

John Dillon / Marie-Élise Zovko (eds.)  
**Platonism and Forms of Intelligence**



# Platonism and Forms of Intelligence

Edited by John Dillon  
and Marie-Élise Zovko



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## Preface

The editors would like first of all to thank the contributors to this volume, as well as the participants and the organizing committee<sup>1</sup> of the International Symposium *Platonism and Forms of Intelligence*, with which the idea for the book originated. We would also like to thank the patrons and sponsors of the original symposium: the President of the Republic of Croatia, Stipe Mesić; the Croatian Committee for UNESCO, the City of Hvar, The Royal Netherlands Embassy/Zagreb, Istituto italiano di cultura/Zagreb, the Ministry of Science, Education and Sport of the Republic of Croatia, the Institute of Philosophy/Zagreb, Croatian Studies/University of Zagreb. We thank furthermore the Ministry of Science, Education and Sport of the Republic of Croatia and Trinity College Dublin Association and Trust for their contribution toward the publication of this volume. Our special thanks go to Akademie Verlag and to Dr. Mischke Dammaschke for their support of the volume, as well as to Dr. Frank Hermenau for his care, patience and professional support with the technical aspects of the book's production.

John Dillon  
Marie-Élise Zovko

Dublin and Zagreb, in July, 2008

<sup>1</sup> The members of the organizing committee were: Laura Blažetić (Zagreb), Renate Kroschel (Freiburg i. Br.), Andrea Mađor Božinović (Zagreb), Josip Talanga (Zagreb), Marie-Élise Zovko (Zagreb).



MARIE-ÉLISE ZOVKO

## Platonism and Forms of Intelligence

Proceedings of the International Symposium, Hvar, 2006

What forms does intelligence take? How does it enable us to know, to feel and to act? The Platonic doctrine of ideas or forms has its roots in a comprehensive understanding of human intelligence, of its ability to access and utilize the contents of experience in order to establish a coherent view of reality, direct our decisions, form our habits of behaviour and inspire our creative productivity. From its inception in the Presocratic paradigmata of Platonic thought to its modern representatives in rationalist and idealist philosophy, Platonists and thinkers closely associated with Platonism – among them Aristotle, Plotinus, Porphyry, Iamblichus, Proclus, ps. Dionysius Areopagita, Nicolas Cusanus and Renaissance Platonists like, Marsilius Ficinus, Pico della Mirandola and Francesco Patrizi; Spinoza, Schelling, Hegel and Franz von Baader – have differentiated levels and types of intelligence: receptive and (re-)productive or spontaneous, intentional and conceptual, argumentative or discursive and intuitive or analogical, individual and transpersonal or universal – recognizing the distinct importance of each and the proportionality expressed by their interrelationships and cooperation.

For Plato and the Platonists, epistemology is not separate from ontology, knowledge from reality, because cognition itself is recognized as the most essential aspect of reality. At the same time, intelligence represents for Platonism the unique means by which we approach and attain to reality, both the reality which intelligence itself is and that to which it refers. In distinguishing various levels of intelligence and their specific modes of (co-)operation, Platonist philosophy thus recognizes and differentiates an inherent diversity in the quality and content of experience, i. e. specific aspects of reality corresponding to each aspect of intelligence and specific ways in which we approach and utilize the different aspects of reality which each individually and all in their entirety convey.

Platonist views on intelligence can be shown to have had a marked influence on Kant and a number of other ostensible counterexamples to Platonic philosophy, providing a unique opportunity to more fully comprehend the genuine import of those systems of thought. The Platonic theory of intelligence also played a determining role in the development of scientific method (defining the role of hypothesis and experiment in the investigation of phenomena; differentiating between observation and explanation, deduction and argument, reasons and causes). Not only in a methodological or historical sense, however, do Platonic views on intelligence prove relevant. In their reflections on the process of cognition and the relationship of intelligence to its objects, Platonist

philosophers furthermore anticipate many significant advances in cognitive science and psychology, and many of their original insights are confirmed and articulated by recent discoveries in neurology and neurophysiology. Fundamental research in the physical and life sciences, for its part, tends to confirm the Platonic „analogy of intelligence“, i. e. the heuristic and paradigmatic role of „something like“ human intelligence for an understanding of the genesis and structure of the universe, and the emergence and organisation of the individual beings which comprise it. Inquiry into the role different kinds of intelligence play in artistic production and art appreciation, on the other hand, provides its own form of experimental evidence for the validity of Platonist ideas on stages and complementary types of intellection.

The theme of the present book is thus of both universal scope and immediate relevancy for research in a wide range of fields. The volume *Platonism and Forms of Intelligence* contains a collection of papers presented at the International Symposium: *Platonism and Forms of Intelligence*, which took place in the ancient city of Hvar on the island of Hvar, Croatia, from October 9-13, 2006. *Platonism and Forms of Intelligence*, nonetheless, comprises more than just an anthology of conference papers. Uniting under a single theme a diverse international group of experts, not only from the area of Platonic studies, but also from other academic and non-academic professions, it transcends the boundaries of univocally academic research in the humanities to initiate an exchange of ideas between specialists on Platonism and representatives from other areas of scholarship, as well as from the arts and education.

In recent years there has been an upsurge of interest in the study of Plato, Platonism and Neoplatonism. Until now, however, the kind of interdisciplinary forum initiated by the International Symposium *Platonism and Forms of Intelligence* has been lacking. Taking the position that it is of vital importance for the resolution of certain pressing issues of common interest to humankind to establish an ongoing dialogue among scientists, artists, academics, theologians and philosophers, *Platonism and Forms of Intelligence* endeavours to bridge the gap between contemporary research in Platonist philosophy and other fields where insights gained from the study of Plato and Platonist philosophy can be of consequence and benefit.

