stance does lead to an interesting diagnosis that allows considering the (mis-)use of technical concepts such as trait difference and heritability. Keller pinpoints a double conceptual and terminological slippage: *variation* in traits in a *population* is often confused with very specific *individual trait difference*, and *heritability* is often equated with *individual inheritance*. Confusing statistical categories (trait variance and heritability) with individual phenotypical traits leads, time and again, to the erroneous assumption that the relative contributions from 'nature' and 'nurture' can be distinguished and expressed in percentages for any given individual trait.

Keller's key question then is: 'What's to be done'? She argues that we need to rephrase our questions in a manner that lends itself to scientific investigation. Keller (2010) proposes to think in terms of 'phenotypic plasticity' (p. 75). Referring to the latest developments in cellular biology and epigenetics, Keller argues that DNA and cells remain a very important and a pertinent object of study, but that it has meanwhile become clear that DNA is a *resource* for the cell, and not the ultimate cause (identifiable in individual genes) of what cells 'do'. Cells also respond to environmental cues and it is more pertinent to consider the 'plasticity' of a trait at a particular stage of an organism's development. Keller proposes to formulate scientific questions in terms of 'phenotypic plasticity' as a way to avoid the false problem of the nature-nurture divide.

But can the divide be dispensed with so easily? Is the divide, as Keller argues, indeed 'a mirage' that disappears once we have pinpointed the terminological slippages that sustain it? We do not believe so. Although we think that Keller offers a pertinent diagnosis of the terminological

confusions that make the nature-nurture divide resurface time and again, the diagnosis begs a further question: *why* are these particular concepts so confusing? If terminological confusion is indeed the root of the problem, then it would indeed suffice to change concepts as Keller proposes. But what if these continuing terminological slippages and the poor formulation of research questions are themselves sustained by a *demand* for answers that parse out natural, biological and genetic causes from environmental and socio-cultural ones?

In what follows, we will demonstrate that policy-specific versions of the nature-nurture divide are constantly being performed to serve practical purposes in societal institutions, such as in insurance, health care and asylum policies. Drawing on our own empirical work and that of other scholars, we propose a sociological and political explanation for the tenacity of the nature-nurture divide, and we will reconsider the relation between a society asking questions and a science answering them in the light of that.

The biopolitics of the nature-nurture divide

The concept of 'nature' has taken different meanings throughout history. Before the Enlightenment, there existed different conceptions of nature, in parallel to different kinds of customs and laws (Daston, 2002). Like custom, nature could be specific and local. Things that were often or mostly the case were considered 'natural'. The Enlightenment period saw the gradual application of the concept of *universality* to both nature and the realm of justice. The metaphor of the 'laws of nature' attests to the common transformation that both 'nature' and 'law' went through under the sign of universality. Throughout these different meanings, 'nature' has always informed moral questions. Daston (2002) and Daston and Vidal (2004) therefore refer to the historical 'moral authority of nature'.

The nineteenth century was particular as the spatial limits of the human body came to be seen as a delimitation between different types of causes to explain traits. Nature, equated to genetic factors, came to occupy the interior of the body, governed by universal laws, while other influences resided outside the body: hygiene, education and so on. This division between the inside and the outside of the body, and the moral authority given to 'nature', has been reproduced by societal institutions since the nineteenth century for *ordering* society and continues to be very powerful and active within contemporary politics of solidarity. Below we give some examples from the realm of social policymaking that indicate the extent to which the human body is mobilized as a vehicle of 'nature' to settle questions seeking to parse out what has been caused by nature on one hand and by nurture on the other. Such questions arise with particular sharpness and urgency in areas where the inclusion of humans into specific schemes of assistance, benefits and solidarity is at stake. We will focus here on examples from social policy (insurance, health care and asylum politics). The common thread between the examples is that the difference between nature and nurture is morally and politically at stake, and that in each example, the nature-nurture divide is *performed* or reproduced through specific techniques of classification. The tenacity of nature versus nurture is not rooted in mere terminological confusion (begging the question why there is so much confusion), nor in a generalized underlying cultural code or *Zeitgeist* (supposing that nature and nurture have a fixed meaning in themselves), but in the constant mobilization of techniques to assign politically and morally 'valid' causes to human actors in order to evaluate and justify the inclusion of those humans within a larger community.

