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## Living natural products in Kant's physical geography

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*Abstract:* In this paper I propose a new account of living natural products in Kant's physical geography. I argue that Kant adopts Buffon's twofold conception of natural history, which consists of a general theory of nature as a physical nexus of causes and a particular account of living natural products in the setting of the earth. Yet in contrast to Buffon, who placed the two parts of natural history on equal epistemic footing, Kant's physical geography can be understood as a second, pragmatic level of inquiry that stands under the formal conditions of nature outlined in *Universal Natural History*. On the higher, formal level, natural history provides a physical account of time and space as an expanding causal sequence. On the lower, pragmatic level, physical geography provides a causal account of particular natural products as developing within a specific place. I argue that this two-tiered account not only clarifies the relation between metaphysics and experience in Kant's pre-critical philosophy, it also sheds light on the continuity between the method of physical geography and the systematisation of nature presented in the critical philosophy.

### 1. Introduction

In his early essay, *Universal Natural History and Theory of the Heavens* (1755), Kant attempted to determine the universal conditions in which natural products arise by means of a hypothetical account of nature's constituent parts. These parts are not the passive corpuscles found in literal readings of Newton but rather dynamic particles infused with attractive and repulsive forces. The particles necessarily form a system as they whirl into vortices and, over long periods of time, give rise to all conceivable natural products, including suns, planets, terrestrial formations and local climates. Yet Kant recognised that the immense complexity of living natural products poses an explanatory challenge for a universal natural history. The structure of even the simplest form of life is more complex than the entire cosmos (*UNH* 1755, AA 1:230).<sup>1</sup> While all that one requires to explain the current arrangement of the cosmos is the right theory of matter ('Give me matter and I will build you a world out of it'), Kant asks whether one can also say,

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<sup>1</sup> Citations of Kant's works refer to the volume and page number of *Kants gesammelte Schriften*, Akademie Ausgabe, except in the case of the physical geography lecture notes, which refer to the pagination of the original manuscripts, and *Critique of Pure Reason*, which refer to the conventional A/B pagination. I use the following abbreviations, including a date of publication to aid the reader in following the development of Kant's lectures in light of his published writings: *UNH* 1755 = *Universal Natural History*; *OPG* 1757 = 'Plan and announcement of a series of lectures on physical geography'; *PGH* 1757–9 = *Physische Geographie: Holstein*; *MH* 1762–4 = *Metaphysik Herder*; *OPA* 1763 = *Only Possible Argument*; *OPG* 1765 = 'M. Immanuel Kant's announcement of the programme of his lectures for the winter semester 1765–1766'; *PGK* 1775 = *Physische Geographie: Kaehler*; *PGR* 1775/1757–9 = *Physical Geography: Rink*; *DR* 1775 = 'Of the Different Races of Human Beings To Announce the Lectures on Physical Geography of Immanuel Kant'; *DR* 1777 = 'Of the Different Races of Human Beings'; *PGD* 1781–2 = *Physische Geographie: Dönhoff*; *MF* 1786 = *Metaphysical Foundations*; *TP* 1788 = 'Teleological Principles'; *CPJ* 1790 = *Critique of the Power of Judgment*.

Give me matter and I will show you how a worm can be created? Don't we get stuck at the first step due to ignorance about the true inner nature of the object and the complexity of the diversity contained within it? (*UNH* 1755, AA 1:230)

Kant concedes that a hypothetical account of matter cannot explain generation. We require experience before we would ever expect nature to give rise to living natural products. Yet his reference to 'inner nature' and 'complexity' suggests that the difficulty is not so much a matter of kind as one of degree.<sup>2</sup> In the Appendix entitled 'On the inhabitants of the planets', Kant implies that his mechanistic framework could in principle explain the presence of organised beings. The mechanical development of the cosmos leads to ever increasing levels of organisation, including living natural products and, eventually, rational natural products, even to a degree beyond earth-bound humans. Following the mechanical-teleological law advanced in *Universal Natural History*, Kant states that the 'end' of planets is to generate life to the highest degree of complexity (*UNH* 1755, AA 1:352–354).<sup>3</sup>

In Kant's view, we get stuck when it comes to explaining the generation of living natural products because we are ignorant of their inner structure. We can examine living natural products *as* structured, however, because the universal conditions of nature make it the case that natural products feature within a single and continuous causal chain. At first glance Kant's view seems to be a mechanical version of Leibniz's (2011, pp. 290–297) account of organic structure, which differentiates living beings from artifices not according to kind but to complexity; organisms are infinitely complex, for they consist of an unlimited cluster of artefacts. Yet in the frame of universal natural history, this position falls into a regress, for the possibility of artefacts depends on the existence of rational beings capable of realising an idea. While the theory of matter presented in *Universal Natural History* makes it the case that to be natural is to feature within a single causal sequence, precisely how nested organisations came into being remains unexplained. The problem is one of localised, particular laws that govern generation. If generative laws are reducible to the general laws of nature, they would be on par with the emergent laws governing the vortex structure. One can examine the vortex structure in which nebulous matter form a primitive system as an artefact that operates according to a principle. Yet if one properly understood the properties of matter, such an account would be replaced with a universal natural history: matter spontaneously adopts systematic form due to the dynamic interaction of attractive and repulsive forces. If the laws of generation are specific to living beings – perhaps even to each species of living being – then they would not feature within a *universal* natural history. There would be as many isolated natural histories as there are forms of life.

While Kant did not speculate about the possibility of generation in *Universal Natural History*, we gain an insight into his position from a new lecture course he developed for the summer term of 1756 entitled Physical Geography, which he continued to teach without a break until his retirement forty years later (Adickes 1911, p. 9). Scholars have suggested that Kant's programme for a physical geography draws from Karl Rappolt,

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<sup>2</sup> McLaughlin (1994, p. 102) argues that Kant's answer to the question of generation in 1755 remains the same throughout Kant's career, and links *Universal Natural History* to Kant's denial of a biological Newton in *Critique of the Power of Judgment*. In contrast, I suggest that Kant was open to the possibility of a mechanical explanation for generation in 1755, yet he considered it to lie beyond the limits of human cognition.

<sup>3</sup> Kant argues that 'most of the planets are certainly inhabited and those that are not will be at some stage' (*UNH* 1755, AA 1:354).

who developed a course at Königsberg during the early 1750s entitled *Geographicam Physicam, Verenio, Woodwardo, Scheuchzero ac Jurino ducibus* (Stark 2011, pp. 71–72). Rappolt’s course covered the work of physicotheologians and natural historians including John Woodward, John Ray and Carl Linnaeus, who identified the role of place in constraining the dynamics in which natural products arise. Yet to situate Kant’s lectures in relation to these sources overlooks what is decisively novel in his programme for physical geography. In contrast to the the static concept of place found in the geographies of his time, Kant examines the co-emergence of place and natural products within a general system.