That a need and an interest for such a forum exists was evidenced by the lively response to the original call for papers, greeted with enthusiasm by experts from a variety of fields not directly tied to academic research in philosophy, among them physicist Fritjof Capra (author of: *The Tau of Physics*, *Web of Life*, *The Science of Leonardo*), internationally renowned neurophysiologist Sandra Witelson („The Exceptional Brain of Albert Einstein“), and distinguished artist and educator Betty Edwards (*Drawing on the Right Side of the Brain*). Bearing out expectations that it would become what Prof. F. A. J. de Haas of Leiden University called a „landmark event in the humanities,“ the International Symposium *Platonism and Forms of Intelligence* attracted such leading experts in the philosophy of Platonism as Werner Beierwaltes, Luc Brisson, John Dillon, Franco Ferrari, Francesco Fronterotta, F. A. J. de Haas, Thomas Leinkauf, Jean-Marc Narbonne, and Patrick Quinn, as well as younger Platonist scholars, including Giannis Stamatellos, Aaron Hughes, and Amber Carpenter, and a number of experts from other fields as well, including mathematician and author of original literary and philosophical

works, Dionysis Mentzeniotis; elementary and teacher education expert, Renate Kroschel (Stohrenscheule, Germany), specialist in Platonist philosophy and education theory; world-class pianist Vladimir Stoupel (Berlin), renowned, among other achievements, for his interpretations of Alexander Scriabin; mathematical psychologist and consultant Jonathan Doner; and one of Hvar's own family of distinguished scholars, internationally renowned archaeologist Marin Zaninović.

In keeping with this diverse gathering of minds and talents, the present volume effects a rapprochement between Platonic and Platonist insights on the problem of intelligence and insights gained from research and practice in the other fields named above. The book itself is structured according to the unified and organically developed theme of the original symposium *Platonism and Forms of Intelligence*: beginning with a consideration of the physical (natural) and bodily conditions of intelligence, it proceeds to reflection on the accessibility in sense phenomena of the intelligible basis for the process of definition and division of natural kinds, as well as for the entire array of conscious and unconscious manifestations of intelligence throughout the cosmos. From here, *Platonism and Forms of Intelligence* turns to the native ethical character of intelligence, i. e. its inherent, natural need to take responsibility for its own cultivation and development, which, unlike unconscious natural processes, does not unfold automatically or instinctively, and which, as opposed to these, necessarily entails the self-conscious (intentional) acceptance of its own involvement in the advancement of and care for the 'others', who, *ab initio*, are always included in the constitution of its own self. Building upon the articulation of the physical conditions of intelligence and intelligibility and intelligence's naturally ethical disposition, there follows a consideration of the transindividual, conceptual and intelligent conditions of intelligence, including the role and „location“ of the forms or ideas with respect to the universal activity of intelligence, as well as their subordination to a highest principle. These considerations evolve naturally into reflection concerning the highest principle itself and its accessibility to human intelligence, as well as, in the book's final chapter, to contemplation of the analogy between human creativity and its products and the creative activity postulated of a universal intelligence and its ultimate principle. A reflection on the original aim and proportionality of the forms and stages of intelligence described by the ‚path‘ of cognition and *paideia* in Plato's analogies of the Sun, the Line and the Cave forms the conclusion of the volume.

The original conference papers, appearing here in their rewritten and reworked form, are distributed thus according to the natural divisions of the topic itself. In chapter one, concerning the physical and sensible conditions of intelligence, mathematical psychologist *Jonathan Doner* first presents „a generalized, functional perspective on the origin and nature of intelligent processes,“ according to which the phenomena of life, brain, mind, and consciousness represent „diverse manifestations of nature's inherent capacity for intelligence,“ all of which „[d]espite differences in type, material, and complexity ... can be understood to ... be governed by the same dynamic principles.“ In „Embodying Intelligence: Animals and Us in Plato's *Timaeus*,“ *Amber Carpenter* takes up the more specific investigation of the immanence of rationality and Plato's portrayal of the bodily conditions of intelligence in animals and human beings. Two further papers investigate

the relationship between intelligence and intelligibility in a wider context. In „The Question of Platonic Division and Modern Epistemology,“ *Byron Kaldis* compares Platonic *diairesis*, the division or classification of concepts according to their intelligible differentiae, with some aspects of modern essentialism and contemporary epistemological theory from Popper to Goodman. Taking the question of intelligibility a step further, *Franco Ferrari* explores, in his paper: „Intelligenza e Intelligibilità nel *Timeo* di Platone,“ the role of the Demiurge as a metaphor for the presence and activity of a cosmic and metacosmic intelligence in the production of sensible reality, and as a basis for consideration of conscious and unconscious (subjective and non-subjective) manifestations of intelligence in reality as a whole.

In Chapter 2, which contemplates Socratic and Platonic insights on the inalienable ethical character of intelligence, *Jure Zovko* opens the discussion with a deft portrayal of the complex and subtle significance of irony for the Socratic/Platonic conception of the care of the soul („Irony and the Care of the Soul in Plato’s Early Dialogues“). *Daniel Kolak* responds with a characterisation of his own original concept of „open individualism“ in: „Stepping into the Same Rivers: Consciousness, Personal Identity and the Metaphysical Foundations for Global Ethics.“ According to this concept, consciousness, as the immediate awareness of our own existence, far from separating us absolutely, in fact joins us to one another – a view Kolak sees as directly descendent from the Socratic and Platonic form of consciousness (much like Heraclitus’ idea of the commonality of *phronesis*, itself a refutation of purported ‚private worlds‘ into which the ‚many‘, ignorant of the universal, shared character of reflection, would turn aside).

Chapter 3 turns to the intelligent conditions of intelligence and intelligibility, which enable both complementary aspects to exist within the activity of thought itself. In „Thinking about Thought. An Inquiry into the Life of Platonism,“ *F. A. J. de Haas* highlights, with his account of the famous confrontation between Porphyry, Plotinus and Amelius concerning the ‚location‘ of the intelligible Forms, the instrumental role played by Aristotelian terminology in clarifying the position of intellect with respect to the forms and the highest principle of the forms. Aristotle’s differentiation, in *De anima*, of a passive intellect, which *becomes* everything, and another, active and independently existing (divine) intellect, which *makes* everything, is juxtaposed with the concept of ‚Thought thinking itself‘ as a self-identical, immaterial object from the *Metaphysics*, to provide Haas and Porphyry with the solution, not only for the location of the forms, but for the Platonic difficulty of the identification of the highest principle with respect to the forms.

