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Introductory Chapter: Reconciling Neurobioethics through Nature's Lens - Metaphysical Determinants of Subjectivity

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1. Forerunners of neuroethical debate

No more than 5 decades ago, bioethics formally took the stage as an independent discipline. Intended to normatively frame the rapidly growing knowledge of biological function, the appearance of the discipline constituted a normative response to what was viewed as a morally agnostic and scientifically aseptic attitude to the investigative and utilitarian ends of biological research [1]. Inspired by a broader recognition of a science isolated from its “ought to do” dimension, highlighted in contemporaneous debates on nuclear power by such literary elites as Huxley [2], the biological emphasis sought to address a spectrum of concerns, from ecological destruction to biological weaponry and genetic engineering, among others. In coining the term bioethics, accordingly, Van Rensselaer Potter emphasized its scope as the “science of survival” that required the bridging of two cultures, one scientific and the other humanistic and moral. Given the historical context of the Cold War era, Van Rensselaer’s proposal resonated broadly in its public recognition, launching bioethics as a widely motivated and widely disciplined undertaking [3].

Nonetheless, and despite the persistent public engagement with issues of ecological misuse and military use of biological capabilities, bioethics has since and relatively quickly come to be viewed as a normative extension of clinical practice. In the evolution introduced by the Dutch obstetrician Andre Hellegers, the object of bioethics was conceived as forging an ethical structure that would give intellectual scope to the ethical dimension already implicit in medical practice. In Hellegers’ scheme [4], the science of bioethics was to discover and compile values in a dialog that encircled medicine, philosophy, and ethics, which would take into account the ongoing stream of information emerging from biological discovery and medical technology.

As an intellectual stepchild of ethical practices surrounding the health care of the human being, bioethics is heir to a normative tradition extending to antiquity. Premised on the recognition of the unique value within each individual, medical care has traditionally been guided by principles meant to ensure the preservation of this recognition even in circumstances of significant health risk. While this historical legacy has clearly influenced the modern understanding of bioethics, its recent emergence as an independent discipline underscores its distinction from the former and raises questions regarding underlying factors that have driven the need for its emergence. Beyond issues of the rapidity and magnitude of information acquired at ever-grander scales—which must be adequately assimilated before any therapeutic intervention—emerging core ethical concerns have been especially influenced

by their contingency to philosophical conceptions that have become increasingly pluralistic. Among these are included an increasing power over the regulation of organismal performance; an evolving conception of intervention as a therapeutic undertaking; supraphysical notions of organismal, organizational reality; and ontological and anthropological conceptions of the physical basis of human nature. A recurring theme raised by ever-greater knowledge and technical prowess over organismal regulation, for example, is the manipulation by and interaction with technological devices that bear not only on limiting their use but also on the very nature of technology and its relation to the human being. New interventional notions thus not only need to include the traditional principles of malfeasance, beneficence, autonomy, and justice but must also incorporate what is meant by health and disease, normality and deviance. Crucially, across a wide swath of the physical sciences, fundamental questions on the nature of physical reality are assuming greater prominence as the recognition of the insufficiency of compositional approaches, which have dominated scientific exploration since Descartes and Newton, impels the consideration of a more synthetic understanding of material reality, like that of entities and their relation to properties. Finally, and critically for the ethics of applied neuroscience, are ontological and anthropological concerns related to human subjectivity and its relation to the objective reality of his corporal presence in the world, concerns that have become especially acute since Heideggerian revisions of metaphysical understanding [5].

Accordingly, bioethics and medical ethics remain the scholarly objects of a philosophical tension introduced and exacerbated by the restless expansion of biological knowledge. This tension originates in the need to appropriate a philosophical conception of physical reality that can then be normatively evaluated. However, with the assimilation of pluralistic notions on the physical reality of the body—which is the direct object of medical or biological intervention—normative principles and ethical praxis themselves remain varied. That is, while ethical praxis is contingent on some action taken toward the corpus, such praxis acquires normative significance only within a conceptual framework of the contingent material reality.

