

Human Tendencies

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Abstract:

Our political and economic policies are now calculated through population paradigms that seem natural to us. Yet, more than just evincing an underlying political rationality, these modes of decision making also actualize a “bio-logic” that considers species and population as entangled properties. We might even say that political economy provides the bio-logic of capitalism and that the human species makes this bio-logic make sense as the dominant calculus through which we partition and participate in the world. This essay considers the historical processes through which this political and economic bio-logic came both to make sense and to seem natural.

Politics and the economy are not things that exist, or errors, or illusions, or ideologies. They are things that do not exist and yet which are inscribed in reality and fall under a regime of truth dividing the true and the false.

—Michel Foucault, “The Birth of Biopolitics” (20)

There is at least a risk that there will be no more human history unless humanity undertakes a radical reconsideration of itself.

—Felix Guattari, *The Three Ecologies* (68)

We need different ideas because we need different relationships.

—Raymond Williams, “Ideas of Nature” (85)

1. Thinking Species

Until the eighteenth century, human beings did not actually appear as a species among other species. Indeed, as Michel Foucault taught us in *The Order of Things*, until the Classical age humans dwelling in the geo-economic, epistemo-political, onto-theological domain we call “the West” did not actually inhabit the same space of representation as other living beings (Foucault 1970, 308). Things changed radically however during the period in which Linnaeus formally nominated us *homo sapiens*.¹ In the tenth edition of his *Systema Naturae* (1758), where the esteemed Swedish taxonomer established his famous binomial nomenclature, he used the specification *sapiens* to qualify the genus *Homo*; in so doing he designated us the primary example of his initial class of primates, “mammals,” an explicitly metonymic taxon (derived from a body part close to his heart) that he also christened in this text.² At the same moment that our new moniker was formalized another key modern parsing of humanness, “population,” also coalesced. Following on the

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late seventeenth century innovations in “political arithmetic” promulgated by John Graunt and William Petty, among others, “population” crystallized in the mid-eighteenth century as a demographic technology that considers aggregates of people as a state’s vital assets by analyzing its subjects “statistically” (i.e., literally as a matter of “statecraft”).³ In so doing, population represents a nation’s people as a simultaneously vulnerable and valuable living assemblage that requires governance, or as the contemporary idiom had it: police.⁴

Since both concepts, the human species and human populations, evoke the ways aggregates of human beings live—and die—together, it makes sense that these concepts quickly became articulated as two sides of the same coin (especially since in its economic valence species also means coins). Foucault explains the significance of this conjunction succinctly:

The dimension in which the population is immersed amongst other living beings appears and is sanctioned when, for the first time, men are no longer called ‘mankind (*le genre humaine*)’ and begin to be called the ‘human species (*l’espèce humaine*).’ With the emergence of mankind as a species, within a field of the definition of all living species, we can say that man appears in the first form of his integration within biology. (Foucault 2007, 75)

Population makes species makes sense to us as a way of sorting out who we are as living beings; conversely, species represents the statistical assemblages that figure human populations as natural sorts. Hence, if the biologization of the human species implicates humans within the field of all living species, then because of its reciprocal articulation with population as an analyzer of state power, species also divides this field in a *specific* way—in a way that following Foucault we might call political, or indeed biopolitical.

While we now largely take for granted the idea that the human species naturally interpellates us as living organisms, and perhaps even believe that this taxonomic hailing also denotes our “animal nature,” the concept of species actually renders the being of “the human” fairly problematic, in part because species itself constitutes something of a conundrum. Although we use it quite promiscuously today, for example in familiar phrases like “reproduction of the species,” “threats to the species,” “companion species,” “endangered species,” and “extinction of the species,” the biological referent of species remains far from fixed. Vehement debates about the meaning of species, especially between those who hold genetically and ecologically based models of living beings (not to mention between those who hold realist and constructivist models of knowledge) continue to roil bioscience.⁵ While the distinction between species as taxa and species as category seeks to reconcile some of these differences, both the significance and the value of species thinking still provoke much gnashing of epistemic teeth. Given this epistemological and ontological uncertainty, we might wonder what do we actually *do* when we consider “being human” to mean “belonging to the human species.” What sense do we make of ourselves when we make sense in these terms? And what sense do these terms, in turn, make of us?

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Species is a peculiarly Western mode of organizing living beings. Although its Latin etymon derives from the verb, *specere*, to look at, behold, regard, or contemplate, the concept that the Latin term translates actually descends from the way Aristotle revised Plato's notion of *eidos*. Of course Plato had conceived *eidos* as a transcendent, immutable, and perfect Idea from which all materialized being constitutes a decisive falling away. Rejecting Plato's otherworldly bias as metaphysically unwarranted, Aristotle recast the notion of *eidos* in two important respects: first, he used *eidos* to designate the form that informs matter (so *eidos* in contrast to *hyle*); and second, he used it to constitute the basis for logical classification (so *eidos* in contrast to *genos*). Thus Aristotle introduced a "tension between *eidos* as individual existence and *eidos* as known in definition" (Grene 1978, 128)⁶ and this constitutive tension underwrites the extension of *eidos*, and its Latin translation *species*, to the field of living beings. Since *eidos* and *species* fold together the atemporality of form with the temporality of existence, their complication—which is literally and etymologically a "folding together"—engenders, what Henri Bergson calls, "[a] stable view taken of the instability of things" (Bergson 1975, 324). In other words, *eidos*-as-species finesses the friction between continuity and change, and thereby encompasses a paradox that seems to us an essential hallmark of life forms. Moreover, it does so by affirming this continuity-in-change as an identity-in-difference as Aristotle himself proposes in *The Metaphysics*:

[T]hat which is different is different from something under some aspect, so there must be something the same in respect of which they differ. And this something the same is genus or species since everything that is differs either in genus or in species. (Aristotle 1998, 295; 1054b)

If species designates sameness-in-difference or difference-within-sameness,⁷ then what does species *do* when it parses the field of being, and especially of living beings? For Aristotle, *eidos* rearticulates the relations between what Plato had distinguished as "the sensible" and "the intelligible," respectively the domains of the material and the immaterial, of belief and knowledge. It thereby makes these famous Platonic dualisms immanent by making them matter. Indeed, using an idiom recently proposed by Jacques Rancière, we might say that, following Aristotle, *eidos* or species constitutes a "*partage du sensible*"—i.e., a dividing and a sharing of the sensible which *de facto* renders it intelligible but only in a *particular way* (Rancière 2000).⁸

In Rancière's usage, a *partage du sensible* determines "the system of self-evident facts of sense perception that simultaneously discloses the existence of something in common and the delimitations that define the respective parts and positions within it." (Rancière 2004, 12)⁹ Consequently, for Rancière the *partage du sensible* underwrites "politics itself" insofar as politics names a "dissensus" whereby "the system of forms of subjectification through which any order of distribution of bodies into functions corresponding to their 'nature' and places

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corresponding to their functions is undermined, [and] thrown back on its contingency” (Rancière 1999, 101). Drawing on its French significance, the word *partage* offers an important insight into the work of politics, since it carries the double meaning of both dividing and sharing. Thus, Rancière’s *partage* elicits “the political” as a part-taking on the part of those who have no part, no share, no appreciable matter, insofar as they trouble what counts and is accounted for as “sensible”—a word whose English definition, perhaps more than its French cognate, connotes both being able to sense and being endowed with *good* sense. The divisions of the sensible determine what counts as intelligible and therefore what can be accounted for as valuable. In other words, a *partage du sensible* determines what must be taken into account by the political decisions that divide the shared world. Furthermore, when we recognize such divisions are not natural segmentations but rather *decisions* (from the Latin *de+caedere*, to hew or cut off, to fall from, but also to kill, to slaughter), we realize that they constitute violent ways of cutting or rending that actualize judgments and materialize values. Thinking politics in terms of the *partage du sensible* underscores how violence congeals—and is concealed—within the value judgments that define and engender it, a violence to which dissensus responds when those previously denied value remap the political order to affirm their own sensibility.