In „Zum Begriff des ‚Geistes‘ in der Frühen Neuzeit. Überlegungen am Beispiel Francesco Patrizi da Chersos,“ *Thomas Leinkauf* explores this Croatian philosopher’s (Francesco Patrizi = Frane Petrić) concept of Mind or Intellect, which formed a counterweight to concepts of natural philosophy developing in the 15<sup>th</sup> and 16<sup>th</sup> century under the influence of a mechanistic physics. Patrizi, like other early modern thinkers (Ficinus and Cusanus, Leibniz and Spinoza, whose closely related concepts of intellect were adopted and further developed by German Idealists Jacobi and Schelling) returns for his reflections on Intellect to ancient sources such as Plotinus, Proclus and Damascius, as well as to Neoplatonic commentaries on important Aristotelian texts such as

*De anima* III and *Metaphysics* XII. Leinkauf emphasises the need to differentiate self or individuality as conceived in early modern philosophy, and the concept of mind in ancient philosophy from which it derives, where self, the I and rationality or intellection coincide in a general sense, from contemporary ideas of the contingent subject as bearer of sensitive, affective and rational-intellectual processes. The unity of Being, Life and Thought portrayed by ancient and Neoplatonic concepts of intellect, in close relation to early modern concepts of intellect, for which the ‚I‘ is not yet separated from its object and not yet raised to the status of absolute self-consciousness, do not allow for an ontology which thinks being in opposition to thought, as nonconceptual or ‚mindless‘: Being is and exists, in the fundamental conviction of (neo-)Platonism, as ‚being-thought‘; Intellect is ultimately the self-transparency and self-relationality of Being present to itself, not something which possesses itself by the difference and separation from an external object.

According to Leinkauf und Patrizi, the grounding of individual self-consciousness in a transindividual concept of mind is accessible in the intuitive experience of a breaking-through of non-subjective intelligent activity into the intelligent activity of the individual in phantasy, imagination and thought. In „Reminiscence in Plato,“ *Luc Brisson* examines the Platonic hypothesis that „to learn is to make an effort to remember, on the occasion of a sensible experience, a knowledge acquired by the soul in an undetermined past, when, separated from all earthly bodies, it contemplated the genuine realities.“ (179) Contrary to G. Scott and G. Fine, Brisson argues that the hypothesis of Forms is a prerequisite for an understanding of the hypothesis of recollection. Reminiscence, namely, in a philosophical sense, despite the importance of *metempsychosis* for Plato’s theory of retribution, is not of sensible events that took place in the course of a previous existence, but of „another domain of realities, the intelligible Forms, to which it must refer the objects that its senses perceive at the end of a process of recollection.“ (181) Intellect, thus, directed toward the intelligent and not the sensible, ensures the order necessary for living being; with respect to Form – a pure, unmixed, non-sensible entity, existing in itself and absolutely, neither composite nor subject to becoming, but relating to the particular realities that „participate“ in it as a model to its image – it brings many sensations into unity. Even the knowledge we think we ‚have‘ is not a constant possession; rather, we must continually make an effort to recuperate it, as though it were somehow lost or forgotten. The recovery of this ‚former possession‘, however, presupposes the relation of the intellect to intelligible reality.

In „Platonismo e scienze della mente: cosa è l’intuizione?“ *Francesco Fronterotta* discusses the nature of the intuitive knowledge presupposed by Plato’s theory of Forms, portrayed in the dialogues as a kind of vision (*Symp.* 210e-211e), contact or touching (*Phaedo* 79c-d). In the Analogy of the Line, visual and tactile language is used to describe a noetic act, as distinguished from the mediate, discursive acts of intelligence called *dianoia*, a faculty compared by Plato to the deductive demonstrations of geometry. As opposed to commentators who refuse to admit to immediate intuition as representing the pinnacle of knowledge in Plato and denounce its irrational or mystical character, Fronterotta proposes that the language with which Plato describes the act of intuition is meant to elaborate a distinction between two types of knowledge recognized

by contemporary neuroscience, the first referring to a cognitive act which directly or immediately attains its proper object, the second to one which transverses or passes through the characteristics of its object in succession, attaining to it mediately or indirectly. Platonic intuition, in Fronterotta's view, far from being confounded with irrationality or a mystical vision, should thus be compared to recent hypotheses of neuroscience, which describe a process of simplification performed at the cerebral level, a process by which all irrelevant or exterior aspects of a particular mental image are omitted, allowing the attention to be concentrated on a simple form of that image stripped of all particularities not essential to it.

Following in natural progression the articulation of the individual stages in the development of the book's topic, from reflection on the sensible and intellectual conditions of intelligence to reflection on the transindividual and transintellectual conditions of Intellect, Chapter 4 comprises a series of papers concerned with the unconditional ground of Intellect, the highest principle, God or the Infinite Ground of being and thought, as well as with the question of the accessibility or intelligibility of transcendence itself and concepts of God. In their joint paper „The Notion of Infinity in Plotinus and Cantor,“ mathematician *Dionysis Mentzeniotis* and Platonist scholar *Giannis Stamatellos* thus first undertake to explore, by a juxtaposition of Plotinus' metaphysics and Cantor's mathematics, the intelligibility of the concept of infinity. In Plotinus, the conception of infinity is „integral to the ontological structure of the Three Hypostases,“ as „related to the inexhaustible and endless productive power of the One, the internal partlessness of Intellect's intelligibles and the infiniteness of the forming principles in the Soul.“ At the same time, it is „connected to the indefiniteness of Matter and the unending expansion of the material universe from the simplicity and unity of the Soul to the plurality and complexity of the perceptible world.“ These two aspects of infinity appear in Plotinus as fundamentally opposed – a circumstance which reappears in modern mathematical conceptions. Plotinus' concept of infinity is shown namely by Mentzeniotis and Stamatellos to anticipate concepts of infinity found in modern mathematics and particularly Cantor's theory of infinity. Cantor, himself a professed Platonist, used the idea of „self-nesting“ sets as a basis for his set theory, developing an ‚arithmetic‘ of infinite numbers, and, in correspondence to its operations, a never-ending hierarchy of infinities. „[D]efinite multiplicities which are not at the same time unities,“ on the other hand, he designated as „inconsistent systems,“ „absolutely infinite‘ totalities“, sharply distinguishing them from the previously described transfinite sets, and allowing their existence only „in potentia.“ These and other parallels between the concept of infinity in Plotinus and Cantor cast light on the general question of the conceivability of the Absolute.