In this paper I argue that Kant adopts Buffon’s dynamic account of natural history to conceive of the development of natural products in reciprocal interaction with a birthplace. Kant lists Buffon as one of the three authorities for physical geography in his announcement for the lectures in 1757 (OPG 1757, AA 2:4), and yet he refers to Buffon only on occasion throughout the lectures. Nevertheless, I claim that there is sufficient evidence to conclude that Kant worked closely with the German translation of the first three volumes of *Histoire naturelle, générale et particulière* as he composed the lecture course.<sup>4</sup> Furthermore, I claim that Kant’s concept of race, presented in his essay of 1775/1777, draws directly from the 1772 translation of Buffon’s article ‘De la dégénération des animaux’ (1766). Zink and Kästner’s translation of the first three volumes of *Histoire naturelle* was published in 1750 as *Allgemeine Historie der Natur nach allen ihren besondern Theilen abgehandelt* (*General history of nature, dealt with according to all its particular parts*). While Buffon set the *générale* and the *particulière* parts of natural history on equal epistemic footing, their translation introduces a conceptual hierarchy, implying that the particular part is nested within the general (Schmitt 2019, p. 54). Kant certainly read the text this way, for he assumes a hierarchical distinction between general and particular natural history in which physical geography can be understood as a second level of inquiry that stands under the physical account of nature presented in *Universal Natural History*. On the higher, formal level, natural history provides a physical account of time and space as an expanding causal sequence, thereby determining the conditions that are the same everywhere. On the lower, pragmatic level, natural history seeks to orient human thought within a specific place, namely, the setting of the earth. This hierarchical system grounds the study of particular natural products – mountains, winds, ocean currents, climactic patterns, plants and animals – in a single and dynamically interconnected chain of physical causes that can *in principle* (though not in practice) be traced back to an original moment of matter’s dispersion.

Before we begin, it is important to note the interpretive difficulties associated with Kant’s lectures. The published Rink (1805) edition is often taken as the definitive representation of Kant’s views on physical geography, for Kant publicly endorsed it over the earlier Vollmer (1801) publication.<sup>5</sup> Yet as Werner Stark (2011, p. 82) has argued at length, this view is problematic, for a close reading shows that the first volume of the Rink edition is based on lectures dated to 1775 (*PGR* 1775, AA 9:156–273), and the second volume (*PGR* 1757–9, AA 9:273–436) is based on lectures given during the late 1750s. Given the exponential growth of travel

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<sup>4</sup> See also Jahn (1990, pp. 229–233), who traces the significance Buffon’s identification of a general and specific part of natural history for the following generation of German natural historians. For a discussion of Buffon’s influence on Kant’s early conception of natural history, see Sloan (2006, p. 633).

<sup>5</sup> Kant wrote a ‘public declaration’ in 1801 that established Rink as the official editor: ‘At the last trade fair, the bookdealer Vollmer published a physical geography under my name, based, as he himself says, on student notes; I do not recognize this text as mine, neither in the subject matter nor in form. I have assigned the legitimate publication of my physical geography to Prof. Dr Rinck.’ Kant, ‘Nachricht an das Publicum’, translated by Stark (2011, p. 82).

writing during the second half of the eighteenth century, Kant's material for the course changed significantly between 1756 and 1796. To make matters even more complicated, none of the lecture notes include text written by Kant himself. We have instead a collection of seventeen sets of notes that aim to capture Professor Kant's spoken words, providing a genre altogether different from his primary works.

To mitigate some of these difficulties, I draw not only from the Rink edition but also from a selection of lecture notes chosen from various periods leading up and including the critical period: Ms Holstein (1757–9), Ms Kaehler (1774) and Ms Dönhoff (1781–2), along with Erich Adickes' discussion of the twenty-two sets of lecture notes that were available in 1911 in *Untersuchungen zu Kants Physischer Geographie*.<sup>6</sup> In Section 2 I examine Kant's conception of physical geography in the general part of the lectures, along with some of Kant's early course announcements. In Section 3 I consider to the particular part of the lectures, where I identify several connections between Kant's classificatory method and Buffon's physical account of race. In Section 4 I turn to Kant's engagement with the human origins debate in the mid-1770s, where I examine his critique of Buffon's theory of generation in light of his reading of Buffon's 1766 essay on degeneration. While Kant's physical geography is often understood in isolation from the critical philosophy, I conclude by suggesting that the pragmatic method developed in the lectures anticipates his critical account of the systematisation of nature.

## 2. The idea of a physical geography

In this opening section I define Kant's idea of physical geography as a second, pragmatic level of natural history in his system of natural philosophy. In his announcement for the lecture course of spring 1757, Kant stated that his goal is to introduce his students to the various sources of geographical knowledge (OPG 1757, AA 2:4). However, by the time he wrote an announcement for the winter semester of 1765–66, Kant had come to view physical geography as preparation for philosophy in general. Knowledge of the world transforms the vague and general information gathered from piecemeal observations and travel writing into clear and particular concepts by means of concrete examples. Kant's involvement in the physical influx debate during the 1750s and his development of a physical account of monads during the 1760s pointed toward the fundamental role of nature acting on the body in all acts of cognition. The physical origins of knowledge meant that a proper philosophical education must be furnished with natural history. Kant explains that while his students were being taught the 'art of subtle argumentation', they nevertheless

lacked any adequate knowledge of historical matters which could make good their lack of *experience*. Accordingly, I conceived the project of making the history of the present state of the earth, in other words, a geography in the widest sense of the term. (OPG 1765, AA 2:312)

Kant transforms the physical basis of truth he developed in the 1750s into a pedagogical framework for his new lecture course. His aim is not to train budding naturalists but rather to provide students destined for other careers with a historical foundation by which they can orient themselves in the world. In his announcement for the 1775 lectures, Kant describes his course as 'more of a useful entertainment than a laborious business', something closer to a 'game' than 'deep inquiry' (DR 1775, AA 2:429). Toward the end of the announcement he describes

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<sup>6</sup> Ms Kaehler is located at the University of Pennsylvania's Rare Book and Manuscript Library (Philadelphia, USA), listed as Ms Codex 1120 and (formerly) Ms German 36. Ms Holstein and Dönhoff are privately owned.

the knowledge that his students will attain from the lectures as *Weltkenntnis*, ‘world knowledge’ (DR 1775, AA 2:443).<sup>7</sup> In recent scholarship there has been extensive discussion of the meaning of *Weltkenntnis* in Kant’s philosophy.<sup>8</sup> Here I want to focus on his presentation of *Weltkenntnis* as serving a ‘pragmatic’ purpose (PGR 1775, AA 9:157). Robert Loudon (2002, p. 21) describes the pragmatic purpose of the lectures in terms of an ‘impure ethics’, which is not about formulating action according to reason but cultivating a practical outlook. Holly Wilson (2006) argues that in contrast to a general view, which seeks to explain a phenomenon by providing a causal hypothesis, a pragmatic view furthers our ability to provide an explanation. It is the difference between ‘knowing how something happens and how to use it’ (Wilson 2006, p. 29). The former is an account that satisfies the abstract intellect, the latter appeals to the practical need to orient oneself in the sphere of nature that can have an effect on one’s actions. Thus, in contrast to the formal outlook of *Universal Natural History*, a pragmatic inquiry orients the human being within the setting of the earth. Kant elaborates in dramatic terms (he was, after all, chasing student enrolments): the study of physical geography is ‘useful for life’, for it introduces the student ‘to the stage of his destiny, namely the world’ (DR 1775, AA 2:443).