GENETICS VERSUS LIFESTYLE IN INSURANCE AND HEALTH CARE

Just as the equation of 'nature' with genetics has a political history that found its most dramatic expressions in eugenics, the notion of 'lifestyle' and its equation with personal responsibility is rooted in neoliberalism and biopolitical governance (Foucault, 2008; Lupton, 1995). These histories, however, do not tell us how genetics (nature) and lifestyle (nurture) are brought into relation and offset against each other nowadays. Insurers, for example, want to calculate premiums on the basis of information and specific criteria that estimate the amount of risk involved. Yet, insurers are not allowed to solicit and use all possible information. Due to fears of 'genetic discrimination', most countries in Europe and the United States have imposed a legal ban on the use of genetic information in private insurance (Wauters & Van Hoyweghen, 2016). However, this specific protection for the 'genetically at risk' in insurance has resulted into harsher penalties in insurance for people with a 'bad lifestyle'. In other words, a politics of solidarity has resulted into a shift to more individual responsibility for lifestyle or behavioural risks, such as smoking and obesity. This shift relies on the idea that 'genetics' and 'non-genetics' can be offset against each other (nature vs nurture) along with the moral implications of that same demarcation ('risk carriers' vs 'risk seekers'). This (bio)politics of solidarity comes with the effect of highlighting a logic of 'control versus no-control', articulating lifestyle agency as an *isolated, individual* affair (Van Hoyweghen et al., 2006). As a result, a new problem space has been created where a behaviour-based control logic plays an ever more important role in insurance and health care. For example, in life and health insurance, wearable devices and digital health technologies are deployed for the enactment of 'behaviour-based personalisation' in insurance (Meyers & Van Hoyweghen, 2017).

The legal ban on genetic discrimination in insurance is interesting because it plays off genetics against all other factors commonly understood as 'lifestyle'. Unconditional solidarity, in other words, is anchored here deep *within* the human body. The realm of solidarity is thereby different from what has increasingly come to be seen as that of 'personal responsibility'. In neither instance - genetics or lifestyle - does the environment enter into consideration. With genetics already focussing upon the individual body since the nineteenth century, the notion of 'lifestyle' has more recently become related to the individual body in terms of behaviourist models. Not allowed to use genetic information (which in itself lacks a clear definition), insurers re-enact the nature-nurture divide for their own purposes, acting according to their interpretation of what is genetic and what is not (Van Hoyweghen, 2018).

THE BODY AS AN EXCEPTION IN IMMIGRATION POLICY

A variant of the distribution between genetics and lifestyle also turns up in policies that are not immediately associated with health and illness at first sight. In immigration policy, the decision to grant asylum bears upon an assessment of the *motive* of the refugee, in the literal meaning of 'what moves him or her'. Like in the previous examples, the question of agency is at stake here. Attributing a motive goes together with the conception of the *refugee* or *migrant* as a clearly defined individual actor. Indeed, the United Nations Refugee Agency distinction between an economic 'migrant' and political 'refugee' is already a consequence of this classificatory work, even though the distinction between the two is not straightforward.