In „Nous: Unity in Difference,“ *Werner Beierwaltes* examines the logical and ontological characteristics of Nous or universal Intellect in Platonism. Plato's differentiation in the *Sophist* of five „highest categories“ or classes: Existence or Being, Sameness and Otherness (Identity and Difference), Rest and Motion, establishes the foundation for grasping reality as a whole and the basis for Proclus' development of a theory of community (*koinonia*) or correlativity of the categories or ideas, by which he elaborates the being and activity of universal Intellect or Nous. In Nous, the intelligible is „differen-



tiated without division (or indivisibly)“ and „unified without mixture“. Beierwaltes concentrates above all on the function of Rest and Motion (*stasis* and *kinesis*), i. e. their simultaneity in Nous, as condition for the differentiating and unifying activity of Intellect.

Taking our investigation of universal Intellect a step further, *John Dillon* explores the relationship of intellect to the highest principle in Plotinus and later Neoplatonism. Whereas philosophical traditions in the Hellenic world until Plotinus considered intellection of some sort to be a characteristic of the supreme principle, or God, in Plotinus and later Neoplatonism, Intellect, as unity in multiplicity, finds its ground in the absolute unity and simplicity of a First Principle. In „The One of the Soul and the ‚Flower of the Intellect‘: Models of Hyper-intellection in Later Neoplatonism,“ Dillon addresses the question as to what form of apprehension we humans might be able to have of such an transintellectual entity, surveying first the approximations to such a faculty of the soul advanced by Plotinus, then passing on to the more precise identifications made by later Neoplatonists such as Iamblichus, Proclus and Damascius.

In a similar vein, *Patrick Quinn* addresses the question of „The Influence of Platonism on St. Thomas Aquinas’s Concept of Mind.“ Plato’s insights are seen by Quinn to have decisively shaped Aquinas’s concept of the human soul as an intermediate being between time and eternity, the physical and intelligible worlds. While respecting Aristotle’s concept of human intelligence, Aquinas favours a model of intellect that is able to function independently of the senses. This can occur, according to Aquinas, in the momentary vision of divine rapture, and occurs ultimately in the vision of God after death. Evidence for intellect’s ability to transcend the senses – in Aquinas a precondition for attaining divine truth and reality – is provided by the phenomenon of abstraction, i. e. the ability to focus on a particular object to the exclusion of superfluous or irrelevant details.<sup>1</sup> While differing from Plato in affirming the importance of bodily life, as well as the necessity of the senses and imagination for the acquisition of knowledge, Aquinas’ concept of mind in general and of the human mind in particular is, in Quinn’s estimate, always defined by its ultimate objective, that is to say, by intellect’s fundamental orientation towards God.

In „Liberté divine chez Plotin et Jamblique,“ *Jean Narbonne* distinguishes various approaches to theology and the concept of God in the ancient world: theology of myth and of cult, philosophical or natural theology (as exemplified by Xenophanes, Plato and Aristotle, the Stoics and the Epicureans), the theology of the Mystery religions and Orphism, and finally a theology of a ‚scientific‘ or ‚geometric‘ tenor, such as found in Iamblichus or Proclus, who attempt to produce a systematisation or *summa* of divine knowledge according to the tradition of Platonism. It is this last form of theology, i. e. knowledge or ‚science‘ of the transintellectual ground of being and intellection, with which Narbonne is concerned in his consideration of divine liberty. In his rebuke of Porphyry’s idea of theurgy in *De mysteriis*, Iamblichus argues that divine nature is not

1 A process which appears to be closely related to the one mentioned by Fronterotta in his discussion of noesis and neuroscience. Cf. above 15f. and below 191f.

subject to physical passions or natural motion, that it is not in nature or physical necessity that the divine essence resides; rather, divine nature is defined by itself alone. Not only are the gods free with respect to natural necessity, they command natural necessity, and thus enable also the individual to transcend it. Human beings, namely, are possessed of two souls: one subject to becoming, destiny and the cycle of rebirth, and one which, having ‚fallen down‘ into the first, is nevertheless the heir of the „first intelligible“ and the power of the Demiurge, whose superiority to the cycle of rebirth enables us to reascend toward the intelligible gods and toward the „Ungenerated“. Iamblichus, as Narbonne observes, strives to show that God is not subject to nature, while Plotinus is concerned to show that God is not subject to *his* nature. Neither, however, allows the workings of the universe to be attributed to chance or necessity, since that would contradict the *concept* of the divine as self-defined and superior to those workings as their cause.

For Iamblichus, to refer to chance and necessity a reality of the rank and beauty of the cosmos is unreasonable; and a person would need to be deprived of intelligence and sensibility to believe that God is not concerned for the things here below, in view of the intellect and wisdom with which natural processes appear to be governed. To this tendency of human intelligence to find intelligence in the world around it, and to attribute the beauty of the cosmos to *something like* the activity of an intelligence like to our own, corresponds the complementary need of the knowing self to create an image of itself and its knowledge in nature and art. The intimate association of intelligence and creativity forms hence the natural transition to the concluding chapter: „Platonism and Forms of Intelligence in Art and Education.“