Kant divides the lectures into two parts, general and particular. While this division reflects Buffon’s presentation of natural history as *générale et particulière*, on my reading both of these parts feature within the second, pragmatic level of inquiry that stands under universal natural history, for both are concerned with the ‘setting [*Schauplatz*]’ that is meaningful to human beings: the earth (PGR 1775, AA 9:160). In Kant’s system, the higher, formal level is akin to the First and Second Discourses of Buffon’s *Histoire naturelle*. In the First Discourse, ‘De la manière d’étudier et de traiter l’Histoire Naturelle’, Buffon (1749, I pp. 1–64) presents a general theory of truth as physical truth. In the Second Discourse, ‘Histoire et théorie de la Terre’ he demonstrates the implications of this theory via a general account of the earth’s formation as a single causal sequence (Buffon 1749, I pp. 65–124).<sup>9</sup> The articles that stand under the theory of the earth, including ‘Géographie’, ‘Sur la production des couches ou lits de terre’ and ‘Sur les Coquilles et les autres productions de la mer, qu’on trouve dans l’intérieur de la terre’, are not strictly universal, for they concern products that form within the system of the earth. These elements fall within what Kant terms the ‘General Part [*allgemeinen Theil*] of Physical Geography’, in which he examines ‘the earth according to its parts and all that belongs to it’ (PGR 1775, AA 9:183). This consists of a series of ‘histories’ that account for the formation of seas, lands, islands, rivers and mountains. In the second part of the lectures Kant examines ‘the particular products and creatures of the earth [*den besondern Producten und Erdgeschöpfen*]’ (PGR 1775, AA 9:183), which mirrors the particular part of Buffon’s *Histoire naturelle*. In each section Kant accounts for the particular morphological characteristics of a given natural product as the result of a dynamic interaction between an original stem (*ursprüngliche Stamm*) and a birthplace (*Geburtsort*) in which it develops (PGR 1775, AA 9:160). In contrast to universal natural history, which traces back to the initial dispersion of matter, and general physical geography, which accounts of a natural product within the earth’s system, particular physical geography considers living natural product as localised systems, each featuring within a line of development that descends back to an original stem. This is why the inquiry in both parts of physical geography is pragmatic: how terrestrial

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<sup>7</sup> Wilson (2006, p. 20) renders *Weltkenntnis* as ‘cosmopolitan knowledge’ to highlight the political nature of Kant’s project.

<sup>8</sup> See Bianchi (2018, pp. 58–59) for a recent summary of the discussion.

<sup>9</sup> For an account of Kant’s *Universal Natural History* as a reading of Buffon’s opening discourses, see Cooper (forthcoming).

formations or the original form of a living natural product feature within the single causal nexus is unknown. Nevertheless, the geographer is entitled to trace physical connections because, on the conditions of universal natural history, to be a natural product is to feature within nature's causal sequence. That geography must be *physical* geography is determined by Kant's universal natural history, in which nature is the series of connections constitutive of time and space.

Kant's description of his lectures as a 'history of the present state of the earth' has puzzled interpreters, for it seems to confuse diachronic with synchronic analysis. Max Marcuzzi (2011, p. 120) for example suggests that there is a 'vicious cycle' in the connection Kant draws between geography and history. According to Marcuzzi, Kant states that geography can achieve 'a systematic form insofar as its object is the entire earth', yet he then 'affirms that it is only complete when it integrates becoming, and in moving into history, which is impossible.' Yet Kant is clearly using 'history' in the Buffonian sense, which consists of an account of how the present state of natural products arose according to natural causes. Many of the section titles recorded in the earliest remaining student notes indicate the historical basis of geography: 'history of seas', 'history of the continents and islands', 'history of rivers', 'history of the great changes [*großen Veränderungen*] that the earth has undergone and is still undergoing' (*PGH* 1757–9, 5, 18, 45, 86). In contrast to mathematical or political geography, a physical geography contains 'a treatment of the natural relationship which holds between all the countries and seas of the world, and the reason for their connection [*den Grund ihrer Verknüpfung*]' (*PGR* 1757–9, AA 2:312). This is, after all, 'the real foundation of all history.' A physical geography for Kant draws the discoveries presented by natural historians into a system of physical causes and effects. This guiding cognitive framework enables the student of physical geography to anticipate possible future experience. The geographical works of Kant's time had so far failed to meet this pragmatic demand.

In the 'history of the great changes the earth has undergone and is still undergoing', which features in each of the Holstein, Kaehler, Dönhoff and Rink manuscripts, Kant gives an account of how the earth transforms itself through earthquakes, rivers, rain, wind, frost and sea.<sup>10</sup> He even considers how human actions – the construction of dams, the draining of swamps, the felling of forests – alter the local climates in which they are undertaken. These changes happen on the level of the earth understood as an interrelated system, without reference to other celestial bodies. Kant's account of great changes is based on 'proofs [*Beweisthümer*]' that the sea formerly covered the whole earth, such as shells discovered on high mountains, the shapes of certain valleys and the constellation of layers of the ground that give evidence to the constant movement of the earth's crust (*PGR* 1757–9, AA 9:298; *PGH* 1757–9, 93; *PGD* 1781–2, 69). In this section we see the working relationship between *Universal Natural History* and physical geography. Kant's formal account of nature sets the conditions in which we can search out the specific laws that govern processes and products. *Given* that natural processes and products are dynamically connected by virtue of featuring within a single chain of causes and effects, the proofs of dramatic changes in the earth invite the physical geographer to project backwards from the present moment along causal series that run (via the proof) toward the initial dispersion of matter. On the formal assumption that the links in the chain of nature are causal, Kant criticises the physicotheologians, including Burnet, Woodward, Whiston and Linnaeus, who attempt to explain such proofs within a Mosaical timeframe

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<sup>10</sup> In Ms Kaehler this section is entitled 'Explanation of the changes of the deposits and mountains out of the chaotic conditions of the earth' (*PGK* 1775, 335). In Ms Dönhoff there is no title for this section, but Kant is recorded as speaking at length about the great changes in the earth through natural processes (*PGD* 1781–2, 60–74).

(*PGR* 1757–9, AA 9:301–313). Their preconceived, non-natural conception of time requires the explanation of natural products according to hypernatural causes. Even Simon de La Loubère, who manages to provide a physical account (in which monkeys carried the shells into the mountains!), is deemed ‘ridiculous’, for he must reject a far simpler hypothesis (the recession of the sea) to maintain the Mosaical timeframe (*PGR* 1757–9, AA 9:298). The fundamental question of natural history, Kant states, is how we conceive of ‘the cause of all these changes’, and his answer is that we conceive of these changes as the result of physical causes within space and time (*PGR* 1757–9, AA 9:301).

Kant’s critique of the physicotheologians follows the structure of the first four articles of Buffon’s (1749, I pp. 127–188) ‘Preuves de la théorie de la Terre’, where Buffon ridicules the Mosaical natural histories proposed by Whiston, Burnet and Woodward. Kant concludes this section with an analysis of Buffon, arguing that Buffon provides a superior theory of the earth, for he locates the great alterations in the sphere of physical geography (*PGR* 1757–9, AA 9:303). Yet Kant also notes that Buffon’s proposal is not entirely successful, for it does not manage to provide a causal explanation for the sea’s retreat from the mountainous regions; it merely describes it as having retreated. What marks a physical geography from a description of nature is that it accounts for past events according to causal connections, that is, it fills in the formal conditions of nature with physical content. For Kant, the proofs can only be understood through a process whereby the earth was originally a liquid mass and then progressively hardened, taking a spherical form that is flatter at the poles. As the earth hardened, the heavier masses were moved to the centre of the earth while lighter ones were moved to the surface. Despite the fact that this process is particular to the earth, and thus singular in character, it arises from a history that can be captured by the physical geographer, even if only through speculative reconstruction.