Embracing the importance of these insights, however, we might still notice that Rancière roots the political in an ineluctable friction between the partitioning and partaking that humans engage in along with others whom we also implicitly address as human—even when we do not value them as such. But what of those *partages* that situate us among other others, among those others who may not be human or vital, but who nevertheless constitute part of the sensible world? Might such distinctions also reveal modes of politics? Might the ways we divide and share the world as such give rise to political engagements? In order to begin to address these questions, I want to push Rancière’s sense of politics in the direction of Foucault’s notion of bio-politics and biopower—even if Rancière’s himself might demur (see Rancière 2000). In the opening paragraph of his 1977–78 lectures at the Collège de France, entitled *Security, Territory, Population*, Foucault offers the following definition:

By [bio-power] I mean a number of phenomena that seem to me quite significant, namely, the set of mechanisms through which the basic biological features of the human species became the object of a political strategy, of a general strategy of power, or, in other words, how starting in the eighteenth-century, modern Western societies took on board the fundamental biological fact that human beings are a species. (2009, 1)

Although Foucault stages our species being as a “fundamental biological fact,” what if we consider the partition of the life world into species as itself a *partage du sensible*, especially insofar as we apprehend ourselves--whoever “we” “are”--as belonging to the human species? What if we deem the partitioning of the human species itself as a political distribution of the relations between the sensible and the intelligible? What if we engage the discourse of human

biology as politics by other means?

One place to begin such an engagement might be with the recognition that not all those who we include within the human species understand personhood as an exclusively human prerogative. Marshall Sahlins, in his recent disquisition on “the western illusion of human nature,” notes that many of the earth’s peoples, past and present, consider “animals, plants [...] features of the landscape, celestial bodies, meteorological phenomena, and even certain artifacts [as] beings like themselves, persons with the attributes of humanity” (Sahlins 2008, 88). Reflecting on the cosmologies of Amazonian Amerindians, the Brazilian anthropologist Eduardo Viveiros de Castro avers: “self references such as ‘people’ mean ‘person,’ not ‘member of the human species’ [...] To say, then, that animals and spirits are people is to say that they are persons, and to attribute to non-humans the capabilities of conscious intentionality and agency which define the position of the subject” (Viveiros de Castro 1998, 476). If intentionality and agency do not belong exclusively to humans, then the assumption that the human species naturally distinguishes humans from other beings, animate and inanimate, may prove either overstated or under-motivated. Indeed, the assertion that being human entails belonging to the human species may represent a paramount example of what Bruno Latour, following Viveiros de Castro, calls “mononaturalism.” Mononaturalism bespeaks the assumption that there is one nature that unites us all. A product of Western onto-theology, and especially of a colonial mindset that sought to universalize the dominion of its three-personed God, mononaturalism construes the world as a universally knowable domain whose privileged spokesmodels often hold forth in the name of science and in the language of mathematics. Yet the interests of mononaturalism reveal specific rather than universal investments since the perspectives that it casts as truth obtain only among those who act upon them in good faith. As Latour explains:

In fact, the importance of the term ‘nature’ does not stem from the particular character of the beings that it is supposed to have assembled and that are thought to belong to a particular domain of reality. The whole power of this term comes from the fact that it is always used in the singular; as ‘nature in general.’ When one appeals to the notion of nature, *the assemblage that it authorizes counts for infinitely more than the ontological quality of ‘naturalness,’ whose origin it would guarantee.* (Latour 2004, 28–29)

Nature, in Latour’s analysis, refers to ways of articulating connections rather than to the stuff that gets connected. Nature-in-general works by legitimating one such mode of articulation as if it were the only way beings can connect. Recalling Rancière’s idiom here, we could say that mononaturalism describes a particular *partage du sensible* that imperialistically lays claim to the world by discounting all those who partition and partake of it in non- or less-exclusive ways. Multinaturalism, on the other hand, proposes that nature’s oneness does not and cannot exhaust the possibilities for being or living, particularly or otherwise. Moreover, it suggests that contestations between and among different “natures” constitute the actual matter of politics. If nature in general leads us to suppose that we can

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know who we are by affirming our identity-in-difference as a species among other species, then perhaps we should consider what a multinaturalist notion of human-ness might entail. Conversely, to call the mononaturalist proposition into question, we might want to ask: how did we come to believe that “belonging to the human species” is the best way to make sense of “being human” in the first place?

If we don't assume that species-being exhausts our nature, we can begin to reflect on what belonging to a species does to or for “the human.”¹⁰ At the most literal level, being a species secularizes us. Within the ambit of early modern Europe, Christian eschatology informed the temporal horizon of existence both theologically and politically. The doctrine of the resurrection supposed a bifurcation not just of body and soul but also of life and afterlife, such that the human soul's travails within the earthly veil of tears merely prefigured an eternal temporality during which its “real life” would take place. Among the manifold implications of this dogma, two especially concern us: 1. the most important thing about being human was not having a body (as we largely assume today) but being a soul; and 2. the soul constituted not only the otherworldly ground of personhood, but also the this-worldly basis for political belonging. Throughout the course of the sixteenth and seventeenth centuries, however, these precepts began to tremble before the complex religious, political, economic, technological, philosophical, and military upheavals that marked the period. Needless to say, a detailed account of these transformations exceeds my scope here today. However, let me note two relevant *sequela*: 1. as Foucault argues, following the Treaty of Westphalia in 1648, the eschatological frame for European politics, which hitherto imagined a universal Christian Empire as its apotheosis, no longer obtained unconditionally; instead Europe fell into secular history as a coincidence of coeval nation-states “having a relation of utilization, colonization and domination to the rest of the world” (2009, 298).; 2. The body replaced the soul as the proper metonym for political, legal, and economic subjectivity such that “being a person” came to mean “having a body,” a new secular political philosophy which C. B. Macpherson famously named “possessive individualism” (Macpherson 1962).¹¹

The emergence of the human species as the collective incarnation of these individual bodies naturalized this secular orientation in the most literal sense. In other words, it evinced the etymological significance that the secular bears from the Latin *saeculum*, meaning “the average duration of a man's life,” a “*life-time*,” or a “generation” (as opposed to Christian eschatology's non-secular valorizations of *soul-time*) (Marchant and Vernam 1892, 497). Prior to the eighteenth century if humans were referred to as a species—which given Europe's Christian orientation was certainly not a prevailing idiom—it signified in a logical rather than a biological sense.¹²