The effect on ethical praxis of assimilating the current conceptual ambiguity is most acute in issues concerned with neural intervention. Indeed, ontological and anthropological tensions uniquely characterize neuro(bio)ethics as a normative discipline, which must confront concerns over the impact of intervention on global and organismal regulations, conceptually addressed in philosophy of science accounts. The uncertainty between how the individual is understood and the physical features inherent in the neural activity of the brain that enable the expression of these human features has marked the field, particularly in its development of meta-ethical principles that correspondingly evolve neuroethical praxis [6, 7]. This text, especially, proposes just such an illustration of the current ambiguity. Accordingly, the following discussion will seek to address this ambiguity by grounding the philosophical accounts in fundamental features of natural reality, articulated through the metaphysical understanding of the ontological subject. This grounding then engages a dialectic with the issues of praxis presented in subsequent chapters.

2. Appropriating a philosophical conception of disease for neurobioethics

2.1 Functionalism

The absence of a reconciliation between philosophical conceptions of physical reality and the neural activity of the brain suggest that interventional praxis may

best be related to medical notions of normality and disease that entail empirically accessible parameters. Neurological impairment, especially, is a significant domain of research, with an expanding fund of knowledge on the etiology of various cognitive diseases. Accordingly, in the absence of philosophical reconciliation, viewing neural intervention by the yardstick of disease replication offers a pragmatic means of arriving at normative conclusions.

Implicit in the appropriation of a disease model, nonetheless, is a conceptual interpretation of the disease state, with its understanding of normality and deviation. According to this conception, attributions about disease etiology frequently view disease as malfunction [8] and well being as a commonly observed biological order. Such functionalist notions derive their sense from what is understood of the role of a component system in “normal” operation, where disease etiologies reflect the component system’s incapacity to function according to biologically ascertained standards. Normality and variance are therefore set in the context of the malfunctioning of a component’s operation, for example, a cardiovascular or retinal lesion where affected anatomical and physiological zones are clearly demarcated.

According to this epistemological approach, a disease is conceived as having a causal origin affecting a specific anatomical or functional domain and generating one or more symptomatic features indicative of the disease state. Hepatitis, for example, is “caused” by the hepatitis virus, which localizes to the liver, where it displays symptoms of fibrosis. Disease states are understood to bridge two domains, one involving empirical judgments about human physiology and another concerned with normative judgments about human well-being [9]. Stated otherwise, notions of normality are articulated through the window of empirical assessment, which is used to delimit functional adequacy. Such judgments thus evoke definitions of normality and deviation that are locally applied to the affected zone. Normative judgments, on the other hand, must be elicited on the empirical judgments to ascertain whether these constitute circumstances that are undesirable or that diminish the capacity for flourishing. Normative conclusions, accordingly, constitute value judgments that are meted out with respect to an objectively accepted value standard for an empirically circumscribed zone. In adopting an analogous approach to the neurobioethics of interventions, there is thus appropriated an empirical methodology used to delimit the range of processes for which normative conclusions may be drawn.

In a Boorsian [8] conception of disease as malfunction, notably, disease features are highly territorialized in their causal structure and zone of influence. Value judgments that are contingent to such narrowly defined empirical assessments, therefore, are restricted to normative judgments on physiological normality, that is, they are primarily conditioned by the normative valuation given to attributions of functional adequacy. In bodily domains outside the nervous system, such as the liver, and even in some brain-based regions such as stroke-related lesions, this value attribution is essentially valid. However, its invocation for many other cognitive diseases, perhaps most, must confront an intrinsic, global regulatory role of the nervous system that is required to regulate organismal properties that define the individual’s ontological features.

Accordingly, normative judgments that are narrowly defined by a functionalist interpretation of the disease state, and the ethical praxis that devolves from this understanding, are insufficient for evolving metaethical principles suited to cognitive intervention. Functionalist approaches to cognitive diseases thus lend themselves with difficulty to the elaboration of a comprehensive, neurobioethical praxis, due to the broader organismal role with which the nervous system is associated.