*Aaron Hughes* opens the topic with his exploration of the intersection between epistemology, ontology, and aesthetics in the Renaissance Platonism of Judah Abravanel in „Intelligible Beauty and Artistic Creation: The Renaissance Platonism of Judah Abravanel.“ Hughes addresses in this context the role of imagination in intelligent and creative processes, considering furthermore the relationship between imagination and ontology and the question as to how the creative activity of the human intellect relates to philosophical speculation. Abravanel follows medieval Islamic Neoplatonists in arguing that a world cannot exist without its ‚display,‘ sense phenomena comprising thus the necessary condition for knowledge of the transcendent reality which is at their source, and sensual images and language enabling finite embodied individuals to move back up the ontic hierarchy to access a reality which exists without matter. As for many of the Renaissance Humanists, myth and allegory are, in Abravanel’s view, not barriers to philosophical understanding but imitate the very ‚fabric‘ of the divine. Without beautiful and poetic language one is unable to encounter the beautiful and, by extension, God. In stark contrast to the reductive tendency of today’s prevalent philosophical currents, the goal of the philosopher for Abravanel is not to translate mythical explanation into analytical prose, but to understand the content of myth and allegory by composing other ‚myths‘. The good philosopher, accordingly, must create aesthetically pleasing treatises (i. e., „works of art“) that replicate the beauty of the universe and the poetical language of myth. Such treatises, in turn, imitate the beauty of objective reality and participate in absolute beauty; and the interpretation of the treatises themselves leads the ideal reader back to the beautiful, the true, and the good (i. e. to God).

In a further development of the theme: intelligence, beauty and art, and a unique contribution to the interdisciplinary exchange of ideas striven for by the symposium and book, *Platonism and Forms of Intelligence*, pianist *Vladimir Stoupel*, in his exposé „La liberté est dans la mémoire: Zur Notwendigkeit des auswendigen Spiels am Beispiel der Werke von Alexander Skrjabin“ provides rare insights into the guiding inspiration for his unforgettable performance in Hvar in October 2006. In the Platonic tradition, the philosopher and the musician share a specific affinity: that of love and devotion to beauty. This devotion is the expression of a gift or divine possession, which requires education and formation for its proper unfolding. As Stoupel explains, the education of the pianist requires the internalisation of complex structures and their transformation into finely tuned motoric ability, as well as technical and executory skills, something which presupposes education and training of a particular kind of memorisation. Both a trained memory and also the pianist's specific individual memories are required in order to establish the specific personality of an individual interpretation. Such memories are not immediately accessible, but subject to visible, acoustic, motoric or intellectual associations. Memorisation, paradoxically, forms a necessary condition for innovation and freedom of interpretation. The pianist, conscious of the impossibility of ‚stepping twice into the same river,‘ finds himself both pressured to conform to convention – and unable to hinder the influence of the associations and memories which rise unbidden from his unconscious. True inspiration, in the conviction of Stoupel, comes from this cooperation of the unconscious, permitting the composer's original inspiration to come to life in the interpretation of the pianist and giving the music its ‚God-given‘ or magical inspirational power. The atonal music of Alexander Scriabin, in which harmony gives way to dissonance and the chord replaces the melody, embodies for Stoupel in a particular way the free expression of the unconscious in art. The sheer unpredictability and even unplayability of some of Scriabin's sonatas – in comparison with Classical works, where the pianist is able to rely at least partially upon the collective memory of an audience familiar with a Classical concert repertoire – represents an enormous challenge to the pianist, relying as he does on memorisation for the freedom of his interpretation. Without a grasp of the inner logic of the piece, the ideal of achieving the same freedom of expression aimed for by the composer is, according to Stoupel, impossible.

The final contribution to *Platonism and Forms of Intelligence* embodies the written version of M. Zovko's contribution to a joint presentation and discussion forum conducted by Renate Kroschel (Stohrenschule; Margarete Ruckmich Akademie, Germany) and Marie-Élise Zovko, which concluded the original symposium in Hvar and addressed the relevance and significance of an understanding of forms of intelligence for education. Renate Kroschel introduced the topic with a synopsis, based on her experience in applying insights from Platonic and Platonist philosophy to elementary school and teacher education, of her own understanding of the idea of „philosophizing with children.“<sup>2</sup> Children's curiosity, their ceaseless questioning and desire to discover

2 An idea which originated in Germany in the 1920's with the reform movement initiated by Walter Benjamin and with Leonard Nelson's call for a revival of the Socratic conversation, and which

and understand the world reflect for Kroschel Plato's concept of ‚*Eros*‘, or love of wisdom and beauty, in its most original form, as the motive force and inspiration of philosophy (cf. *Symposium* 203d 7: *Eros* „philosophizes throughout the whole of life“). This love of knowledge Kroschel sees as particularly present in children, especially small children, although still in its inception and not yet at a conscious level. While Plato does not explicitly speak to children, but to youths and adults capable of consciously taking up the challenge of freeing themselves of ignorance, philosophizing with children has, in Kroschel's view, a vital role to play in the preservation and development of this original curiosity and questioning. For Kroschel, ‚philosophizing with children‘ means „to keep alive and to cultivate childlike curiosity and joy of questioning, to develop the questions of childhood and the independent reflection natural to childhood with the goal of cultivating a permanent and fundamental attitude of questioning“ – a characteristic of the utmost importance for the preservation of the values of a just and democratic society.

In „The Way Up and the Way Back is the Same: The Ascent of Cognition in Plato's Analogies of the Sun, the Line and the Cave and the Path Intelligence Takes,“ *Marie-Élise Zovko*, finally, considers the overarching proportionality which conjoins the analogies of the Sun, the Line and the Cave to each other and to an ‚unknown‘ fourth ‚term‘, the proposed science of dialectics, as well as the role of the Divided Line in demonstrating the ‚method‘ by which to ‚solve‘ the proposed proportion and gain an understanding of its inherent direction and aim. Plato's ‚proportion equation‘ is shown thereby to be not an external, but an intrinsic and essential aspect of the exposition of the ascent of cognition depicted by the Divided Line and reinterpreted and expanded in light of the task of *paideia* in the Analogy of the Cave. The „way up“ to knowledge of the highest things and the „way back“ to a rediscovery and redefinition of individual kinds and species, to a *reproduction* of the objects of intelligence in our words and acts, works and ideas, as well as in our efforts to „turn about“ and encourage to the ascent those who have yet to turn their vision in the ‚right direction‘, are, in Zovko's interpretation, the ‚same‘ in an *ontological* and in an *epistemological* sense, with regard to the original proportionality and hierarchy of the forms and functions of intelligence, and at the same time distinct, and distinguishable, relative to one another and to the one ‚path‘, because of the irreversibility of their original orientation toward the Good. Plato's use of proportion in the central analogies of the *Republic* is compared with