What is crucial to note in the lectures is the various levels from which nature can be understood as a dynamic system. Local systems including climate and geophysical formation are part of the global system, meaning that they are shaped by and give shape to their surrounds. Yet as we will see in the following section, living natural products are a special, localised kind of system. To examine the connections between living natural products in a line of descent as *physical* connections, including the acquisition of adaptive characteristics that are passed on to a following generation without fail, the physical geographer must assume that living natural products are open to the physical order and yet constrained by specific, inner forces that enable them to respond to environmental effects and pass on their adaptations to future generations. In contrast to the passive earth, which is *shaped by* natural processes, living natural products *shape themselves* in response to environmental changes and, in turn, shape their environment.

### **3. Particular physical geography**

In this section I turn to the particular part of Kant’s physical geography lectures, which, I suggest, build on the particular part of Buffon’s *Histoire naturelle*. Having outlined the general theory of the earth, Buffon (1749, II pp. 20–62) opens the particular part of natural history with a theory of generation. His theory of generation is based on the acknowledgment that living natural products are underdetermined by the general conditions of nature. While most naturalists conclude from this acknowledgement that generation is a non-natural cause, for it cannot be accounted for by general principles, Buffon (1749, II p. 20) proposes that generation can be understood as a form of movement specific to an organic kind of matter. Speculation about organic matter is warranted in a particular theory of generation, he claims, for it is the only alternative that



successfully navigates between two unacceptable positions. The first position is to appeal to a hyperphysical cause. This violates the general part of natural history, which accounts for natural products within a single causal nexus. The second is to explain the animal economy by mechanisms such as levers, springs and bellows. Such an attempt is ‘vain and ineffectual’, for the functions of the animal body, including the circulation of blood and the movement of muscles, cannot be captured by ‘any of the common laws of mechanism’ (Buffon 1749, II p. 23).

To situate the particular part of natural history within physical nature, and yet to maintain the distinct causality of living natural products, Buffon suggests that growth and reproduction ‘are effects of laws of a different nature’ (Buffon 1749, II p. 23). These laws are more specific than the universal laws of gravity and impulsion, and thus do not warrant membership among the mechanical principles. Yet Buffon (1749, II p. 23) presents them as laws nonetheless, for, if Newton was permitted to posit gravity as an unknown force uniting the celestial sphere, so too are we permitted in the study of physiological movement to propose an unknown force ‘to collect the superfluous organic particles, and bestow on them the figure of the body from which the proceed.’ At the core of Buffon’s theory of generation is an account of expansion and growth in which the different parts of a body ‘are effected by the intimate penetration of organic particles [*molecules organiques*], analogous to each of these parts’ (Buffon 1749, II p. 21). Buffon speculates that the organic particles are moved into the various parts by a penetrative force, where they are pressed into the appropriate shape by an interior mould (*moule intérieure*). When there is a surplus of organic particles, they make their way to the testicles and seminal vessels to become part of the process of generation (Buffon 1749, II p. 23). Of course, Buffon acknowledges that his theory of generation is hypothetical. Yet given that the general conditions of nature make it the case that only physical hypotheses are permissible, he claims that it is the best hypothesis to date, for it is the only proposal that explains physiological effects according to natural causes. Varieties are the result of a physical sequence of causes expressed through the dynamic interplay of the penetrating force, diet, climate and geographical terrain.

Kant recognised that Buffon’s focus on spatial and temporal variation transforms the scholastic practice of natural history from a logical procedure of division, whereby the same species concept applies to geology, meteorology, plants and animals, into a physical procedure, whereby the naturalist seeks to ground divisions in what Buffon termed a ‘natural cause’. He is event in the very opening of the lecture course, where he distinguishes between logical and physical knowledge: ‘Division of knowledge according to concepts is **logical**; according to time and space it is **physical**’ (*PGR* 1775, AA 9:159). To understand the difference between logical and physical knowledge, it will be helpful to turn to Kant’s account of grounding in the student notes taken from his lectures on metaphysics during the 1760s. In the Herder notes (1762–4), Kant is recorded as making a distinction between logical and real grounds:

A ground is thus something by which, having been posited, something else is posited. ... Every *ground* is either logical, through which the consequence, which is identical to it, is posited as a predicate according to the rule of identity, or *real*, through which the consequence, which is not identical to it, is not posited according to the rule of identity. (*MH* 1762–4, AA 28:11)

Kant stipulates that grounding relations are *posited*: if a ground is posited, what it grounds is simultaneously posited. A ground is logical, Kant explains, when the relata of a logical grounding relation are identical, that is, something is a logical ground of something else if the concept of the former contains the concept of the latter (membership within a genus is a logical ground of membership within a species). Logical grounds are thus conceptually determining grounds (*ratio cognoscendi*). The relata of a real grounding relation, in contrast, are not related by identity:

Every determination of things, however, which demands a real ground, is posited through something else, and the connection of a real ground with the real consequence is thus not comprehended from the rule of identity, also cannot be expressed through a judgment, but is rather a simple concept. (*MH* 1762–4, AA 28:24)

In contrast to logical grounds, real grounds capture an entirely different class of lawlike claims. If a real ground is posited as a *cause*, a consequence follows as something non-identical, namely, an *effect*. Thus a real consequence does not follow logically but existentially. The relationship between the cause and the effect is one of metaphysical determination, where the real ground gives rise to what it grounds. A real ground is thus a ground of becoming (*ratio fiendi*), whereby the effect is not identical to the cause. The capacity of a real ground to determine certain effects is captured by the concept of a force (*Kraft*):

*Ratio fiendi*: there exists a real ground *X* such that force *F* obtains in virtue of what it means to be *X*. Hence, by positing *X* as a real ground, force *F* is also determinately posited.

The upshot of Kant's distinction between logical and real grounds is that we cannot grasp the connection between a real ground and its effect *a priori*. Kant states that the 'connection between the logical ground and the consequence is comprehensible, but not that between the real ground, that when something is posited, something else would be posited at the same time' (*MH* 1762–4, AA 28:12). This is to say that it is only 'through experience can we have insight into the connection of the real ground' (*MH* 1762–4, AA 28:24). The *X* serves as an unknown force to be discovered in experience, and the naturalist must work backwards from the effects to discover the cause. Buffon's penetrative force, while hypothetical, is nevertheless a *physical* hypothesis, and thus far superior to those who consider generation according to hyperphysical causes or postulated mechanisms.