2.2 Cognitive disease and organismal unity

This broader role pertains, minimally, to capacities for unifying organismal operation and goal orientation, that is, integral and teleological features intrinsic to the ontological status of the organisms as a whole. Indeed the widespread recognition of the unique and irreplaceable role of the nervous system in mediating organismal unity has constituted an empirical pillar for philosophical conceptions of bodily integration that underwrite clinical ethics in death determinations [10]. As a fundamental capacity for goal seeking, integration is crucial to human flourishing. Hence, impairing these mechanisms can be expected to diminish this capacity and so evoke normative concern. Cognitive diseases, as mentioned, are especially prone to impairments of these mechanisms, and interventions reproducing effects of the cognitive disease states, either whole or in part, are likely to deleteriously influence them. Accordingly, they are likely to be physical conditions that would be ethically probative.

This is manifestly evident in the limiting case of bodily death, life being predicated on the body's organismal integration. With death, mechanisms of integration are no longer operative, and organismal unity is thereby destroyed. As a conceptual position universally recognized across religious, cultural, and secular scholarship [11], the loss of all organismal unity constitutes a probative, ethical imperative of ultimate and universal significance. This is also to say that while the events of death and the organismal mechanisms that work to unify the organism are physically instantiated, it is in view of the conceptual validity of organismal unity that the normative imperative is validated. By extension, factors that diminish but do not wholly void bodily integration also lessen individual well-being. A reduced capacity for intentional self-action, that is, a hallmark of several widely prevalent cognitive diseases, for example, diminishes autonomy and the satisfaction of individual need. Disturbances of self, for instance, traditionally mark the diagnostic evaluation of the schizophrenia patient [12], seen in an abnormal sense of ownership of the body, loss of ego boundary, and confused sense of self-agency. Such reduced phenomenological capacities have been shown to have their counterpart in physical features of cognition. Imaging modalities reveal, for example, a consistently high correspondence between fMRI modules and those of diffusion imaging in normal individuals, whereas those from schizophrenia patients exhibit both decreases in overall modularity and in correspondence of networks [13]. These diseases illustrate that not only the absence but also the partial impairment of physical processes for organismal integration significantly impact individual flourishing.

Taken together, meta-principles premised on disease and notions of malfunction have a practical but restricted role for evolving neuroethical praxis in the absence of philosophical judgments on global, physical attributes of the individual, of which the integrative and unitive dimension is paramount.

3. The organismal dimension of neurobioethics

3.1 Metaphysical contingency of the neural architecture

Normative conclusions that relate to a global organizational order, on the other hand, resemble ethical approaches that generalize to the individual as a whole, that is, not as an epistemological abstraction only but as a metaphysical conclusion on the natural reality of the individual, who is epistemically evident. These approaches thus distinguish themselves from those that define the human being functionally and that emphasize properties to the exclusion of their source, like that premised

on the “stream of consciousness” [7] or that of delocalized essence, like extended mind theory [6]. They are thus also distinguished from an ethical pragmatism that is contingent to notions of disease as malfunction.

Such holistic routes to metaethics typically value the individual as a normative locus that is operative in the world. By virtue of an intrinsic metaphysical unity, they then extend value contingency to the whole of the individual. Neo-Thomistic developments in the twentieth century, like that of Etienne Gilson [14], for example, draw normative value from metaphysical conclusions, prioritizing the notion of presence as action in philosophies of being. Karol Wojtyla’s metaphysical approach to ethics [15], for instance, anchors the personalist dimension of intentionalized action in the unitary reality of the whole individual. As a metaethical principle, this dimension appeals to a dual normative contingency present within the individual. The personalist subject is considered, first, as an agent of ethical activity and, second, as an end for the pursuit of the good, that is, as a value contingent locus. Here the appeal is chiefly theoretical and conditioned by the analysis, since bridging these contingencies is the experience of morality in action. Consequently, as a metaethical “object” for ethical praxis, the individual capacity for moral behavior validates the acquisition of a wholly unique, value-laden referential status for the person. Kant, significantly, adopts a strikingly similar perspective, identifying the individual exclusively as an end and not as a means.

In Wojtyla’s theoretical exploration, the specific focus entails the phenomenal experience of subjectivity, that is, a cognitive and conscious dimension unique to each individual. His ethical analysis, accordingly, experientially and superficially, resembles ethical approaches that are phenomenologically and functionally driven. Unlike these approaches, however, Wojtyla explicitly views these as epistemological features only and so merely outward indicators of an inner and integral unity that he terms the “human suppositum,” that is, a metaphysical essence that is subjectively constituted and phenomenologically manifested.