Referring to the application of more restrictive immigration rules in France during the 1990s, Didier

Fassin (2009) notes that the difference between ‘political refugees’ and ‘economic migrants’ increasingly made way for a different kind of distinction during that same decade. The new distinction is based on a humanitarian exception rule that the French government began to apply in order to legalize undocumented immigrants who suffer from a severe disease that cannot be treated in their home country. Didier Fassin (2009) refers to this derogation as an instance of what he calls *biolegitimacy*: which type of life is legitimately entitled to protection? Fassin argues that biolegitimacy forms a lens through which to examine the type of biopolitics Western states are conducting: what value and what legitimacy is assigned to what kind of ‘life’? To Fassin (2009), biolegitimacy:

[...] illustrates the shift in the politics of life which occurred during this period. It would be more correct to talk of a shift in the sort of life politics is interested in. To the life of the refugee, with its painful past and its political meaning, is henceforth preferred the life of the sick, with its present suffering and its physical evidence. (p. 51)

The above examples demonstrate how a (bio)politics of solidarity implicitly relies on the nature-nurture divide to categorize ‘types’ of lives and actors. On a wider front, Western welfare states perform ‘moral economies’ (Daston, 1995) in which societal protection is offered based on the articulation and mobilization of ‘categories of worth’ that are used to shape social policy. Potential beneficiaries of social policy are divided between ‘deserving’ or ‘undeserving’ (Steenland, 2006; Van Oorschot, 2006). This morally charged debate about ‘deservingness’ constitutes the ground of political efforts to assign responsibilities between the state, tax payers, insurers and individuals (Baker and Simon, 2002) and of a politics of solidarity in our Western societies.

Ambiguities in environmental epigenetics

Medical and scientific categories are used for social classification resulting in policyspecific versions of the nature-nurture divide. But what about the sciences themselves? Environmental epigenetics poses conceptual challenges to the distinctions between nature and nurture; body and environment. It is here that Keller expects to see badly formulated problems replaced by more pertinent research questions in terms of plasticity. During the past decade, critical scholarship in medical sociology, anthropology and science studies has questioned whether epigenetics will really take us beyond the duality by virtue of its findings. This scholarship points out that the experimental designs in this domain are not free from moral conceptions.

Epigeneticists analyse how environmental factors influence how DNA operates. Attention shifts to biochemical processes that regulate genes and to the many factors that influence these processes. Epigenetics therefore brings to light other forms of heredity than traditional genetics: for example, long-term exposure to a toxic substance can change the chemical regulation of DNA and this change may be passed on to offspring. For some, this means a welcome or unwelcome return to the theory of Lamarck, Darwin’s predecessor, who postulated that species adapt because the natural environment prompts them to. An important difference between Lamarckism and epigenetics is that the meaning of the ‘environment’ is not stable. For each research design in epigenetics, a specific ‘environment’ needs to be chosen and defined. For example, ‘air pollution’ can be defined as an environment for its effect on the fetus or preterm birth (Lin et al., 2016; Maghbooli and et al, 2017). Another example of an ‘environment’ is the influence of famine, the

Dutch 'Hunger Winter' in 1944-1945, on the next generation (Lumey et al., 2012) or the influence of 'maternal care' as an environment for rats for their pups (Weaver et al., 2004). Moreover, in these epigenetic studies, 'the environment' is not necessarily a spatial entity; it can also be a particular behaviour (such as rats' grooming and licking behaviour) or a historical and political situation (e.g. 'the Hunger Winter'). Nutrition can also be considered as an environment for our body (Landecker, 2011).

But how does one opt for operationalizing a specific environment or set of factors rather than another, and what does that choice entail? Sociologists Martha Kenney and Ruth Müller (2016) analysed the research design of an epigenetic study into 'maternal conduct' towards baby rats and demonstrated how many assumptions need to be made to define the variables and outcomes. These assumptions relate to representations of what a 'good mother' is and her responsibility, gender role divisions, 'single' rats, and the behaviour of their 'daughters'. In other words, anthropomorphizing and moralizing are already contained in the epigenetic research design and therefore not only a matter of *post hoc* interpretation.

Both social scientists and life scientists have already given a critical response to epigenetic studies that examine a mother's influence on the health of the fetus: while the mother is considered as an 'environment' and experimentally operationalized as such, valuations about the mother's individual responsibility are often being reinforced (Richardson, 2015; Richardson et al., 2014). Moreover, such studies tend to focus specifically on *poor* mothers without considering what being poor exposes one to. Why not zoom out for example to air pollution and the fact that poor families tend to live in cheap houses, often in strongly polluted environments?