Moreover, since species functioned as a categorical determination that foregrounded identity-within-difference, it applied indiscriminately to all being. Thus Linnaeus, who first named our species-being as such, classified minerals as well as plants and animals as species, positing no essential distinction between species'

animate and inanimate forms.¹³ However, once the notion of species took a distinctly organic turn, as it did in the work of Georges-Louis Leclerc, Comte du Buffon (who explicitly disputed Linnaeus' promiscuous usage and argued that only living beings speciate) species became conceived for the first time as a vitally *secular* matter of generation and generations.¹⁴

According to Buffon, a species' temporal dissemination, its "faculty of producing its fellow creature (*semblable*)," constitutes the "real existence of the species" (Buffon 1749, 2, 18). If in order to be a species at all a species must endure through a multitude of successive iterations, then the generation of new individuals constitutes its vital crux. Furthermore, the species actually exists as "the constant succession and the uninterrupted renewal of the individuals who constitute it" (Buffon 1753, 384). From this perspective, sexual reproduction becomes—again for the first time—a means of reproducing "the species," rather than simply of engendering offspring.¹⁵ Thus, Buffon posits: "the species then is nothing other than the constant succession of similar individuals who can reproduce themselves together" (1753, 4:386).¹⁶ This reproductive criteria provides a simultaneously inclusive and exclusive notion of species: individuals belong to the same species if and only if they reproduce offspring who can themselves reproduce more offspring—a criteria that essentializes sexual difference, foregrounds the troubling notion of hybridity, and introduces "race" as a vital category.¹⁷ Once the human species appears to insist and to exist through generation and generations, i.e., through the corporeal iterations that such life forms manifest in and through time, then our "secular nature" fully comes to make sense as a *partage du sensible*.

The unacknowledged corollary of this putatively natural *partage* holds that, as a species, we speciate as individuals. While the species endures through generations, it passes—i.e., it actually *takes place*—through the passage of individuals. Indeed, in the *Premier Discours* that introduced his magnum opus, Buffon epistemologically commits himself to the individual as the only "real" natural unit: "In nature only individuals really exist; genres, orders and classes only exist in our imagination" (1753, 1:38). Hence as he writes in a later volume: "All the similar individuals that exist on the surface of the globe are regarded as composing the species of these individuals" (1753, 4:384). Individualism thus constitutes a logical, bio-logical, and historical precondition for the conceptualization of the human species as a species. Moreover, in Buffon's case, it was also a biographical precondition since, as Philip Sloan notes, before Buffon embarked on his *Histoire Naturelle* he pursued "intensive study in mathematics, Newtonian mechanics, English philosophy, and probability theory" (Sloan 1995, 127). When Buffon incorporates the individual into natural history as the medium through which the species inheres, he links its earlier philosophical meanings to its new biological significance, and thereby expands the proper domain of the individual from politics to nature.

Liberal individualism emerged in seventeenth-century England as a political response to

monarchal absolutism and its discontents. Claiming an ontological basis for refusing the sovereign's theologically-legitimated prerogatives, it asserted the individual's originary ownership of *his* own body (and of course individuals were inevitably male). This political philosophy holds that "the body" represents the individual's natural property, which, as John Locke famously avowed, cannot be alienated without due process of law. Indeed, the precept of self-ownership as the basis for legal rights is what the affirmation of Habeas Corpus still purports to guarantee. However, while individualism successfully disputed the metaphysical claims of political theology by "naturally" grounding itself in a political ontology of the human body that held that "the body" represents "nature" in and for the person, it also introduced a new question—hitherto unknown to political theology—into political life: i.e., once you affirm human beings as discontinuous individuals who own their bodies as their property, how do you reaffirm their collective coexistence as essential, let alone as an essential property? Or, to turn the question another way, how do you make sense of the collectiveness of a political collective if you suppose that the collective's members bear their individuality within themselves as their most essential property?

The possible answers to this question were numerous: contract theory, "human nature," "the economy," "society," and "culture," among others, all emerged during the late-seventeenth and eighteenth centuries as responses to the ontological quandary that individualism introduced. Behind, beneath, or perhaps beyond all these various attempts to reconcile continuity with—and within—individuality, the "human species" appears to affect a natural resolution to the collective problem insofar as it incorporates a vital force that sustains both the production and the reproduction of individuals. In order to appreciate how this reconciliation works, consider for a moment what individualism tries to do. As a political strategy, individualism seeks to isolate people from the biosphere and reorient their "natural" being inwardly, as if "life itself" were spatially and temporally localized within their epidermal envelope, a political incarnation that famously led Norbert Elias to ask: "Is the body the vessel which holds the true self locked within it? Is the skin the frontier between 'inside' and 'outside'? What in man is the capsule, and what the encapsulated?" (Elias 1982, 249). Individualism proposes a bifurcation, or *partage*, of the universe around "the body" (which is after all what the "environ" of environment signifies). The body hence becomes the proper metonym for the person only insofar as it bears no other essential relation to anything else—family, kin, clan, tribe, rank, estate, nation, territory, etc. However much this fiction might make sense logically or strategically as a political reaction to monarchal prerogative, it does not necessarily follow organismically or ecologically, let alone ontologically. All living beings must be both bounded and open, localized and distributed, focused and enmeshed. Moreover, organisms only exist insofar as they coexist—as for example our own coexistence with the commensal bacteria that flourish in our guts and skin reveals. The affirmation of the individual as a simultaneously political and a biological unit, then, far from constituting a natural fact, betrays an unnatural attachment to the historical and cultural assumptions on which it leans.

To put this another way: individualism proposes a material *partage du sensible* that limns the terrain of the biopolitical. By specifying “the body” in lieu of the human person, that is to say by proposing the body as the place in which “the human” lives, this *partage* conjures both “life itself”—or what we might call the *ipseity* of life, the proper life that both can be contained and can contain itself (Levinas 1978, 125)—and “specific life”—life localized within “the body” as its property, which reproduces itself in its relations with other bodies and thereby constitutes a species. Needless to say, this vital formulation hinges on an implicit doubling of “the human body” as at once an individual and a species body, a doubling which weirdly recalls and recasts Kantorowicz’s famous theologico-political icon, “the King’s two bodies,” in manifestly secular terms (1957). The individual’s body thus conceals an intrinsic duplicity precisely insofar as “it” identifies us, both individually and collectively, as human. The modern duplicity of the human body is a real paradox, simultaneously a general singularity and a singular generality. If we regard it as such, we begin to discern some of the economic, political, and philosophical investments in our own “specialness” as humans that underwrite our sense that we belong to the human species.