was subsequently carried forward and developed in the USA by Matthew Lipman (*Institute For The Advancement of Philosophy For Children*) and Gareth B. Matthews. As Kroschel put it, „The expansion of the movement gave philosophy and pedagogics in Germany important stimuli for further development of the idea of philosophizing with children. One can thus speak of a return of a school of thought which was exiled, so to speak, during the Nazi period.“ In her presentation, Kroschel highlighted two important representatives who gave the reform movement in Germany new momentum following World War II: education specialist Hans Ludwig Freese (*Kinder sind Philosophen*, 1989) and Ekkehard Martens, Professor for philosophical didactic in Hamburg (*Philosophieren mit Kindern – Eine Einführung in die Philosophie*, 1999), who conceives of the idea of philosophizing with children as a manner of introduction to philosophy for adults. [With grateful acknowledgement to R. Kroschel for permission to use her notes].

research on analogical reasoning from the field of cognitive science and psychology, as well as with research regarding ‚lateralization‘ or hemispheric distribution of brain function from the field of neural science and shown to corroborate insights gained by this type of research in important respects. Some of the distinct ratios which describe the interrelationships of our sensible and intelligible capabilities are considered in this light – *dianoia* and *noesis* in the realm of thought and the intelligible, *eikasia* and *pistis* in the realm of opinion and the sensible, their relationship to the overarching ratio of *episteme* and *doxa* – and the mathematical proportion which they severally comprise, a complex proportion, which on closer examination exhibits something like the character of a living, organic process. Plato’s recognition that mathematical intuition represents a synthetic activity different from that of mere sense perception and also from that of discursive reason (cf. *Phaedo* 96d-97e), and his grasp of the aesthetic nature of *noesis*, the highest form of human thought, especially as it functions in the method of hypotheses described in the *Phaedo* and the Divided Line, anticipate modern and contemporary insights into the aesthetic nature of intuition and its relationship to something like *dianoia* or discursivity in intelligent processes. Despite their analogous relationships, however, Plato does not confound the aesthetic nature of judgement and intuition with the perceptive and emotional faculties. Rather, in keeping with the requirement of subjecting the manifold impressions of sense and the phenomenal objects which give rise to them to a process of definition and ‚justification‘ – the famous ‚flight to the logoi‘ is upheld, and later developed to a science of dialectic, whose task, as Heraclitus put it, is to ‚give an account of each thing and how it behaves according to its nature,‘ applying methods of collection and division to trace the natural connections, the inherent rules and proportions which determine the character and functioning of complex beings and govern their interactions, and thereby paving the way for the soul to grasp truths that transcend the realm of discursive thought.

The work of the International Symposium Platonism & Forms of Intelligence was inspired by the efforts of a small group of philosophy teachers and students at the University of Zagreb, by their commitment to the reform of the system of higher education in Croatia and their dedication to the advancement of standards of excellence which might enable Croatian scholars to compete with the best of international research in philosophy. The language of Plato and the philosophy of Platonism shaped the vocabulary of science and of theoretical reflection on issues regarding the study of nature and humanity as a whole. The language and thought of Platonism formed the basis for modern declarations of human rights, and is still clearly comprehensible and relevant today. *Platonism and Forms of Intelligence*, like the symposium from which the volume issued, aims to encourage those concerned in an academic sense with the philosophy of Plato and the Platonist tradition to enter into a permanent dialogue with representatives of a variety of fields and interests, not only from an historical, but also from a theoretical and practical, as well as from a creative and educational point of view. This approach required and requires taking a certain risk: the risk of appearing to be unserious or dilettantish, because of encouraging experts in philosophy to speak a language understand-

dable to specialists in other fields, and encouraging experts from other fields to communicate their insights in a more generously comprehensible manner as well. We believe that in the final estimate the risk-taking of this joint venture has paid off; for what participants at the conference experienced was the unique, almost enchanted atmosphere of a free flow of ideas rarely occurring in academic circles, invigorating and inspiring. What is presented in the book *Platonism and Forms of Intelligence* is, we hope, a not too distant reflection of that living atmosphere of philosophical conversation.

# 1. PLATONISM AND THE PHYSICAL AND SENSIBLE CONDITIONS OF INTELLIGENCE





JONATHAN DONER

## The Origin and Nature of Intelligence

### Toward a generalized functional theory

This paper<sup>1</sup> is grounded in the hypothesis that, despite differences in their substance and complexity, the various processes that we identify as life, brain, mind, and consciousness<sup>2</sup> are all based on the same functional architecture and driven by the same dynamic principles.

Workers from several disciplines have sought unity among these varied phenomena.<sup>3</sup> The present approach begins with the simple fact that life, brain, mind, and consciousness are all *intelligent* phenomena. On the one hand this is obviously the case; on the other, it is deeply problematic. Each constitutes a clear expression of intelligent functioning, yet unifying their understanding within a single theoretical framework is very difficult. Current conceptions are not adequate to this task. What is needed is a more encompassing and incisive philosophy of intelligence.