Based on empirical work, many social scientists have observed and cautioned against new forms of reductionism where environmental or extrasomic factors, including social and political factors, become 'naturalized' in terms of molecular biochemistry (Lock, 2013). The nature-nurture divide then gives way to a version of nature in terms of the molecular and the individual body, with no genuine consideration for its *interaction* with an extrasomic environment and the question of how that environment might be approached. The individual or molecular body has the scientific authority of nature, while it increasingly comes to embody *responsibility* as well, because intrasomic biology indexes the impact of extrasomic events, including lifestyle. Our own analysis (Hendrickx & Van Hoyweghen, 2018) relates to a discussion between scientists about the conclusions to be drawn from research showing epigenetic marks in the offspring of obese fathers. In the discussion, it was said that fathers should not be held responsible for their children's health, as long as the evidence is not conclusive. But why should individual responsibility be the issue in the first place? And why should the analysis and discussion stop within the molecular body of the obese father as such, and not take into account the broader context of obesity as a social, rather than an individual phenomenon? Is the environment not part of the epigenetic question? Although epigenetics may potentially challenge the nature-nurture divide, the field currently struggles with the complexity of its findings and there is a tendency to simplify this through discussions that offset nature and nurture against each other, along with what nature and nurture are supposed to imply in terms of responsibility. Where does this tendency come from?

Darling et al. (2016) point out that researchers in epigenetics frame their projects in molecular terms, sometimes reluctantly, in order to make better chances in obtaining research funding.

Referring to a ‘molecular imperative’, Darling et al. point to a broader societal context, including research funding bodies, that value biological data and reductionist approaches. This feeds into a longer tradition of critical sociological scholarship on the interests, research objects and approaches that came to be valued and financed in the transformation of medicine into *biomedicine* (Clarke et al., 2010). These studies of biomedicine focus on the neoliberal values and biopolitics of individualized and technology-mediated health; the necessary drive for competition and innovation; and molecularization. With respect to epigenetics, Dupras et al. (2017) caution against a strong tendency towards the internalization of health determinants in the medical translation of epigenetics, in line with the commercial promises of a technology-mediated personalized medicine. Arguably, the concept of ‘plasticity’, if conceived as malleability, could serve personalized medicine well. Although it might help to change research focus (as Keller suggested), its biomedical translation may also re-emphasize the current neoliberal focus on lifestyle, personal responsibility and techno-fixes for personalized health management.

The current ambiguities about the position of environmental epigenetics with respect to the nature-nurture divide concern the choices as to what counts as an organism and an environment. In making those choices, molecularization is often privileged. Surely, this is in line with the techniques that molecular biology and genetics have developed over the past decades: it is what these sciences are good at. Yet, these sciences only came into their expert position through massive investment from both the public and private sectors, driven by questions that ask for answers in terms of ‘nature’ (Clarke et al., 2010; Rose and Rose, 2014). This shows that research questions and problem frames are often defined at the interface of science and society, and that work on both sides is needed to change those questions and frames.

It also suggests that there is an institutional dimension to the mobilization of the nature-nurture divide. The political history of biology and biomedicine has been well- documented indeed, but the relation between the nature-nurture divide and its role in the functioning of contemporary societal institutions deserves more attention if we want to understand the tenacity of that divide despite the many criticisms and objections that have been formulated against it.

Understanding the tenacity of the nature-nurture divide: biopolitical imputation

In the preceding sections, we discussed how diverse (Western) societal institutions define actors and assign causes and responsibilities explicitly (in insurance), or implicitly (the motive of the asylum seeker; the research object in epigenetic research designs). What the different examples have in common is a basic, yet *moralizing* operation that defines particular types of actors, their presumed forms of agency, and the attribution of causes and responsibilities.