Kant's distinction between logical and real grounds can be understood against the background of Buffon's distinction between 'abstract' and 'physical' truth in the First Discourse. In contrast to the majority of Newtonians, who privilege deductive over inductive knowledge, Buffon reverses the relation of the two orders such that physical truth reaches a greater level of certainty than abstract truth (Buffon 1749, I 53–54). Kant accepts this revised relation of truth on the pragmatic level of physical geography. He suggests that the categories of the scholastic system, which are logically grounded in a higher category via a relationship of identity, yield only artificial distinctions that we cannot be sure track natural divisions.<sup>11</sup> On this definition it

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<sup>11</sup> For an account of the similarities between Kant and Buffon's conception of physical truth, see Sloan (2006, pp. 630–633).

seems unfair to describe the Linnaean system as entirely logical, which Kant does in the quote below. While Linnaeus ([1735] 1964) accepted that the classificatory categories are logically related, he nevertheless treated the relata within the lowest category of variety to the higher level of species in terms of a real grounding relation, whereby a substance is the real ground of accidents.<sup>12</sup> Yet Kant, like Buffon, aspired to ground *all* classificatory distinctions in natural causes. In Buffon's (1749, I 51–52) presentation, by retaining the set of logical concepts as the fundamental concepts of classification, Linnaeus failed to observe the enduring modifications undergone by a variety when faced with changed conditions, which are not captured by the logical concept of variety. Kant certainly agreed, claiming that Buffon transformed the scholastic divisions into physical divisions, meaning that the taxonomical categories themselves are grounded in natural causes:

Division of knowledge according to concepts is logical; according to time and space it is physical. By means of the former [logical division], we obtain a system of nature (*systema naturae*), as for example that of Linnaeus. With the latter [physical division] we obtain a geographical description of nature.

If, for example, I say that the species 'cattle' is one of the kinds of four-footed animals ... then this is a division I make in my head: it is a logical division. The *systema naturae* is, as it were, a kind of register of the whole, wherein I situate all things, each in the class to which it belongs, even if on earth they are to be found in widely separated areas.

In accordance with the physical division, however, things are considered in terms of the positions [*Stellen*] they occupy on earth. The system indicates their position [*Stelle*] in the classification. The physical geographical description of nature, on the other hand, seeks after the positions on earth where those things are actually found. Thus, for example, the lizard and the crocodile are basically the same animal. The crocodile is only an enormous lizard. But the places [*Örter*] where the two are found are different. The crocodile lives on the Nile; the lizard on land, including in our area. In sum, we are concerned with the setting [*Schauplatz*] of nature, the earth itself, and those regions [*Gegenden*] where things are actually encountered. But what matters in the system of nature is not birthplace [*Geburtsorte*], but similarity of form. (PGR 1775, AA 9:159–60)

Kant contrasts Buffon's physical system with scholastic system for the reason that it relates the extrinsic differences between living beings (their place and environment) in terms of a ground that is intrinsic to them. The classification of the species *cattle* under the kind *four-footed animal* is arbitrary, for there may well be four-footed things all over the earth that bear no physical connection with cattle. Or consider the crocodile. When considered purely according to common morphological characters, the naturalist could classify the crocodile under *lizard*, for the only qualitative difference is its size. But when the naturalist considers the crocodile's birthplace, recognising that it lives on the Nile and not on the continent, she begins to examine it within a projected lineage related by a causal sequence (what Buffon calls a 'natural cause' and Kant a 'real ground'). By examining the crocodile within a projected lineage, the naturalist can then search for marks specific to this line of descent. A lineage connected by a natural cause gives rise to a class division that is not made in one's head but

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<sup>12</sup> In *Ratio operis* (1737), for example, Linnaeus (2007, p. 565) speaks of originally created species that 'afterwards produce more, but always similar forms according to inherent laws of generation.'

that is discovered experimentally. Thus geography, in providing the physical context for understanding living beings, is fundamental to the prospects of a natural system:

History and geography extend our knowledge in relation to time and space. History concerns the events that have taken place one after another in time. Geography concerns phenomena that occur simultaneously in space. (*PGR* 1775, AA 9:160)

The combination of history and geography allows the naturalist to extend their knowledge of natural products by identifying physical boundaries between natural groups that are not simply described or learned by habit but are physically extended in time and space. By combining spatial distribution with temporal continuity, the naturalist can represent the location and ground of each species within a projected system of physical connections. What appears as the accidental alteration of a permanent or enduring locus of heredity in the Linnaean system becomes a matter of ‘race [*Race*]’, a physical network of historical filiation united under an original ‘stem [*Stamm*]’.<sup>13</sup>

From the pragmatic vantage of physical geography, the formal conditions of nature outlined in *Universal Natural History* do not determine the laws specific to an original stem. The assumption undergirding Kant’s examination of particular natural products is that an original stem is the real ground of a race. Once the naturalist has discerned structural similarities between two groupings in different locations that suggest a shared historical lineage, Kant identifies an experiment that enables the naturalist to test whether two groupings can be traced back to the same original stem. This experiment is Buffon’s law of procreation, which enables the naturalist to discern between two kinds of causal connection, one that grounds the category of race and one that grounds the category of variety:

Some living beings that are different can, through mating, produce offspring that are able to reproduce, and have several similar aspects from one to the other progeny [*Zeugenden*]. These are named races [*Racen*]. In other living beings it is observed that, if they are the same, they still produce such products which self-propagate [*selbst fortpflanzen*] and are entirely similar from one to the other of the progeny [*Zeugenden*]. These are named variations [*Varietäten*] by Buffon, because the difference between the animals does not have an influence on the power of procreation [*Zeugungskraft*]. (*PGK* 1775, 356)

Here Kant draws directly from Buffon’s 1766 article ‘De la dégénération des animaux’ (translated in 1772 as ‘Von der Abartung der Thiere’), where Buffon (1772, pp. 189–222) examines the fertility of some mules to argue that hybrids are not monsters composed of two natures but an intermediate kind of species which he terms

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<sup>13</sup> In the section ‘On Human Beings’, Kant states that a race ‘is a degeneration [*Abartung*], which stands in contrast to the other [kind of descendent] that cannot reproduce, which can be called a variety [*Varietaet*] or deviation [*Ausartung*]’ (*PGK* 1775, 360). Recognizing that Kant’s classificatory concepts draw from Buffon, my translations of Kant’s classificatory terms differ from Zöller (Cambridge edition) and Mikkelsen (SUNY edition). Zöller renders *Abartung* ‘subspecies’ and Mikkelsen ‘deviate forms’, and both render *Ausartung* as ‘degeneration’. In contrast, I render *Abartung* as ‘degeneration’, following the German rendering of Buffon’s ‘De la dégénération des animaux’ as ‘Der Abartung der Thiere’, and *Ausartung* as ‘deviation’. In translating *Stamm* I follow Mikkelsen’s literal rendering as ‘stem’ in contrast to Zöller’s use of the nineteenth century neologism ‘phylum’, which is historically misleading.

a ‘race’. In the following section I will argue that Buffon’s article provides the background for Kant’s 1775 course announcement and his published essay on race. Staying with the physical geography lectures for now, we find that from the Kaehler notes (1775) onward Kant uses Kästner’s translation of *dégénération* as *Abartung* to refer to decedents that have permanent morphological differences from an ancestor stem and yet nevertheless possess the capacity to reproduce, and his translation of *variété* as *Ausartung* to refer to descendants that differ but in such a way that does not affect the line of decent.<sup>14</sup>

In ‘De la dégénération des animaux’, Buffon presents a revised account of generation as the result of experimental examination of the differences within species of quadruped found in both the Old World (Europe) and the New World (the Americas), recognising that the same physical conditions do not necessarily produce or even favour the same forms in all places. On the assumption that the present variety of animals has resulted from natural causes, Buffon states that ‘the two hundred species we have given the history of, may be reduced to a small number of families, or principal stems [*souches principales*], from which it is not impossible all the others have derived their origin’ (Buffon 1766, XIV p. 358).<sup>15</sup> Consider the following example from his study of hares:

one cannot therefore imagine with any foundation that the climate of America has so far changed the nature of our hares to so great a degree as to make them tapetis or apereas, which have no tail; or agoutis with pointed muzzles, and short round ears; or pacos, with a large head, short ears, and a coarse hair marked with white stripes. (Buffon 1766, XIV pp. 371–2)

The variation within the species of hare across the continents is too excessive to be considered as the accidental modification of a substance in response to contingent environmental conditions. That is, it is not a standard kind of generation. Yet this claim does not lead Buffon to conclude that there are different species of hare originally created in different locations. Rather, he identifies a different kind of connection between generations he describes as ‘degeneration’, whereby a descendent acquires an adaptive characteristic that is invariably passed on to the next generation. Degeneration creates a new branch from a principal stem, which Buffon calls a race.