For ethical praxis this is significant for linking all dimensions of the individual to an integral reality that is phenomenologically expressed. In fact, the absence of such a unifying dynamic leaves ethical praxis inchoate, without either a contingent locus for value or a medium for its execution. Accordingly, the identification of the subject as a metaethical principle thereby extends value to the cognitive dynamics and physical organization of the neural architecture also. Indeed, it is on the basis of the integral unity of the individual that he later cautions in *Veritatis Splendor* [16] “against a manipulation of corporeity that would alter its human meaning.” For neuroethics, the utility of this metaphysical conclusion thus relates directly to the contribution of the nervous system to the unity of the person, that is, as a corporal manifestation that is enabling to a human ontological, subjective, and integrative order. In other words, by invoking the unity of the uniquely human subject, the metaphysical subject identifies in the neural operation a normative terrain.

3.2 The metaphysical subject as an ordering principle for the neural architecture

3.2.1 Integration and systemic operation

The reality of the metaphysical subject is evident through the objective manifestation of the phenomenal subject; that is, it is a reality apparent through epistemological inference. Importantly, the absence of direct empirical confirmation does not imply the absence of the subject’s reality, which can be seen in the variety of human functions that are nonetheless united in each individual. The subject’s epistemic appearance thus reveals the role of the metaphysical subject to be the physical realization of the integral and uniquely human subject.

This role is apparent first in a unified organizational order that is operationally confined, which is to say that the metaphysical subject is seen through the reality of organismal integration. Its dynamic unity, for instance, is a fundamental feature shaped by evolutionary forces [17]. As one entity in an adaptive space, the organism constitutes a “unit of interaction” [18] where the whole organism is molded by evolutionary pressures to acquire a suite of behavioral features maximizing its fitness.

The subject’s neural “manifestation,” accordingly, is not autonomously determined but is shaped by an extrinsic metaphysical order that is determinative for its expression. Indeed, it is generally recognized that material reality is subject to immaterial priors, for example, organizational principles. Recognition of these externally imposed orders can be seen in the need to invoke non-causal explananda in natural design, like the accounts used to explain the design of flagellar motors [19]. These immaterial determinants are even more apparent in the case of neural operation, where dynamic brain activity is necessarily linked to a system-wide network that subsumes regional activity to global performance [20].

Because such metaphysical determinants are only epistemically evident, however, empirically elucidating the physical mechanisms of integration becomes key to a principled neuroethical praxis. In consequence, praxis remains subject to both empirical and philosophy of science accounts for its evolution. For integration, the reconciliation of these accounts has been the subject of much debate. Although the reality of integration is evident in the natural world, its conceptual articulation through philosophy of science accounts has restricted the choice of hypothetical presuppositions used to define empirical resources. This has exposed current accounts of integration to factual inconsistencies and delayed the evolution of more realistic and comprehensive frameworks.

The somatic integrity thesis, for example, which has served as the conceptual platform for clinical determinations of death, invokes a causal, brain-directed model of integration, through which the functioning of the body’s varied physiological systems is coordinated [21]. According to this understanding of integration, ethical practice is contingent on the empirical demonstration of an irreversible loss of the capacity to maintain cohesive and coordinative function, the causal origin of which is identified with the brain. Loss of brain function is therefore equated with loss of the capacity. This conception now constitutes the philosophical linchpin for what has become a global clinical praxis. Probative actions, in consequence, such as the removal of vital organs, are defined in reference to the loss of a single organ, the brain.

Its validity, however, is challenged by a number of empirical observations following a diagnosis of brain failure, including continued heart and whole body circulation [22], wound healing, temperature regulation, and even pregnancies [23]. These apparent contraindications, claims of technological artifacts notwithstanding, thus raise the issue of the nature of the brain’s relation to bodily processes and so how this relation impacts the physical conception of the death event.