The operation is very clear in insurance practice: risk selection is per definition geared to classify actors according to the risks they represent, along with the delimitation of their agency: what is the extent of individual responsibility (lifestyle) *with respect to* conditions beyond the scope of individual agency (genetics)? To capture this double movement that defines an actor and delimits its presumed agency and responsibility, we borrow a concept from law and legal theory: *imputation*. (Gutwirth, 2010; Latour, 2004b). In legal practice, imputation means qualifying

elements of information as being ‘a case of’ a pre-existing legal category. Imputation creates and connects ‘a case’ with the entire body of law and makes something that would otherwise be purely anecdotal and contingent into a legal issue. Imputation therefore transforms piecemeal information into legal material. Imputation is an operation with consequences for further action. In order to characterize these consequences and to make a distinction with imputation as a legal concept, we will refer to *biopolitical imputation*.

We define biopolitical imputation as an operation that translates *fundamental questions about inclusion and solidarity into a technical problem* attributing agency, causality and responsibility according to the nature-nurture divide. The divide is drawn upon and reinvented in setting up a moralizing scheme that defines actors along with their agency or motive. If the N/N duality is a particular historically situated metaphysics in the West (Daston, 2002), then biopolitical imputation is the particular articulation of that metaphysics in specific societal institutions, sustaining a tenacious propensity to formulate complex problems in terms of the nature-nurture divide. The operation serves to determine what kind of intervention or non-intervention must be envisioned according to a moral separation between nature and nurture. This is a form of biopolitics (Foucault, 2008) and it is the common thread between our examples.

We have seen that the legal ban on the use of genetic information has led to an increasing penalization of lifestyle and individual behaviour in insurance. Genetic non-discrimination laws already express the genetic level as the ultimate locus of solidarity, as genes are considered beyond the control of human beings (Van Hoyweghen, 2010).

Figure 1. Different declinations of the nature-nurture division in society and science.

Nature	Nurture
<i>Since 19th Century: human body as ‘nature’ and vehicle of inheritance</i>	
body	environment
genes	social background, education, ...
internal	external
hereditary	non-hereditary
<i>20-21th Century: Biopolitical Imputation: increasing moralization of ‘nurture’</i>	
Insurance: risk carrier/ genetic make-up	Insurance: risk seeker/ behavior and lifestyle
Immigration: body/life at risk	Immigration: political/economic motives
Epigenetics: molecularization of behavior and lifestyle - body as index of nurture	Epigenetics: disappearance of social/political factors in favor of individual behavior

Asylum policy defines types of actors (refugees vs migrants) according to their motives: are they moving (on their own accord; as a matter of choice) or *being* moved (against their will; out of necessity)? Again here, a specific version of ‘nature’ emerges from this classificatory work: Sickness and other threats to life and physical integrity are considered as ‘categories of worth’ for solidarity. These conditions are given *exceptional* status in contrast to other possible motives not related to bodily integrity (and therefore deserving *unconditional* solidarity). In our final example on

epigenetics, we have seen how epigenetics will not unsettle the nature-nurture divide by virtue of its scientific evidence alone. Many examples show that the individual or molecularized body receives again the most scientific authority - indeed that of 'nature' - while it increasingly comes to embody individual responsibility as well (when for example obesity is discussed in terms of 'blame'). In other words, the design and interpretation of epigenetic research often relies on the division of nature and nurture in order to make the one visible through the other, without necessarily redefining the entities, phenomena and relations involved.

In all these examples, the nature-nurture divide *moralizes* by attributing causality and responsibility in a politics of solidarity. This is reminiscent of Shklar's (1990) analysis of how notions of justice and solidarity are closely correlated with the contrast between choice and necessity - a contrast that gains meaning in line with the prevailing views of what 'nature' is considered to be.