2. Calculating Habits

In the *German Ideology*, Karl Marx declares that humans are the only living beings that “relate to” other living beings, whereas non-human organisms just are (Marx, Engels 1970, 51). In positing “relating” as essentially human, Marx extrapolates from Hegel’s precept that consciousness exists through—and as—the negation of nature’s immediacy, thereby anticipating Bataille’s famous (Hegelian) claim that “animals are in the world like water in water” (Bataille 1992, 23). Lest we drown in our animality, we must relate and thereby become human. The different forms that such relations manifest inform the conditions within which human beings live together—with human and non-human others—at different moments in history. Within the compass of modernity, wage-labor constitutes the economic form that the relations informed by individualism take. Unlike feudalism before it, which had supposed a metaphysical hierarchy among ranks, estates, and degrees of people, and concomitantly assumed a material continuity between serfs and the land, wage-labor deterritorializes these historical nexuses in order to reterritorialize them as aggregates of self-owning individuals who contractually self-alienate themselves in exchange both for remuneration and for political rights. Within this juridico-politico-economic horizon, population becomes a means both to count and to account for the vital asset that individuals represent to and for the state. However, population is not merely a matter of counting and thereby accounting. In order for population to take on statistical significance, i.e., in order for it to operate as an analyzer of state power, it must concern itself with those individual changes that occur among the population over time.¹⁸ Birth rates, death rates, unemployment rates, rates of mortality and morbidity are just that: rates of change through time. As such they represent singularities quantitatively assimilated into generalities through calculating practices. Moreover, because such rates are themselves comparable as calculations, taken together they make it possible to

evoke the relative rates of change between two or more populations; hence they implicitly gesture towards an even more general population that in turn contains them all.¹⁹

Population, then, like species, encompasses both production and reproduction. Indeed, population, like species, only produces itself by reproducing itself through individuals through time. This conjunction marks what Foucault describes as “the entry of life into history, that is, the entry of phenomena particular to the life of the human species into the order of knowledge and power, into the sphere of political techniques” (1978, 143–4). Moreover, these political techniques represent the desire to make the imperatives of human life calculable—or even “governable”—and therefore amenable to economic and biological regulation. Hence they simultaneously render population a vital metonym for species and reveal “the economy” as the natural domain within which these imperatives must be fulfilled. Not so surprisingly, the seminal articulation of this politico-economic perspective appears in the texts of an author whose familiarity with both Linnaeus and Buffon deeply informed his thought: that inestimable polymath, Adam Smith. Indeed, we might consider that Adam’s Smith’s particular stroke of genius is not best represented by his famous “invisible hand,” but rather by the invisible sleight of hand through which he created a vision of political economy that knits together population with species and thereby regards economics as biology by other means. (As we’ll see below, the subsequent inversion of this formula also constitutes another famous stroke of genius, when Darwin adapts Malthus’ reading of Smith to the theory of evolution and thereby renders biology as political economy by other means.)

In order to appreciate how classical political economy emerges as a bio-political hybrid, we need to consider briefly the assumptions Smith imports from natural history into his economic thought (Schabas 2003). Smith’s debts to Linnaeus are several since not only did Linnaeus invent the binomial system that continues to map the field of living organisms and famously dub us *homo sapiens* in the process, but he also advocated Swedish national autarchy, predicated on a cameralist policy of import substitution. Moreover, by promoting rational agricultural innovation and development as a vital resource for the nation, he used his work as a natural historian to underwrite his economic policy (Koener 1999). Thus, in addition to the seminal *Systema Naturae* (to which Smith refers in his early essay, “Of the External Senses”). Smith also relied on Linnaeus’ essay “The Oeconomy of Nature” (1749) which begins: “By the oeconomy of nature we understand the all wise disposition of the Creator in relation to natural things, by which they are fitted to produce general ends and reciprocal uses. [...] Whosoever turns his attention to the things on this our terraqueous globe, must necessarily confess, that they are so connected, so chained together, that they all aim at the same end, and to this end a vast number of intermediate ends are subservient” (Linnaeus 1759, 39–40). Linnaeus’ reflections on this useful and reciprocal relation explicitly combine his interests in policy and natural history, and in so doing prefigure Smith’s notion of a self-regulating political economy.²⁰ The enchainment that Linnaeus sees as rectifying intermediate ends so “that they all aim at the same end” provides a “natural” analogy for the unity of ends that Smith ascribes

to the market economy, an ascription that for many today still seems “natural” given the current reign of neo-liberalism.

Linnaeus’ assessments of the “oeconomy of nature” explicitly inspires Smith’s fusion of natural history and moral philosophy in *The Theory of Moral Sentiments* (published in 1759, the year following Linnaeus’ nominalization of *homo sapiens*). In Smith’s estimation, the oeconomy of nature:

not only endowed mankind with an appetite for the end which she [nature] proposes, but likewise with an appetite for the means by which alone this end can be brought about, for their own sakes, and independent of their tendency to produce it. Thus self-preservation, and the propagation of the species are the great ends which Nature seems to have proposed in the formation of all animals. Mankind are endowed with a desire of those ends, and an aversion to the contrary; with a love of life, and a dread of dissolution; with a desire of the continuance and perpetuity of the species, and with an aversion to the thoughts of its entire extinction. (Smith 2002, 90)

Here Smith’s text binds up Linnaeus’ notion of the economy of nature and Buffon’s reproductive criteria for species (with which Smith was also familiar) in order to posit a natural basis for his moral theory. In Smith’s estimation, the species imperative acts through individuals, “independent of their [own] tendency,” and it is precisely this agency independent from individual agencies but which nevertheless acts “for their own sakes” that constitutes the “oeconomy of nature.” Needless to say, this formulation exactly anticipates Smith’s ideas about political economy, which he will publish in 1776, as *An Inquiry in the Nature and the Causes of the Wealth of Nations*. However, in the later text, it is the market, rather than the oeconomy of Nature that, independent of mankind’s individual tendencies and thanks to the “invisible hand,” produces ends conducive of the continuance and perpetuation of the species. Given Smith’s conflation of natural and market forces, of individual and species imperatives, we can appreciate why Foucault not only characterizes political economy as “the knowledge of processes that link together variations of wealth and variations of population,” but also why he refers to political economy as circumscribing “the horizon of social naturalness” (2009, 350).

Smith adumbrates the paradox of social nature in his chapter “Of the Wages of Labor” in *The Wealth of Nations*, where he synthesizes his ideas about natural history and political economy in order to explain why, as his first sentence declaims, “[t]he produce of labour constitutes the natural recompense or wages of labour” (1937, 64). Smith’s exposition of this mode of “natural recompense” leans on an anthropological narrative that moves from an “original state of things, which precedes both the appropriation of land and the accumulation property, [in which] the whole produce of labor belongs to the laborer,” to an articulated division of labor predicated on contracts between “masters” and “workmen.” Given its juridico-political investment in this contractual relation, labor becomes subject to and regulated by market

dynamics that determine the “demand for those who live by their wages.” In this telling phrase we see that Smith seeks to explain how and why wages fluctuate by collapsing the distinction between living and wage-earning, such that for a substantial portion of the population “living” becomes tantamount to wage-earning and vice versa. This economic indistinction then not only affirms the elision between “natural recompense” and the “wages of labour,” but also conversely locates the political basis for national wealth in the living dimension of wage labor—i.e., in the *population* of wage laborers considered as a sub-set of the human species: “The most decisive mark of the prosperity of any country is the increase in the number of its inhabitants. [...] [I]n the present time [...] this increase is principally owing to [...] the great multiplication of the human species” (1937, 70).