Kant recognised that Buffon’s physical method identifies classificatory categories according to real grounds, enabling the naturalist to construct a science of bodies in time and space. In the Rink edition Kant states that by integrating history into geography, Buffon split the genuine practice of natural history (*Naturgeschichte*) from mere natural description (*Naturbeschreibung*) (PGR 1775, AA 9:161). In contrast to natural description, which classifies varieties according to common marks, natural history combines temporal and spatial relations to examine variation as the result of a physical process. The problem, however, is that only if one were to ‘describe the events of the whole of nature as it has been through all time, then and only then would one write a real so-called natural history’ (PGR 1775, AA 9:162). By a ‘real so-called natural history’ Kant seems to refer to a universal natural history that accounts not only for time and space but also for natural products and places. To provide such an account one would require the mind of God, for such a natural history ‘is not one whit shorter than history itself.’ Here Kant explicitly acknowledges a structural feature of his system

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<sup>14</sup> For a helpful discussion of the confusion introduced to the German translation of Buffon’s notions of species and degenerations, see Schmitt (2019, p. 57).

<sup>15</sup> Kästner translates ‘souches principales’ as ‘Hauptstämme’ (Buffon 1772, p. 214).

that, on my account, was at least implicitly in place from the origin of the lectures: a universal natural history that encompasses particular natural products lies beyond the reach of human cognition. The dynamic interactions of the composite parts over geological time are too multifaceted, and the alteration of organic form over biological time too complex, to be cognised by human intellect. The task of the natural historian is rather to orient herself within the spatial and temporal conditions of the earth by following the methodological ideal of the natural system, building up from observation to a projected system of physical relations. Kant offers an example taken from Buffon: the task is not to write a complete narrative of which variations occurred and when, but rather ‘how the various breeds of dogs descended from one stem [*Stamm*]’ (*PGR* 1775, AA 9:162; c.f. Buffon’s entry on ‘The Dog’). This methodology enables the naturalist to subsume the variety of dogs under lines of descent (races) connected by natural causes back toward an original stem.

#### 4. On human beings

During the mid-1770s Kant became involved in a public debate over the nature of human origins. This debate, I suggest, pushed him to clarify his system of natural history in light of the epistemic distinction he had made between the two levels of inquiry. Kant had included a section entitled ‘On Human Beings’ from the beginning of the lectures, in which he provides an account of the differences in human form across the known world. In the earliest remaining student notes we find evidence that he even proposed grounds for these differences. In the Holstein notes Kant is recording as accounting for dark skin colours according to hot climatic conditions, which dries out the blood vessels, allowing light to harden the remaining blood (*PGH* 1757–9, 120). Further, he recognises that once several generations have seen this effect, the acquired characteristics can become hereditary. Yet such alterations, Kant explains, are ‘accidental’, and their inheritance is ‘not easy to explain.’ He compares dark skin to dark feathers in chickens, and suggests that it would be possible to select lighter children from darker parents to bring them back to their original colour (*PGH* 1757–9, 120).

In 1775 Kant published an essay entitled ‘On the Different Races of Human Beings’ as a new advertisement for his physical geography lectures. This was presumably the section on human beings that was to be given in the second part of the lecture course. As we have seen, such an occasional piece was not in itself unusual. Previously Kant had published four separate announcements for his lectures, each consisting of a short essay of wider interest followed by a brief overview of the programme. Yet these announcements were written during his time as *Magister*, a non-salaried member of faculty who was required to draw in their own student and income (Zammito 2006, p. 36). Lectures run by a *Magister* were not published in the official catalogue of the university, so a successful announcement was imperative for a viable academic career. By the summer semester of 1775, Kant had already held the ordinary professorship in logic and metaphysics at Königsberg for five years, so there must have been other reasons that drove him to produce the announcement.

Few scholars have considered the curious occasion of Kant’s race essay, for it is usually called on as a precursor to the theory of race Kant developed during the 1780s.<sup>16</sup> This broader focus tends to isolate Kant’s race theory from his critique of metaphysics, which was developing simultaneously. When viewed in context, Kant’s development of a new, critical metaphysics and his choice to publicly engage in the question of human origins both respond to two competing frameworks of knowledge in Prussian society: ‘school knowledge [*Schulkenntniße*]’, based on rote learning and a logical conception of the natural system, and ‘popular

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<sup>16</sup> Exceptions are Adickes (1924, pp. 412–414) and Zammito (2006, pp. 36–37).

knowledge [*Populaire Kenntniße*], which aimed to upend school philosophy with an aesthetic and culturally specific programme of learning (*PGD* 1781–2, 2'). In Kant's view, the proponents of popular philosophy failed to provide a viable alternative to the school philosophers, for their developmental account of cognition presented human culture as a historical achievement. Kant's conception of a physical geography, in contrast, offered a pragmatic alternative that aspired to cultivate its students *through* education. Thus, his choice to offer a new announcement for his lectures was not an isolated decision, but, to use John Zammito's (2006, p. 36) words, a 'highly strategic intervention.' That Kant's essay was crafted in response to these movements is further evidenced by his decision to republish the essay in 1777 in the popular journal *Der Philosoph für die Welt*, with only minor emendations.<sup>17</sup>

Kant's race concept cuts to the heart of *Popularphilosophie*. The unscriptural idea of polygenesis had already been advocated by Voltaire and Hume on the basis of new evidence of the diversity of human form across the globe in places that seem to be entirely isolated. In 1734 Voltaire had argued that while he denied the mutability of species, such evidence justifies polygenesis:

Thus it seems to me that I am justified in believing that it is with humans as it is with trees; that pear, pine, oak and apricot trees do not come from the same tree, and that white bearded men, that black woolly haired men, yellow men with manes and men without beards do not come from the same man. (Voltaire 1734, p. 492)

Voltaire's theory was divisive. On the one hand it managed to account for the extreme variation in living beings without accepting mutability. Yet on the other hand it relied on a speculative history in which various human seeds were planted around the globe. Despite these weaknesses, polygenesis received growing support during the 1770s as a new generation of naturalists in Britain and Germany attempted to explain the development of multiple sites of human life through reference to a civilising power in nature that, in conjunction with accidents such as climate and environment, was predisposed toward reason. In *Sketches of the History of Man* (1774), which quickly became available in German (Home 1775), Lord Kames argued that the differences in human kind could only be explained according to natural differences between human species. He developed a theory of stages that attempted to capture the 'History of the Species, in its progress from the savage state to its highest civilisation and improvement' (Home [1774] 1788, I.I, p. 84). Kames argued that history itself demonstrated that humans were originally divided into small tribes, and that 'these original tribes were different races of men, placed in proper climates, and left to form their own language' (Home [1774] 1788, I.I, p. 75). In Kant's view, polygenesis utterly fails to provide an explanation for multiple sites of generation, for it relies on analogies and historical conjectures that aestheticize science. It thereby removes the distinguishing characteristics that separate natural history from mere natural description.