Our different examples are not intended to propose a historical or cultural theory about the nature-nurture divide as a uniform scheme directing all political action. It is clear that the concepts are mobilized in different versions that are not necessarily compatible (see also Daston, 2002). We want to bring attention to the production of specific dualities that imply opposing types of causes, or forms of agency, when complex situations are transformed into 'solvable problems' in a (bio)politics of solidarity. The examples we have discussed show different variants of 'nature' and 'nurture', with varying moral overtones. Figure 1 indicates some of the declinations of the N/N dichotomy as an epistemological and moral scheme. Reductionist interpretations of epigenetics fit into this scheme, but the broad and rich field of epigenetics cannot be reduced itself to such interpretations and research designs. We return to epigenetics below.

Setting a generative problem space, the nature- nurture divide is (re)produced through societal institutions and practices that reformulate political questions as problems of classification and *ordering* life. Biopolitical imputation exists and it affects how certain problems are defined in science and in society, especially where questions of solidarity and inclusion are at stake. Within this frame, biology as 'naturalized' gets authoritative power in attributing solidarity. The N/N duality has considerable tenacity indeed, *because an institutionalized politics of solidarity keeps it well alive*.

Pointing out how different institutions rely on biopolitical imputation means redefining the stakes of what it means to move 'beyond' nature and nurture. Contrary to Keller's argument, we do not believe that the nature-nurture duality can be set aside as merely a false scientific problem, only to be replaced by better scientific concepts. Thinking beyond nature and nurture raises fundamental political, moral and ontological issues about agency, causality and responsibility in relation to politics of inclusion and solidarity.

Solidarity after nature: from biopolitics to cosmopolitics

How do we divide up the world and define its components? Who has the power to do so? How can we avoid that the nature-nurture divide over-codes important questions about inclusion and solidarity? Which other politics of solidarity is possible? How will the answers to these questions affect our modern social institutions, so many of which still perform and rely on the nature-nurture divide with its specific distribution of agents, causes and responsibilities? We characterize these

questions as cosmopolitical questions (Stengers, 2006; 2011). In the words of Latour (2004c: 454), the merit of the concept of cosmopolitics is that '*Cosmos* protects against the premature closure of *politics*, and *politics* against the premature closure of *cosmos*'. Cosmopolitics is a concept to open up the possible meanings and practices of politics and it invites to consider what politics becomes if we think of our world not as 'society' but as 'cosmos'. Where the concept of society is traditionally reserved for humans, 'cosmos' brings along non-human actors, forms of agency, and modes of existence such as animals, spirits, plants and technological objects. Indeed, biopolitical imputation restricts questions to individual *human* agency while humans are always part of a broader ecology. Cosmopolitics does not presuppose the intervention of an arbiter to settle questions in a world that is already given, but puts at stake the very question what world needs to be built. In contrast, biopolitical imputation demands closure of both politics and cosmos. More precisely, we have shown that it privileges a particular *type* of closure geared to define and delimit the human actors that are entitled to policy-specific benefits of the polis. Biopolitical imputation performs a logic that is diametrically opposed to cosmopolitics.

Our characterization of biopolitical imputation as an *operation* that makes given institutions *function*, helps to sharpen the cosmopolitical question in more practical terms: what kind of operation(s) do we need instead? Can institutions function on the premise of a world 'to be built'? Characterizing biopolitical imputation confronts us to the scope of the challenge that cosmopolitics sets if taken seriously: it is not enough to change our scientific questions and concepts, as Keller proposed, to turn nature-nurture into a *nonissue*. Epigenetics proposes challenging concepts, but they are easily interpreted in reductionist anthropocentric terms *and mobilized as such* in further research. Political and institutional change is needed to allow the science-society nexus to genuinely set new problems and ask different questions. Cosmopolitics is a useful concept to think such change, and by definition resists political calls to arms for imposing a single solution or recipe everywhere. As we understand the concept, cosmopolitics does not imply a stance against closure, but it turns closure into a question to work upon, rather than a routinized operation such as imputation. The question is: how and when can an issue be settled - at least temporarily - and who is included in making that decision? Cosmopolitics is about inclusion and the question what common world needs to be built. This question turns the idea of solidarity into an ontological, pragmatic and active search into what 'having in common' means (Morton, 2017; Stengers, 2014), instead of conditioning solidarity upon a question of nature versus nurture.