Using the rudimentary statistics available to him (from William Petty, Gregory King, Charles Davenant, and Richard Price) Smith proceeds to assert a correlation between changes in population and changes in wages. Moreover, he avers that insofar the former derive from natural fluctuations, so do the latter, even when the changes in population themselves reflect the impact of wages on the sustenance of workers and their offspring. Thus, the market dynamics of wage labor, according to Smith, reflect the natural patterns of reproduction that we call species:

Every species of animals naturally multiplies in proportion to the means of their subsistence, and no species can ever multiply beyond it. But in civilized society it is only among the inferior ranks of people that the scantiness of subsistence can set limits to the further multiplication of the human species; and it can do so in no other ways than by destroying a great part of the children which their fruitful marriages produce.

The liberal reward of labour, by enabling them to provide better for their children and consequently to bring up a greater number, naturally tends to widen and extend those limits. It deserves to be remarked too, that it necessarily does this as nearly as possible in the proportion which the demand for labour requires. If this demand is continually increasing, the reward for labour must necessarily encourage in such a manner the marriage and multiplication of labourers, as may enable them to supply that continually increasing demand by a continually increasing population. [...] It is in this manner that the demand for men, like that of any other commodity, necessarily regulates the production of men. (1937, 79–80)

In this important passage Smith limns the movement from species to population to human reproduction to commodity production, on whose basis political economy stakes its claim that it also represents the “oeconomy of nature.” However, unlike Linnaeus’, the nature of Smith’s economy no longer inheres in the “all wise disposition of the Creator in relation to natural things, by which they are fitted to produce general ends and reciprocal uses.” Rather the general ends and reciprocal uses produced by wage relations determine the natural reproduction of the human species, even as the “desire of the continuance and perpetuity of the

species” sparks “multipl[ication] in proportion to the means of subsistence” in the first place. In other words, following Adam Smith, political economy knits together population and species as if they naturally belonged to the same social fabric, a social fabric that he calls “the market.” Furthermore, with this articulation of population and species, modern political economy “appears,” or rather represents itself, as the “natural” locus within which the “human species” necessarily lives. It thereby legitimates itself as nature by other means—an egregious instance of mononaturalism to be sure.

While *The Wealth of Nations* forges the theoretical nature of political economy from the confluence of species and population, this amalgam becomes even stronger a quarter of a century later when Thomas Robert Malthus claims to elaborate the precept “empirically” in his famously pessimistic *Essay on the Principle of Population* (1799).²²

As David McNally argues: “Proceeding from the alleged law of population, [Malthus] arrived at a complete naturalization of capitalist social relations: private property, wage-labour, and class inequality became the inevitable outcomes of natural laws” (McNally 2000, 441–42). Not surprisingly Malthus generously credits Smith with providing much of the conceptual background for his argument, which, given Smith’s observations about the relation between species and subsistence cited above, seems more than fair. However, despite his obvious indebtedness to Smith’s vision of “multiplication in proportion to the means of subsistence,” what Malthus crucially adds to Smith’s biopolitical conjecture is Newton’s calculus (see Waterman 1998, 575–76). Or, to put it another way, Malthus brings Newton’s mathematical invention to bear on Smith’s social nature in order to calculate the ratio between human reproduction as a species and human reproduction as a population and therefore constitutes this ratio as political economy’s natural rationality (see Stengers 2005, 999). While it’s not possible for me to reflect on the epistemological and metaphysical issues entangled in Newton’s development of the calculus here, especially as they engage the contradictions presented by Descartes’ analytic geometry,²³ suffice it to say that Malthus relies on Newton’s fluxions and fluents to motivate his tendentious comparison between the rates of increase of food supply and of mouths to feed (see Waterman 1998, 582). By invoking Newton’s calculus to derive and legitimate the bio-logic of political economy, Malthus renders the eponymous “principle of population” a simultaneously biological and economic “fact” that serves (even today) to calculate political decisions.²⁴

In order to appreciate the motivation for Malthus’ politico-economico-bio-logic, it is important to remember that Malthus offered his *Essay* as a “melancholy” rebuttal to the progressive “speculations” of William Godwin and the Marquis de Condorcet, asserting that the means by which “population must be kept down to the level of subsistence” forms “the strongest obstacle in the way to any very great future improvement of society” (1798, 3). The demonstration of this explicitly political assertion rests on the assumption that the phenomena encompassed by the concepts “population” and “subsistence” can be formulaically compared as two functions that trace the changes in these phenomena over time. Newton’s differential

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calculus underwrites Malthus' reflections on the proportion between these two different rates of change—a proportionality Smith merely asserts as self-evident—and legitimates Malthus' famous claims about the irreconcilable tension between two competing natural tendencies: the tendency of population to increase geometrically and the tendency of food supply to increase arithmetically. Malthus thus invokes Newton's calculus precisely in order to affirm the supposedly biological or natural conditions of human existence as our inevitable political and economic limits.

When Malthus posits his famous dilemma, he does so by applying the mathematical strategies that Newton developed to calculate instantaneous rates of change for physical movement (for example of planets) to the vital transformations that arise within collectivities of living human beings whose coexistence coincides with their conviviality.²⁵ This procedure enables Malthus, as it did Newton, to finesse the conceptual distinction between an aggregation of points (i.e., population as data set) and a continuous interval (i.e., population as natural species). Just as Newton was able to create an ontological continuity between the infinite points that comprise a line by asserting that the line traces the movement of a point and therefore that *the differences between the points are differences that make no difference and thus make all the difference*, so Malthus constitutes population as the traces of individual changes through time. Malthus' calculus thus renders the infinitesimal transformations of human existence, the infinite differences that make no difference and thus make all the difference, into functions of four variables: food, labor, sex, and death, whose temporal entanglement can be stated as a simple “natural law”: following its own tendencies, population will outstrip food supply. Moreover, in Malthus' case, the application of this natural law enabled him to legitimate his political and economic claims that, given the relentless biological necessities of the human species, providing out-of-door relief to the poor would “naturally” increase suffering and immiseration (despite the fact that his argument lacked much empirical substantiation).

Today we understand that Malthus's tendentious bio-logic underwrites the enterprise of political economy insofar as it constitutes the risks and vulnerabilities inherent in a living population as calculable and hence predictable (though apparently not preventable).²⁶ However, while Malthus founds the science of economics by representing human nature and human biology as *tending* towards calculable predictability, this economic strategy itself provides, as Bruno Latour and Vincent Lépinay have recently noticed, an emotional or psychological response to fear and thus motivates what they call an “entirely psychological passage from uncertainty to probability” (Latour, Lépinay 2010, 63). In order to make this affective passage make sense, Malthus' *Essay* conflates population with species as if this conflation represents a natural fact and then utilizes the mathematical analysis of population to make claims about the natural conditions within which humans necessarily coexist. Population thus seems to evince the dynamics of species-being as a matter of counting and accounting for human coexistence, both with other humans and with other others, insofar as these relations are naturally regulated by economic means. Yet it is important

to remember that the “oeconomy of nature” does not describe how nature really is, but rather affirms one particular version of what Latour calls “nature-in-general” as a strategy for universalizing the assumptions to which it is indebted. In this case, the belonging of human beings to the human species offers a way of dividing up the sensible world that forecloses non-calculating habits of thought which do not assume that population and species mean the same things or in the same ways. Nevertheless, the force of this largely unremarked equivalence continues to elude us in part because these calculating habits now appear to us as the very nature of who we are.