The human origins debate centred on the number of lines of descent required to explain the current diversity of human form. Kant responds in the essay by developing the role of 'Buffon's rule' in his theory of classification, signalling again his desire to replace Linnaeus' logical concept of variety with Buffon's physical concept of race (*DR* 1777, AA 2:429). For Kant, race is not a preestablished concept clustered within a logical

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<sup>17</sup> In the second edition Kant removes the opening and closing paragraphs of the original essay, the latter part of the title and references to the announced lecture course.

hierarchy but rather a physical concept that captures causal connections by which parents pass on adapted characteristics to their young. The Linnaean concept of variety led many naturalists such as Georg Forster ([1786] 2013) to adopt polygenesis, for it implies that enduring characteristics require a distinct line of descent. By contrast, Buffon's account of degeneration acknowledges that some physiological variations *become* necessary as a new subspecies breaks away from the original stem. Variation in skin colour may be a response to contingent environmental conditions, yet it is nevertheless passed on without fail. In *Les époques de la nature*, published in 1778 and translated into German in 1781, Buffon re-entered the human origins debate. He argues that the 'races in each species of animal are only constant varieties which perpetuate themselves by generation' (Buffon [1778] 1789, p. 252). This definition reinforces the physical dimension of the race debate, enabling the naturalist to move from the present distribution of natural products to a science of bodies in time and space.

Yet during the 1760s, Kant had become critical of Buffon's theory of generation on the grounds that it confuses analogical thinking with explanation. The parity Buffon granted to general and particular natural history meant that the general laws presented in his theory of the earth (i.e. Newtonian laws) have equal status to the laws of generation outlined in the particular part. In *Only Possible Argument* (1763), Kant rejected Buffon's theory of inner moulds and organic particles, for it does not extend our understanding of generation or prompt further inquiry but rather parades as knowledge (*OPA* 1763, AA 2:115). As we saw in Kant's lectures on metaphysics, to postulate a force is to open a line of experiment in search for a possible cause of like effects. To postulate an organic kind of particle, by contrast, stands as an explanation that competes with the mechanical determination of matter. Kant denies that particular, hypothetical forces have explanatory parity with mechanical forces. An explanation according to mechanical forces applies the causal template of the universal laws of nature to a particular event. A hypothetical force, by contrast, is the causality of a real ground specific to a single line of descent. Because such a force cannot be reduced to the universal conditions of nature, it stands as a placeholder in lieu of a mechanical explanation. Here we can discern the consolidation of Kant's two-tiered hierarchy in which the systematic reconstruction of natural products stands under the general conditions of nature's intelligibility and yet is underdetermined by them. Applied to the question of human origins, while Buffon's theory of generation cannot explain the capacity of living beings to acquire novel traits, his distinction between degeneration and variation nevertheless enables the naturalist to classify living natural products according to their effects.

Having worked out some of the fundamental tenants of his critical method during the 1760s and early 1770s, Kant now presents a monogenetic account of human origins in which four varieties of human being trace back to a single 'original stem [*Abstammung*]' (DR 1777, AA 2:437).<sup>18</sup> While this affirms Buffon's determination of race as a physical connection, Kant's account operates within the new epistemological register developed in his published work. He begins by offering an example of the kind of phenomenon his theory aims to explain: birds that develop either a moderate layer of feathers in mild climates or an additional layer if they

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<sup>18</sup> Despite hereditary differences within a single stem, 'race' is the collective noun Kant uses to refer to line of 'degenerations [*Abartungen*]'. This provides an additional reason for translating *Abartung* as 'degeneration' and *Ausartung* as 'deviation'. Kant's point is that degenerations 'persistently preserve themselves in all transplantings (transpositions to other regions) over prolonged generations among themselves and which also always beget half-breed [*halbschlächtige*] young in the mixing with other degenerations [*Abartungen*] of the same stem [*Stamme*]' (DR 1777, AA 2:430).



migrate to cold climates (DR 1777, AA 2:434). Such birds invariably pass on the *capacity* to produce the appropriate layering of feathers, and yet the *expression* of that capacity is contingent on climatic factors. To explain this phenomenon, Kant proposes two hypothetical forces, germs (*Keime*) and dispositions (*Anlagen*), which are present in a single generative stem.<sup>19</sup> Germs were of course the hallmark of preexistence theories, for they were used to explain generation according to a capacity already planted within the living being. Yet in practice they were an extremely mutable concept. Charles Bonnet had called on preformed germs as mechanical centres of organisation that dynamically respond to environmental conditions, and Haller added to germs the notion of physiological faculties when he returned to preexistence theory in 1758.<sup>20</sup> Kant's account is different again, for germs feature as placeholders to stand in for a projected, unknown cause – a *ratio fiendi* – of observed effects. Germs regulate the 'development' of an organic body that 'concerns a particular part [of the plant or animal]', and dispositions direct the development that 'concerns only the size or the relationship of the parts [of a plant or animal] among one another' (DR 1777, AA 2:434). While germs and dispositions are passed on invariably, their phenotypic expression is not. They are postulated grounds for the capacity of a bird to develop a new layer of feathers should it migrate to a colder climate.

A race, according to Kant, is a line of descent that branches out from an original stem in which some adaptations, over a long period of time, are passed on invariably, provided both parents possess the adaptation. For example, certain varieties of albatross have a greater wingspan than others, a quality that does not return to an original state when members of the line of descent return to the environment of a distant ancestor. Kant explains this phenomenon by suggesting that different germs and dispositions are either turned on or off to make a group 'fitted [*anpassend*]' or 'suited [*angemessen*]' to its environment as determined by the need to 'preserve [*erhalten*]' the species. As a consequence of long-term environmental conditions, such 'purposive adaptations' become fixed, presumably to prepare the race for the particular circumstances of their climate, and the germs responsible for the variable expression of the trait such as skin colour is 'turned off' or 'held back'. The invariable inheritance of such adaptations become the 'mark [*Merkmale*]' and 'distinguishing feature [*Kennzeichen*]' of their 'generative origination [*Erzeugung*]' as a distinct racial group. Yet the fact that members from different races can interbreed and produce fertile offspring (Buffon's rule) indicates that they share the same 'stem species [*Stammgattung*]', that is, they are not distinct species, for they share a common ancestor. In the context of human origins, Kant identifies four 'base races [*Grundracen*]' – 'whites', 'Negroes', '[Asian-]Indians' and 'Americans' – that have derived from an original stem. Buffon's rule, he explains, identifies a shared *Stammgattung* according to the ability to 'produce fertile young with one another (whatever differences in shape they may be)' to show that the 'natural division into species and kinds [*Gattungen und Arten*]' in the animal kingdom is grounded in the common law of propagation, and the unity of the species [*Gattungen*] is nothing other than the unity of the generative force [*zeugenden Kraft*] that is universally valid for a certain manifoldness of animals' (DR 1777, AA 2:429).