The challenge to the somatic integrity thesis, in fact, retrieves a systemic notion of integration, where the source of integration is understood to be delocalized and distributed within and throughout the body rather than being confined to a single anatomical region. Such a conception of unity substantially differs from the strict causal notion of imposed control used to achieve an aggregate coordinative order. By siting its origin to a single organ within the individual, the latter notion has the conceptual and diagnostic effect of segregating the brain from the body’s remainder, physically, hierarchically, and functionally. Normatively, this division has created a chasm between the brain and body where the brain has acquired a valued status and the body’s remainder has been relegated to a dependency on the brain’s vital operation. The empirical contraindications thus evidence a form of integration that more closely resembles an integral unity shared equally by all

material components and processes of the body, *that is, a form of integration more closely corresponding with the metaphysical notion of unity invoked by Wojtyla. This altered conception has the important normative consequence of valuing the individual as a whole.* Importantly, it reveals how the understanding of normative value is itself influenced by the epistemic order of the material body.

Considerable neuroscientific evidence favoring a systemic model of bodily integration has in fact now been gathered, particularly with regard to motor dynamics. Existing studies reveal, for instance, that peripheral and central nervous system activities mutually and reciprocally contribute to integration at multiple levels. These largely plastic influences have been shown to be progressively and hierarchically scaled within the nervous system to (1) shape inward and outward flow between the brain and body, (2) generate stable representations of bodily interaction with the world, and (3) yield a dynamic, bodily integrated performance unit.

These studies underscore the unity of the body by showing that bodily sensory input molds connectivity patterns in the brain to shape the brain's responses to afferent input, that is, the body is responsible for configuring the brain's reaction to sensory information; the functional outcome of this molding is to modulate the brain's "perception" of the world as a function of the body [24], that is, to unify bodily responses to external events with respect to the whole individual.

The generation of the bodily percept appears to unify the body for performance [25]; that is, the percept is generated to unify action as originating from a single source. Accordingly, the dynamic nature of this process precludes the functional segregation of the events of the body from those of the brain. The need to achieve unity in performance, accordingly, implies that the perception of the world through the body requires the integration that is effected by the dynamical and reciprocal relations between the body and brain, *that is, a delocalized source of unity*, which relates the body to the world and which is fundamental to its interaction with it.

3.3 The metaphysical subject and higher-order properties

Nonetheless, the delocalization that distinctively characterizes systemic forms leaves unexplained the presence of goal-directed behavior that is essential to autonomous living and the relation of such behavior to the mediation of systemic unity. Notions of integration premised on a systemic model, notably, fail to account for higher order (i.e., organismal and not merely cellular and organic, organizational, and behavioral) properties constitutive of multicellular organisms generally and of humans with highly evolved nervous systems, in particular. This is also to say that while systemic models are consonant with the holistic character of living organisms [19], they do not account for autonomous behavior [26] and so are unable to account for a material realization of ontology. Such an explanation is crucial for neurobioethics in order to identify an empirically salient source of material processes undergirding ontology and structuring a systemic model of integration. The account for the "emergence" of ontology in fact is likely to conciliate with intrinsic metaphysical features of natural reality, like the relational and communicative features described by Etienne Gilson [15], *that is, these intrinsic features are fundamental determinants for the ontological form that is generated. In particular, they yield the most advanced expression of physical reality, the subjective entity, which, accordingly, is constituted as a metaphysical reality, as noted by Wojtyla.* Indeed, neuroscientific evidence on the phenomenal subject is consonant with a role for their metaphysical evocation.

Critically, empirical studies indicate that higher-order properties emerge from the corpus as a whole and that these properties implement organismal integration,

here understood as an outcome of intentional, goal-oriented behavior. Accordingly, the integral unity of the individual is directly attributed to the autonomy of the intentional subject. Drawing from Mossio and Moreno's theoretical account of organismal autonomy, notably, human ontological faculties share a profound intimacy with the body [27] both mediating bodily integration [28, 29] and sustaining life. As predicable properties of the whole, that is, emerging for the "good of the whole organism" [17], such properties are intimately linked to processes both influencing and influenced by its extended organizational form, and so are manifest in the mutually constraining influences of the peripheral and central nervous system. In other words, higher-order properties emerge from the body as a whole where they unify the body through intended global actions, including self-identity, agency, and consciousness, and so mediate a delocalized, systemic mode of integration.