Coda: Special Tendencies

One of the most vital consequences of Malthus’ putatively natural calculus arises when it rebounds into bioscience itself via Charles Darwin’s theory of evolution. As historians of evolution frequently remark, Darwin explicitly incorporates Malthus’s political and economic bio-logic of population into his theory of evolution. Indeed, Darwin often credits Malthus for inspiring his dynamic synthesis of evolutionary theory, for example when he declares in *On the Origin of Species by Means of Natural Selection* (1859): “It is the doctrine of Malthus applied with manifold force to the whole animal and vegetable kingdoms” (Darwin 1859, 63).²⁷ The eminent twentieth-century biologist Ernst Mayr neatly framed Darwin’s debt to Malthus in terms of what Mayr calls Darwin’s “population thinking” (Mayr 1989, 176) since Darwin’s conceptual breakthrough posits that a species incorporate, as he writes in *Origin of Species*, “the full effects of many slight variations, accumulated during an almost infinite number of generations”(Darwin, 1859, 481). When these slight variations that preponderate through almost infinite generations are thought in terms of population, they appear as what Darwin and Alfred Wallace characterized, in the title of their famous co-authored essay as “the tendency of species towards variation” (Darwin, Wallace 1858, 46–50).²⁸ Though Darwin himself was fairly nominalistic about the notion of species,²⁸ understanding that he could not provide a well-bounded definition since by definition species evolve, nevertheless misgivings about the political implications of his intellectual genealogy abound—including those of Marx and Engels in his day, along with many subsequent scholars.²⁹

Whatever we think of Darwin’s investment in bourgeois political economy (which was quite literal since he lived off his inheritance), we can say that evolution’s political bio-logic persists insofar as Darwin conflates species with population and therefore relies on an unremarked mathematical operation borrowed from Newton by way of Malthus that extrapolates evolving tendencies from aggregates of individuals.³⁰ In order to conceptualize distinct tendencies towards speciation from infinitesimal organismic variations over time, Darwin leans on Malthus’ use of Newton’s infinitesimal calculus as a natural logic that resolves change into continuity, thereby incorporating the same at once mathematical and ontological sleight of hand.³¹ By relying on Newton’s mathematical precept to translate infinitesimal changes into determinant life forms, both Darwin and Malthus elide manifold

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biological differences that living beings evince so that these differences appear to make no vital difference and the elision of these differences makes all the difference. To put this more succinctly, we might say that both Malthus and Darwin treat population as a “black box” where individuals go in and the human species comes out and where change disappears into the conceptual darkness that lies in between.

So why try to throw some light onto this black box? Whether we realize it or not, our political, economic, or military policies are now almost exclusively calculated through population paradigms. More than just betraying an underlying political rationality, we could say that these modes of decision-making actualize a political bio-logic that considers species and population as entangled properties and, in so doing, incalculably effects multifarious living beings—human and otherwise. Insofar as states, corporations, and NGOs, for example, make decisions concerning the lives of people and other living beings in terms of populations as vital aggregates, they unreflectively materialize the political and economic assumptions that population thinking represents as natural, or even as our nature. Furthermore, the mononaturalist assumption underlying this political rationality supposes that the Western characterization of human beings as “belonging to the human species” legitimately underwrites this calculation since it describes the most *natural* way of being human. However, if we reflect on the population-species conjunction as a historical rather than a natural accomplishment, we begin to apprehend that it only coalesced across the eighteenth and nineteenth centuries in Europe as a politico-economic strategy for dividing and sharing the *human* world—Capitalism for short—that then morphed into a putatively natural way of dividing up and sharing the *life* world. Moreover, as we begin to appreciate that the coin of species-population amalgamates mathematics, natural history, political economy, and liberal political philosophy, we recognize how it legitimates secularized human-ness as a viable form of life.

We might say then that political economy provides the bio-logic of capitalism and that the human species makes this bio-logic make sense as the dominant calculus through which we partition and participate in the world. Or to recruit Rancière’s idiom: under capitalism, political economy serves as a bio-political *partage du sensible*. If the sensibility that political economy underwrites enables a psychological shift from uncertainty to probability, as Latour and Lépinay suggest, it does so by rendering vital processes subject to calculations that mathematically exclude incalculable variation as insignificant or without value. Indeed, this is precisely what Malthus’ extension of Newton’s calculus to population thinking achieved: Malthus claimed that human tendencies are fully calculable and that this calculability justified specific social policies, in this case eliminating out-of-door relief to the poor. Yet tendencies need not be totalized by their calculations, just as species need not be totalized by their populations.

In its etymological sense, tendency comes from the Latin *tendere*, to stretch; hence, by definition tendencies encompass tensions that trouble fixed boundaries and settled formulas. If

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species constitute tendencies, as post-Darwinian evolutionary theory tells us, they literally name a tension that they must also contain: i.e., they must encompass that which stays the same even as it changes and then incorporate this sameness-in-difference within themselves as that which is proper to them. The tension between sameness and difference means that species must inevitably be properly improper, which is just to say that they must be self-differing or evolving—a self-difference which species’ conflation with population obscures or elides. Yet this tension, this tendency, must endure as the incalculable substrate of both our vitality and our humanness, if we are to have any hope of continuing to evolve at all. Thus, rather than investing so much in our sense that “being human” means “belonging to the human species,” we might need to appreciate that we could be the human tendencies that we become.

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Notes

¹ Charles Linné [Carolus Linnaeus] (1806). For an excellent survey of the distinction between Linnaeus’ and Buffon’s theories of species, especially with respect to the natural history of humans, see Philip Sloan (1995) who provides a careful explanation of the shifting taxonomies of the human in both authors, along with a discussion of the categorizations offered by the late seventeenth-century English taxonomer, John Ray. Sloan explains that Linnaeus only fixed the binomial system of nomenclature in the tenth edition of his *Systema Naturae* (1758) thereby confirming homo sapiens as a distinct species among other species. Previously Linnaeus had classified humans within the genus Homo whose “specifying distinction” as reason (as identified by Delphic motto, albeit in Latin: *Nosce te ipsum*) was nonetheless modulated by four “varietal distinctions” defined both by geography and skin color: *europaeus albus*, *americanus rubescens*, *asiaticus fuscus*, and *andafricanus niger*. In the tenth edition, when the binomial taxon had been fixed, Homo sapiens included the former varietals along with a number of new ones including ferus (wild), troglodytes (nocturnal), and monstrous (with a number of sub varieties).

The classic comparison of the various additions and emendations from edition to addition appears in T. Bendyshe, “The Anthropology of Linnaeus,” (1865), which includes the following “quaint note upon man” which he identifies as having been added to the sixth edition of the *Systema Naturae* in 1746 which elaborates Linnaeus’ understanding:

Know thyself theologically; *that you are created with an immortal soul, after the image of God.*

Morally; *that you alone are blessed with a rational soul for the glory of your Creator.*

Naturally; *that you are the lord of the animals, and the ultimate end of creation, for whose sake*

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all other things have been made.

Physiologically; that you are a most perfect and wonderful machine.