Although epigenetics is unlikely to lead to cosmopolitical questions by virtue of its current research questions and findings alone, we think that it does offer an interesting starting point to experiment with cosmopolitical questions, provided that we include the question what epigenetics is and could be. We have argued elsewhere that conclusions with respect to epigenetic evidence are drawn far too quickly, and that it is useful to consider epigenetics as a *mode of attention* rather than a mere provider of evidence (Hendrickx & Van Hoyweghen, 2018). Epigenetics draws attention to new relations and modes of relating between social and biological events over time, challenging the definitions of the lifeforms and relations involved, and indeed of 'society' itself. What is a 'person' for example (Lamoreaux, 2016) and how do we qualify the relations of a 'person' to other entities and generations? The taking up or closing down of such questions hinges upon the shift from a biopolitical to a cosmopolitical approach.

Conclusion

Over the past decades, scientific and philosophical arguments have qualified the nature-nurture divide as inadequate to describe realities that are much more complex. Many pleas have been made to abandon thinking in terms of nature versus nurture (e.g. Descola, 2013; Keller, 2010; Latour, 2004a; Lock, 2013). In light of this scholarship and evidence from both the life and the social sciences, why do nature and nurture resurface time and again? What is sustaining the divide? In this article, we have argued that the nature-nurture divide is *institutionalized* as a biopolitics of solidarity, and we have provided examples from different societal institutions that indicate a specific operation, common to different areas of policy intervention and the sciences themselves, where complexity is reduced to solvable problems. We have termed this operation ‘biopolitical imputation’, and naming the operation has helped us to pinpoint and criticize what happens in Western societal institutions when questions are at stake that might be more complex than (merely) assigning individual responsibility to human actors. Our characterization of imputation as an *operation* that sets solvable problems to make institutions *function*, helps to sharpen the cosmopolitical question in more practical terms: what kind of operation(s) do we need instead? Do we need ‘operations’ or do we need new modes of deliberation (Callon et al., 2009)? Characterizing imputation confronts us to the scope of the challenge that cosmopolitics sets if taken seriously: it is not enough to change our scientific questions and concepts, as Keller proposed, to turn nature-nurture into a *non-issue*.

The examples we discussed (insurance and health care, immigration policy and environmental epigenetics) all exert a strong moral injunction into how we *ought* to conceive of what responsibility is, and what solidarity and inclusion mean. These are precisely the issues that a cosmopolitical approach obliges one to reconsider more fully. We do not believe that the nature-nurture divide can easily be set aside. First, it is not just a matter of ‘understanding’ that the divide is scientifically implausible. Second, it is all the more difficult because nature and nurture have always been moving targets, and they are still so at present (Lock and Palsson, 2016). Consequently, the presumption that the nature-nurture issue needs to be resolved *first* (by science or philosophy) is not a good starting point. The concepts of nature and nurture and its list of variants (as depicted in Figure 1) have different faces; they are well-established and institutionalized; and they are morally *visceral*. They vaguely guide our thought and they are given concrete substance in political action, especially with respect to fundamental questions about inclusion, solidarity and responsibility. Therefore, cosmopolitics should start with rethinking the institutions and practices that shape the contours and meaning of solidarity, responsibility and inclusion. Rather than a *tabula rasa*, we think such rethinking and redesigning implies what Donna Haraway (2016) calls ‘staying with the trouble’ in addressing complex situations. This means asking what a situation is composed of and who gets to define a situation in the first place. It also means asking what is gained and lost when a decision is made. The ring of the word ‘cosmopolitics’ has a somewhat unfortunate resonance with ‘biopolitics’, giving the impression that we are proposing a shift from one problem-solving method of governance (biopolitics) to another way to solve problems (cosmopolitics). This is not the case. What we advocate is a shift to asking questions about the ontology, ethics and politics of solidarity.

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