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<sup>19</sup> Here I draw from Sloan's (2002, p. 240) translations of *Keime* and *Anlagen*. Sloan explains that *Keime* was regularly used as the German translation for the French 'germs', and *Anlagen*, which derives from the German *legen* meaning 'to lay out', refers to an 'organizational layout' or 'disposition'. Kant is the first to use *Keime* and *Anlagen* together in this technical usage, combining the preexistence idea of original germs with the epigenetic idea of unfolding development.

<sup>20</sup> Building on Bonnet, Haller (1758, II 172) claimed that the issues associated with epigenesis 'are so difficult, and my experiments on the egg are so numerous, that I am proposing with less repugnance the contrary opinion [i.e., preformationism], which is beginning to appear to me the more probable.'

Buffon's rule, when supported by Kant's hypothetical account of germs and dispositions, allows the diversity of human form to be represented within a single line of descent. Kant is not entirely clear how Buffon's rule differs from the rules of physics. He does not provide a clear differentiation between a rule of classification from explanatory laws, which leads to some confusion in the essay. This will be clarified by Kant's explicit presentation of the hierarchy of transcendental conditions over the systematic reconstruction of natural products in the critical philosophy, which separates laws that are necessary and universal for experience from particular laws of classification.<sup>21</sup> Phillip Sloan (1990, p. 308) points out that Kant oscillates between the two conceptions of law: 'Depending on how one reads Kant's intentions, his distinctions could be interpreted either as warranting the development of historical speculations of nature, along lines suggested by his discussions in such works as *Kritik der Urteilskraft* of 1790, or as implying the confinement of all scientific inquiry to the domain of description and analysis of contemporaneously available process.' On my reconstruction of his intellectual development, however, Kant already rejects the capacity of hypothetical forces to explain the process of development. What he finds in Buffon is a method of bringing observations together into a system connected by physical laws of generation and degeneration.

## 5. Concluding remarks

There is, of course, a great deal more to be said on Kant's account of living natural products during the critical period. While such a task lies beyond the scope of this paper, my hope is that this study will enable a better understanding of the continuity between Kant's pragmatic method in his physical geography lectures and the systematisation of nature developed in the critical period. To this end I conclude with some provisional remarks on the interdependence of Kant's revised conception of natural history and his critical philosophy. On Sloan's (2006, p. 629) account, Kant's critical philosophy provided 'grounds for rejecting a historical science of nature', leading him to outline a conception of *Naturgeschichte* that 'made no claims concerning bio- or geohistory in the developmental sense of the terms.' While Sloan is correct to note that natural history for the critical Kant is not explanatory, for germs and dispositions do not govern experience but rather the systematic reconstruction of experience, the two-tiered account of Kant's natural history presented in this paper leads to a different reading. Kant had already presented the lower level of natural history as a pragmatic inquiry that does not explain the development of living natural products but that orients the student of nature within the setting of the earth. And it is important to bear in mind that he continued to teach this pragmatic approach to physical geography until 1796; it was not eclipsed by his race essays of the 1780s. During the critical period, Kant replaces the higher level of universal natural history, which establishes the conditions in which natural products appear, with the transcendental conditions of possible experience outlined in *Critique of Pure Reason* (1781/7). Because the localised causality of living natural products is underdetermined by nature's transcendental conditions, Kant grounds the classification of living natural products in the pragmatic requirements of human cognition.<sup>22</sup> He defends the need for a new *a priori* principle to 'orient observation toward a *natural history*', for experience alone does not yield classificatory concepts (TP 1788, AA 8:161).

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<sup>21</sup> Lagier (2004, p. 20) notes that here we can already see the 'root of certain distinctions in Kant's schema of knowledge, which will be finally expressed in the 1790 distinction between determinate judgment (dominated by the mechanism of the understanding) and reflective judgment (guided by a technique of nature).'

<sup>22</sup> As Kant will state in *Critique of the Power of Judgment*, 'the ground for judging in this way must be sought in the sources of cognition [*Erkenntnißquellen*] *a priori*' (CPJ 1790, AA 5:182).

Kant's idea of a principle that grounds systematic reconstruction carves out the conceptual space he would soon develop in the second part of *Critique of the Power of Judgment* (1790).<sup>23</sup> In the Transcendental Dialectic, Kant had argued that the regulative principles that guide our reflection on nature as a system are already available in advance and are 'assumed only problematically' (A646/B674). Yet in his 1788 essay on teleological principles, he argues that observation is not a form of systematisation according to reason but rather 'methodologically conducted experience' (TP 1788, AA 8:161). Methodologically conducted experience does not subsume a particular under a rule but rather searches for a rule under which to subsume a particular. The key to Kant's revised account of judgment is the sharp distinction between cognition and observation. Natural history would only be a science of the gods if the naturalist were to think that her system is constitutive of nature. Kant states in *Critique of the Power of Judgment* that reflection on living natural products as products of an inner cause is 'rightly drawn into our research into nature [*Naturforschung*], at least problematically, but only in order to bring it under principles of observation and research [*Beobachtung und Nachforschung*] ... without presuming to explain [*erklären*] it' (CPJ 1790, AA 5:360). While observation does not bring living natural products under explanatory principles, it enables the naturalist to classify them according to physical connections within a projected natural system. Observation thus reveals a new kind of transcendental principle, for if we did not presuppose that nature arranges itself into a system of intelligible natural products, 'all reflection would become arbitrary and blind' (CPJ 1790, AA 20:212). This principle completes the transition from Kant's two-tiered account of natural history to his critical philosophy, where the reconstruction of natural products within a system of physical connections 'stands under' the categories (B165) and yet is grounded in its own principle (CPJ 1790, AA 5:360).

These remarks are of course provisional. My claim in this paper is simply that situating Kant's account of living natural products against the backdrop of Buffon's physical conception of natural history provides greater insight into the connection between his precritical physical geography and his critical account of nature's systematicity. Specifically, it gives us reason to consider the hierarchical structure of universal natural history and pragmatic physical geography as the conceptual scaffolding for the critical system, which situates the systematic reconstruction of particular natural products under the transcendental constitution of possible experience. The clearest account of this position is found in the Preface to *Metaphysical Foundations*, where Kant presents the system of nature as a hierarchical system in which natural history stands under the empirical concept of matter and its metaphysical determinations but is not grounded in it (MF 1786, AA 4:468). Natural history does not qualify as a proper natural science, for it is not grounded in the empirical concept of matter but in 'an interconnection of grounds and consequences.' It nevertheless stands under the categories, for the interconnection of grounds and consequences are physical. In *Critique of the Power of Judgment*, Kant accepts that the 'daring adventure of reason' – the challenge of explaining the existence of living natural products according to mechanical principles – is in principle a possibility, a point that was implicit in *Universal Natural History* (CPJ 1790, AA 5:418–419). Yet once again Kant insists that it is not possible in practice, for natural history affords only a pragmatic investigation that arranges lines of decent according to original organisations that develop in specific places (CPJ 1790, AA 5:418). Grasping the continuity between Kant's position in his lectures on physical geography and his critical philosophy demonstrates that the problem of generation – the

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<sup>23</sup> For example, Kant identifies the transcendental principle of purposiveness in 'experience of the kind that is methodically undertaken and is called observation' (CPJ 1790, AA 5:376).

problem of connecting living natural products in a projected spatial and temporal system – was not only significant to Kant in the 1780s. It featured in Kant’s earliest work, and remained one of the defining problems of his philosophical career.

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