Dietetically; that the Parent of nature has given you kindred animals to be to you for use and food.

Pathologically, what a fragile bubble you are, and exposed to a thousand calamities.

If you understand these things, you are a man, and a genus very distinct from all others. (423–24)

A decade later in the tenth edition, in which Linnaeus appends sapiens to Homo, this note explodes into a disquisition of several pages (426–528) that loquaciously expounds on our “special” significance. For our purposes, the most relevant aspect appears under the heading “*Naturally*” which is bracketed by the following quotations:

That you, the miracle of nature’s audacity, the chief of the animals, for whose sake nature has produced everything, are an animal, weeping, laughing, singing, speaking, docile, judging, very wise, but delicate, naked, defenseless by nature, exposed to all the contempt of fortune, dependent on the assistance of others, of anxious minds, and desirous of protection, of wavering spirit, obstinate in hope, querulous in life, very slow in gaining wisdom. [...] But how far so ever our misfortunes carry us; we accumulate dangers, we rush upon the unknown, we are angry without being injured, like wild beasts we kill people we know nothing of; we ask for favorable winds in order that we may be carried to war; earth, wide enough does not seem enough for our deaths,” Seneca. “Against other animals dissimilar beings unite, but most of the misfortunes of man come from man,” Plin. (427)

² On Linnaeus’ advocacy of breast-feeding, see Londa Schiebinger (1993).

³ See Peter Buck (1982) and (1977), Stigler (1986), Porter (1986), and Hacking (1990).

⁴ On Foucault and police, see also the introduction to Cohen, *A Body Worth Defending*, (2009).

⁵ For an overview of the debates see the entry on “species” in the [Stanford Encyclopedia of Philosophy](#). For an extended treatment of the positions, see Stamos (2003); for a polemical defense of species, see LaPorte (2007); on humans as a species, see Dupré (2002).

⁶ Sloan notes that *eidos* designates both a term of logic or classification (species in contrast to genus) and as an aspect of hylomorphism where it contrasts with *hyle*. In Aristotle’s biological writings *eidos* represents “the dynamic principle of life, an immanent principle of organization and vitality which assumes the role of the formal, final and efficient causes of all organic activity” (1987, 104). See also Balme (1962), Grene (1974), and Mouracade (2008).

⁷ See Deleuze’s critique of Aristotle notion of “difference” in the species/genus distinction in *Difference and Repetition* (1994). Species also carries with it the significance of its Latin etymology (from *specere* to look at, to behold) as “visible aspect” or “appearance.” Throughout scholastic thought, species thus often refers to the image of something as opposed to its essence, or even to a specter or apparition; see Zirkle (1959). In “Special Being,” Giorgio Agamben ruminates on the medieval significance of “species” as the image that appears in a mirror and the way this anticipates modern conceptualizations of the human (e.g., as incarnated in Lacan’s mirror stage) (2007). In the catholic liturgy communion was considered “under les deux espèces”: bread and wine were both themselves and the body and blood of Christ. Sloan notes: “Traditionally the term species had several standard uses none of which captured Buffon’s meaning in using the term. Traditional employments included that of a sense datum; a term denote external aspect; a universal applied to more than one individual; or one of the five predictables of traditional logic” (1995: 131). Compare with early 18th century definitions in Chambers’ *Cyclopaedia* (1741) and Harris’s *Lexicon Technicum* (1704).

⁸ On the implications of the concept, see Pangia (2010).

⁹ Synonyms for sensible: amenable, appreciable, noticeable, palpable, perceptible, sensitive, susceptible.

¹⁰ For a recent reflection on the contemporary implications of human species-being, see Dillon and Lobo-Guerrero (2009).

¹¹ For an elaboration how “the body” becomes a proper metonym for the person, see Cohen (2009).

¹² Given this historical framing, it’s not surprising that the most famous philosophical justifications for modern personhood, which in one way or another underwrite liberal and neo-liberal notions of human-ness as individual-ness, do not rely on the presumption that humans constitute a biological species. Descartes doesn’t invoke the idea, and neither does Hobbes. John Locke uses the phrase “human species” exactly three times in *An Essay Concerning Human Understanding*, not to reveal anything about our shared biological nature, but rather as an exemplary instance of nomination (in Book III, Chapter VII, “On the Names of Substances”). However, in one of his earliest writings (not actually published during his lifetime), *Essays on the Law of Nature* (1663–4), Locke offers a single instance which is wonderfully telling: “The inheritance of the human species as a whole is always one and the same, and it does not increase as population grows.” While in context the statement simply offers evidence for his premise that self interest cannot underwrite natural law, Locke’s conjugation of species and population here also asserts a “natural” (meaning-inevitable-and-immutable) constraint which forces humans to compete for limited resources. It thereby anticipates the fertile elaboration of this bio-politico-economic nexus a century later by Adam Smith and Robert

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Malthus, as we will see. In the late seventeenth century however this elaboration did not take place in part because neither “population” nor “species” yet provided the basis for articulating living beings simultaneously as individuals and as aggregates (the very problem of course which Hobbes’ *Leviathan* attempted to resolve).

¹³ The full title of Linnaeus’ text was *Systema naturae sive regna tria natura*, the “system of nature or the three kingdoms of nature”—meaning mineral, plant and animal.

¹⁴ See Sloan (1995), (1976, and (1985); Farber (1972), Lovejoy 1959.

¹⁵ If we consider that this reproductive valence introduces the possibility for conceiving the individual and population as “related” through production and reproduction, then we understand better why Foucault claims that sexuality exists at and as the interface “the anatomo-politics of the human body” and “the biopolitics of populations,” the former focused on “the body as machine” and the latter on “the species body, the body imbued with the mechanics of life and serving as the basis of the biological processes” (Foucault 1978, 139).

¹⁶ This criteria also founds Buffon’s critique of Linnaeus’ more expansive use of species to include inanimate as well as animate being. The quote continues: “it is clear that this denomination must only extend to animals and plant and it is by an abuse of terms or ideas that the taxonomers [*nomenclateurs*] use it to designate different sorts of minerals.”

¹⁷ Buffon's exposition of this reproductive ideal occurs not coincidentally in his discussion of the horse and the ass, the sterility of whose offspring, the mule, fueled discussions about hybridity for the next two centuries. On Buffon and race, see Hudson (1996), Sloan (1973), Curran (2009).

¹⁸ Foucault discusses the shift in population thinking between the late seventeenth and mid eighteenth centuries in relation to the transition in economic “policy” from mercantilists to *économistes*. While the former were concerned with “numbers, workers, and docility, or rather large numbers of docile workers,” for the latter “population does not have an absolute value, but simply a relative value” (2007, 344–5).

¹⁹ For example, in eighteenth-century Europe, population technologies sought to enable states to assess their own subjects' vital relations to one another as shaping their relations to other European states. This relational relating took on especial significance as an index of their defensive capabilities, since in post-Westphalian Europe the coevalness of states supposed a “balance of powers” that was tantamount to a permanent state of war preparedness (Foucault 2007, 290–306.).

²⁰ Indeed, Linnaeus developed his famous binomial nomenclature precisely to facilitate his students' ability to discern the plants on which cows, pigs and sheep feed and thereby to improve animal husbandry, not just to hone a formal system of classification (Koener 1999, 101–104).