Intelligence is not simply an attribute of animal and human behavior. It is a fundamental condition of the world – one that has emerged from purely physical processes and yet has redefined the nature of physical reality. Neither has it emerged as a magical consequence of complexity. It arises within specific conditions and will always be of a

- 1 Comments and questions by Luc Brisson, John Dillon, Byron Kaldis, Thomas Leinkauf, and Marie-Elise Zovko were very helpful in the revision of the original presentation, though only the author should be held accountable. This paper is dedicated to the memory of Timothy William Doner.
- 2 For the present, these terms are used generically. Each, of course, encompasses a range of phenomena.
- 3 Cairns-Smith, A. G. (1996). *Evolving the mind: On the nature of matter and the origin of consciousness*. Cambridge, UK: The Cambridge University Press; Geary, D. C. (2005). *The origin of mind: Evolution of brain, cognition and general intelligence*. Washington, D.C.: American Psychological Association; Morowitz, H. J. & Singer, J. L. (Eds.) (1995). *The mind, the brain, and complex adaptive systems*. New York: Addison-Wesley Publishing; Newell, A. (1990). *Unified theories of cognition*. Cambridge, MA: Harvard University Press; Penrose, R. (1989). *The emperor's new mind*. Oxford: Oxford University Press; Pfeifer, R. & Scheier, C. (1999). *Understanding intelligence*. Cambridge, MA: MIT Press; Piaget, J. (1971). *Biology and knowledge*. Chicago: University of Chicago Press; Schrodinger, E. (1992). *What is life?* Cambridge: Cambridge University Press; Smith, J. M. & Szathmari, E. (1999). *The origins of life. From the birth of life to the origins of language*. Oxford: Oxford University Press.

particular organization. Here is the heart of the matter, and the classic Aristotelian causes<sup>4</sup> provide a preliminary glimpse into its nature.

According to the proposed perspective, the *formal* cause of intelligence has three main aspects. First, an intelligent process has definable characteristics. Though intelligence comes in great variety, a generalized, functional theory is possible.<sup>5</sup> Second, intelligence can emerge within any substrate capable of supporting those characteristics. Not all substrates support intelligence, but neither is intelligence limited to only a single substrate. Third, every intelligence is developmental, either through phylogeny, ontogeny, or learning. Its nature begins as a population of lower-level interacting functions and develops into a single, integrated intelligence operating at a new level of complexity.

The *efficient* cause of intelligence is two-fold. The first aspect relates to its operation, and the second relates to its realization.<sup>6</sup> According to the model, the operation of every intelligence, at any level of complexity, is describable in terms of the coupling of a stereospecific classification and a stereospecific action within a conditional relation. Clearly this echoes behaviorism's stimulus-response psychology. However, a stimulus is only a stimulus insofar as it is a classification,<sup>7</sup> and a response is only a response insofar as it is an action conditioned by a classification. As to the realization of intelligence, the model argues that this follows a universal scheme. Structured populations of interacting agents provide a substrate supporting the critical characteristics of intelligence. This leads first to the growth of primordial intelligence, and subsequently, insofar as intelligence is its own best substrate, to the evolution of embedded levels of intelligent functioning.<sup>8</sup>

The substance, or *material* cause, of every natural intelligence is thus of three aspects. First, intelligence exists in a physical world and is therefore composed, fundamentally, of physical stuff. Second, an intelligence is composed of all of its constituent lower-level intelligences. And finally, the intelligence is manifested as a set of characteristic functions which are at the highest level of complexity, are not strictly reducible to lower-level functions, and which give integrity, unity, and efficacy to the intelligence.

Lastly, the purpose, or *final* cause, of intelligence is best seen in terms of its actual consequences in the world. Intelligence takes a world that is purely physical and reconstitutes it into a world that is supportive of and conducive to the growth of ever

- 4 These are formal, efficient, material, and final cause [see, *Physica*, translated by R. P. Hardie and R. K. Gaye, in R. McKeon (Ed.) (1941). *The basic works of Aristotle*. New York: Random House]. Though interpretations can vary, as used here, the formal cause is the design or organization of an entity. Efficient cause concerns its operational dynamics. Material cause relates to the substance of the entity, and final cause is its purpose or reason-to-be.
- 5 Putnam, H. (1975). Philosophy and our mental life. In H. Putnam (Ed.) *Mind, language and reality: Philosophical papers*. (Vol. 2) Cambridge: Cambridge University Press, pp. 48-73.
- 6 Kim, J. (1998). *Mind in a physical world*. Cambridge, MA: MIT Press.
- 7 Hayek, F. A. (1952). *The sensory order*. Chicago: University of Chicago Press.
- 8 Smith & Szathmari identify what they call „major transitions“ in evolution (Smith, J. M. & Szathmari, E. (1995). *The major transitions in evolution*. Oxford: Oxford University Press.).

more varied levels of intelligent operation. Continually, at every level, intelligence re-creates its world and itself, generating processes and conditions that would be otherwise impossible.

## Principles of intelligence

The remainder of this paper discusses these points within a précis of the full, generalized functional theory. Following the approach of Pfeifer & Scheier, the perspective is outlined through a set of *design principles*.<sup>9</sup> These summarize the basic nature of intelligence, the conditions under which intelligence can arise, and the dynamic functions which guide it.

### 1. Intelligence can arise within any medium that supports its basic characteristics.

This principle brings together functional and structural perspectives. Intelligence is *not* an emergent property of complexity. Emergent processes exist within the physical and computational universe,<sup>10</sup> and intelligence most likely entails emergent processes. The concept of emergence, however, does not explain intelligence. Regardless of the complexity of a dynamic medium, intelligence will only arise within media that support its nature. Intelligence has defining characteristics, and a medium must support these characteristics if intelligence is to arise.

There is no reason, *a priori*, to believe that intelligence is limited to only one kind of medium.<sup>11</sup> Natural intelligence, in fact, occurs with respect to several different media, though generally speaking, these are of two classes.

The primordial medium is made up of purely physical processes. It is essential that intelligence be capable of arising within a purely physical medium, such that the origin,

9 Pfeifer and Scheier's principles are summarized in Table 10.1, Pfeifer and Scheier, *Op. cit.*, pg. 303. Their book is excellent and highly informative. The present theory has similarities with aspects of their perspective, but overall, it differs substantially.