The need for the emergence of these properties from the body can be seen in the case of self-identity and understood as an ability to differentiate the physical breadth that is subsumed by processes belonging to itself from those of the contiguous environment. An organism like *Caenorhabditis elegans*, for example, must identify this range through the dynamical operation of its neural architecture [30], which regulates individual motor movements in reference to this global activity. In humans this perception of self has also been shown to be a process arising from afferent, somatotopic input of the whole body [27]; indeed, in the body's absence, there would be no percept.

Similarly, the ability to initiate actions by oneself requires that these be stably linked to the self-percept [25] now known to entail a neural dynamic termed the motor image [31]. As currently understood the motor image constitutes a covert action undertaken only mentally and as a simulation of a non-executed action. That is, the motor image contains the feature elements of a motor trajectory and so contains the projected series of motions that are prospective for execution. Insights drawn from the motor image reveal that bodily representation is a key feature that frames the elements of the plan as teleologically oriented, that is, one that inscribes actions linking an agent with an objective destination. So inscribed, actions are thereby executed as a coherent and coordinated dynamical ensemble, which have a causal origin linked to the whole individual. Accordingly, features of the motor plan entail mutual though distinct contributions from peripheral as well as central origins, underscoring the essential unity of dynamic performance even in its covert formulation, and directing it toward a unique goal.

Consciousness, likewise situates as a global property enable both responsible action and the execution of higher faculties. Current insights suggest a decentralized physical origin [32], where the body contributes to the emergence of consciousness in at least two ways, by (1) creating a generalized platform that sustains a phenomenological background of mental awareness and (2) stimulating its focal emergence. Together these results argue for a complex but nonetheless shared participation of brain and body in eliciting and sustaining all higher order properties, that is, *a unified and delocalized source of bodily emergence*.

4. The advancing future: prospects for neurobioethics from a metaphysics of subjectivity

As noted, for Wojtyła, it is the dimension of metaphysics that situates the ethics of the personalist subject, where the person "constitutes a privileged locus for the encounter with being, and hence with metaphysical inquiry." In the Wojtyła formulation, the normative value of the personalist subject thus emerges from its metaphysical and immaterial mooring, constituting the ground for its physical instantiation and the essential metaethical dimension for neuroethical praxis.

Accordingly, it grounds his claim against “dehumanizing” corporal intervention. In doing so it has a direct bearing on the construction of ethical standards that are probative, that is, the construction of normative statements that pertain to actionable standards that would or would not infringe on a specifically human meaning.

By contrast, prevailing models of the subject that are a legacy of Cartesian metaphysics, challenge, the specifically human meaning of the personalist subject that flows from his ontological primacy in the order of being. It is a challenge, moreover, also directed to the understanding of material reality. As Gillett has pointed out [33], what is evident in current debates over the nature of material reality is the extent to which the Cartesian segregation of immaterial and material dimensions and the invocation of a strictly causal model of relations suffice for ontic adequacy, that is, whether materialism alone or dualism offer adequate explananda to account for the material order. The debate on physical reality has significant repercussions in the ethical sphere, with normative consequences that impact neuroethical praxis and leads, increasingly, to dehumanizing tendencies.


How metaphysics grounds ethical praxis, accordingly, is a critical dimension often ignored in debates about human nature and its modification that are exacerbated by the advent of neuro and genetic technologies. The culmination of a multistaged metaphysical divorce has transpired since Descartes; however, its current understanding has left efficient causal and mechanistic commitments to drive the prevailing materialism of modern neuroscience, leaving a decompositional and reductive philosophy to determine how brain operation is interpreted for the foreseeable future. *Presuppositions invoked by these efforts belie the consilience with neuroscience that is more evident in Wojtyła's proposal.* Crucially, the need to account for the emergence of subjectivity from the material order, that is, the hallmark of the neural architecture, is left unexplained by the Cartesian metaphysical segregation. The ferment in current efforts to explain the reality of the brain and mind, however, indicates that modern metaphysical presuppositions that undergird neuroethics are in a process of flux. The current uncertainty surrounding the metaphysical status of subjectivity, therefore, suggests that the Wojtyła metaphysical subject may open a new window on the objective reality of the subjective mind that will offer surer philosophical ground for neurobioethics.

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