²¹ Smith cites Buffon in his very first publication, “Letter to the Authors of the Edinburgh Review,” (1811). On the letter see Lomonaco (2002).

²² The *Essay*'s first edition uses a limited archive of statistical data, relying largely on its theoretical premises to legitimate the argument. In the subsequent editions, Malthus worked to supplement this statistical paucity and filled out the texts with evidence; however, the evidence necessarily follows the assumptions in whose wake it follows.

²³ Malthus was a “Newtonian” for whom empirical data supposedly provide the ground for theoretical formulation. Thus, he critiqued Godwin and Condorcet as Cartesians who sought to make the data fit the theory. See Waltzer (1987), Winch (1996), and Cohen (1994).

The literature on Newton's calculus is huge. The basic text is: Isaac Newton., *The Method of Fluxions and Infinite Series; with its Application to the Geometry of Curved Lines* (1736). See Kitchner (1973), Arthur (1995), Guicciardini (2006), Ramati (2001); J. E. McGuire (2007). As Kitchner's 1973 “Fluxions,” illustrates, Newton was increasingly anxious to legitimate his algebraic technique in geometrical terms in order to eliminate his reliance on infinitesimals whose existence troubled his metaphysical and his theology. Thus in the *Principia* he develops the method of “first and last ratios” as a means of providing a geometrical explanation for the use of the calculus. In his essay “Is God a Mathematician?” (1966), Hans Jonas argues that the application of algebra to classical geometry effects a shift from forms to formulas, and thereby enables analytic geometry and calculus “to represent geometrical form itself as a function of variables, that is as a phase in their continuous growth and so to formulate the laws of its ‘generation’” (68).

²⁴ McNally (2000) argues that it was precisely Malthus' Newtonianism that enabled his theory of population to be taken up as “natural law”—and therefore, I would argue, as a *partage du sensible*—within political discourse.

²⁵ See for example, Malthus's *Observations on the Effects of the Corn Laws*: “Many of the questions both in morals and politics seem to be of the nature of the problems de maximis and minimis in fluxions; in which there is always a point where a certain effect is the greatest, while

on either side of this point it gradually diminishes.”

²⁶ In his *Introductory Lectures on Political Economy* (1847, delivered in 1831), Richard Whately notices the conflation that Malthus’s use of “tendency” implies:

Again, the doctrine, as mischievous as it is, I conceive, unfounded, that since there is a tendency in the population to increase faster than the means of subsistence, hence, the pressure of population against subsistence may be expected to become greater and greater in each successive generation (unless new and extraordinary measures are resorted to,) and thus to produce a progressive diminution of human welfare;—this doctrine which some maintain in defiance of the fact that all civilized countries have a greater proportion of wealth, now, than formerly,—may be traced chiefly to an undetected ambiguity in the word ‘*tendency*,’ which forms a part of the middle term of the argument. By a ‘tendency’ towards a certain result is sometimes meant, ‘the existence of a cause which, *if operating unimpeded*, would produce that result.’ [...] But sometimes again, a ‘tendency towards a certain result’ is understood to mean ‘the existence of a state of things that that result *may be expected to take place*.’ (231–232)

²⁷ On Darwin’s relation to Malthus, see Young (1985), Vorzimmer (1969), Herbert (1971), Bowler (1976), Ariew (2007). In 1839 after reading Malthus, Darwin cites the *Essay* in the following in his Notebook E:

‘And since the world began, the causes of population & depopulation have been probably as constant as any of the laws of nature with which we are acquainted.’—this applies to one species—I would apply it not only to population & depopulation, but extermination & production of new forms.—their number & correlations. (1859, 3)

²⁸ See Darwin’s demurrals in *On the Origin of Species* (1859):

From these remarks it will be seen that I look at the term species, as one arbitrarily given for the sake of convenience to a set of individuals closely resembling each other, and that it does not essentially differ from the term variety, which is given to less distinct and more fluctuating forms. The term variety, again, in comparison with mere individual differences is also applied arbitrarily, and for mere convenience sake. (52)

Needless to say, as with all things pertaining to Darwin, there is much controversy about Darwin's position on "species." For a detailed summary of the history of the arguments and an attempt at resolving them, see Stamos (2007).

²⁹ In a letter of 18 June 1862 to Engels, Marx wrote:

I'm amused that Darwin, at whom I've been taking another look, should say that he also applies the 'Malthusian' theory to plants and animals, as though in Mr Malthus's case the whole thing didn't lie in its not being applied to plants and animals, but only — with its geometric progression — to humans as against plants and animals. It is remarkable how Darwin rediscovers, among the beasts and plants, the society of England with its division of labour, competition, opening up of new markets, 'inventions' and Malthusian 'struggle for existence'. It is Hobbes' *bellum omnium contra omnes* and is reminiscent of Hegel's *Phenomenology*, in which civil society figures as an 'intellectual animal kingdom', whereas, in Darwin, the animal kingdom figures as civil society. (1862, n.p.)

Friedrich Engels in a 12 November 1875 letter to P.L. Lavrov responding to an article that Lavrov had sent Engels:

The whole Darwinian theory of the struggle for existence is simply the transference from society to animate nature of Hobbes' theory of the war of every man against every man and the bourgeois economic theory of competition, along with the Malthusian theory of population. This feat having been accomplished— (as indicated under (1) I dispute its unqualified justification, especially where the Malthusian theory is concerned)— the same theories are next transferred back again from organic nature to history and their validity as eternal laws of human society declared to have been proved. The childishness of this procedure is obvious, it is not worth wasting words over.

For a survey of non-Malthusian theories of evolution, see Todes (1989), Sapp (1997).

³⁰ As early as 1842, in his “First Pencil Sketch of the Species Theory,” Darwin writes the following series of notes to himself:

But considering the enormous geometrical power of increase in every organism and as every country, in ordinary cases, must be stocked to the full extent, reflection will show that this is the case. Malthus on man—in animals no moral restraint [...] the pressure is always ready . . . a thousand wedges are being forced into the economy of nature. This requires much reflection; study Malthus and calculate rates of increase and remember the resistance— only periodical. [...] In the course of a thousand generations infinitesimally small differences must invariably tell. (Quoted in Young 1985, 41).

See [Darwin 1842](#) for a facsimile of the original

³¹ As Henri Bergson will note this kind of temporal prestidigitation afflicts scientific realism more generally since it understands that “matter evolves in such a manner that we can pass from one moment to the next by a mathematical deduction” (Bergson, 2007, 76). In *Creative Evolution*, Bergson directly links this strategy to the Newtonian invention of fluxions arguing that by incorporating differential calculus to describe the movement of time: “You are therefore really speaking only of the present—the present, it is true considered along with its tendency” (1975, 26). Furthermore, Bergson argues that such habits of understanding tendentiously bear on evolution by occluding the actual passage of time: “Evolution implies a real persistence of the past in the present, a duration which is, as it were, a hyphen, a connecting link. In other words, to know a living being or natural system is to get at the very interval of duration, while the knowledge of an artificial or mathematical system applies only to the extremity” (Bergson, 1975, 27).

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