10 Wolfram, S. (2002). *A new kind of science*. Champaign, IL: Wolfram Media.

11 Early work in computer science and artificial intelligence first raised the issues of intelligence being independent of substrate *per se*. This strengthened interest in a functional approach, especially Putnam, H. (1988). *Representation and reality*. Cambridge, MA: MIT Press. Influential discussions from AI include, McCarthy, J. (1977). Epistemological problems of artificial intelligence. *Proceedings of the 5<sup>th</sup> International Joint Conference on Artificial Intelligence*, 1038-1044. Reprinted in B. L. Webber and N. J. Nilsson (Eds.), (1981). *Readings in artificial intelligence*. Palo Alto, CA: Tioga Publishing; Minsky, M. L. (1968). Matter, mind and models. In M. L. Minsky (Ed.) *Semantic information processing*. (425-432), Cambridge, MA: MIT Press. This paper's perspective agrees that machine intelligence is possible, but only if it conforms to the proposed characteristics of true intelligence.

operation, and evolution of intelligence obey the laws of thermodynamics. Nonetheless, intelligence is not constrained by those laws. Intelligence is constituted of, but not limited by, physical matter. Rather, it infinitely extends physical matter's possibilities.

The other class of media which supports intelligence is intelligence itself. Intelligence begets intelligence. Within our world it is apparent that once primordial intelligence arises, it serves as the foundation for the evolution of successive levels of intelligence. Thus according to the present perspective, first, the Physical composes Life, then Life composes Brain, Brain composes Mind, and Mind composes Consciousness.

A basic characteristic of intelligence, at every level, is that its dynamic growth always follows particular transformational principles. Intelligence grows in three general ways: through phylogeny, i. e., a lineage of successive generations, through ontogeny, i. e., a process of maturation, and through learning, i. e., change brought about through experience. According to the theory, despite the obvious differences, all three follow the same transformational dynamics.

Another basic characteristic is that intelligence possesses a fundamental structure. That is, all intelligences are composed of certain basic types of operations which are interrelated according to a particular organization. Consequently, the operation of all intelligence follows the same functional principles. There is a basic functional form to everything an intelligence does.

## 2. Every intelligence can be characterized as a $\Lambda(P\Delta)$ function of some complexity.

This is a defining characteristic. The operation of intelligence consists, fundamentally, of two components. Intelligence *classifies* its conditions and it *acts* into its world. This paper calls the process resulting in classification P (rho), and the process resulting in action,  $\Delta$ . The process designated as  $\Lambda$  represents the conditional relation of P and  $\Delta$ ,

$$\Lambda(P\Delta) = \{\text{IF } P, \text{ THEN } \Delta\}.$$

The operation of P and  $\Delta$  within the relation  $\Lambda$  is the most general characterization of the functions performed by any given intelligence. This captures the essence of the behaviorists' insight concerning the importance of stimulus and response, but avoids the many problems to which behaviorism is prone. For example, the present view does not deny the existence of Mind and Consciousness. Rather, it seeks to understand them within an encompassing model of all intelligence.

The classification, P, is a fixating process, whereas  $\Delta$ , the action, is a transforming one. P codes conditions as a particular thing;  $\Delta$  transforms conditions into something else. Consider Cairns-Smith's description<sup>12</sup> of part of the molecular system which controls the locomotion of the bacterium *E. coli*:

12 Cairns-Smith, A. G., *Op. cit.*

...allosteric proteins, embedded in and crossing the main cell membrane (the plasma membrane), ... have a binding socket on the outside and a catalytic socket on the inside. ... the catalytic socket on the inside is allosterically affected by whether the outer binding socket is occupied or not.<sup>13</sup>

This makes the point crystal clear.<sup>14</sup> These proteins classify their conditions by specifically binding to a particular molecule (fixating). They then act back onto these conditions by catalyzing a chemical reaction (transforming).

P is a *stereospecific* classification of some input from the environment, and  $\Delta$  is a *stereospecific* action into an environment. Stereospecificity here refers to a process possessing a particular spatiotemporal shape, pattern, or structure, *and that this matters*. Thus the process designated as P classifies events that possess a particular spatiotemporal form. And the process designated as  $\Delta$  constitutes actions of a particular spatiotemporal configuration.

For example, enzymes play critical roles in all aspects of physiology. According to the late Nobel laureate Jacques Monod, the paradigmatic enzyme function comprises two steps:

- 1) The formation of a stereospecific complex between protein and substrate.
- 2) The catalytic activation of a reaction within the complex: a reaction *oriented* and *specified* by the structure of the complex itself.<sup>15</sup>

Unlike non-biological catalysts, enzymes act in specific ways and catalyze specific reactions. They do this by virtue of the stereospecificity of their binding and the precise orientation of their action. Monod says, „What is at work here, is, quite literally, a microscopic discriminative (if not ‚cognitive‘) faculty.“<sup>16</sup> Monod realizes that protein complexes are intelligent agents, though he buries that realization within quotes within parentheses. By the present theory, enzymes are one form of primordial intelligence. Quite simply, as Monod acknowledges, they do what intelligences do.

The function  $\Lambda(P\Delta)$  can also be considered to be the general characterization of an intelligent *state*. An intelligent state *is* an intelligence. Whether we want to refer to a neural state, a mental state or a conscious state, if it is an intelligent state, it must be a  $\Lambda(P\Delta)$  function. Across levels of intelligence, this basic function will vary in terms of the complexity, *qua* information content, of P and  $\Delta$ . Human classification and action, for example, has far greater information content than protein classification and action. Nonetheless, what both are doing has the same functional form.<sup>17</sup>

<sup>13</sup> *Ibid.*, pg. 92.

<sup>14</sup> This passage was pivotal in the early development of the present perspective.

<sup>15</sup> Monod, J. (1971). *Chance & necessity*. New York: Vintage Books, pg. 54. The italics are his.

<sup>16</sup> *Ibid.*, pg. 46.

<sup>17</sup> Thus every  $\Lambda(P\Delta)$  intelligence is most generally characterized by six variables. These are 1) the accuracy of P, 2) the complexity (i. e., information content) of P, 3) the precision of  $\Delta$ , 4) the com-

$\Lambda(P\Delta)$  functions are clearly kin to Leibniz's monads.<sup>18</sup> Monads perform two primary types of operations. First, they *perceive*. Leibniz construes this primarily as a kind of phenomenal experience or awareness, but it is clearly classificatory and fixative. Second, they *change states*, which is clearly transformational. Nonetheless, this transformation has no external consequences because monads are windowless. They have no direct interaction with their environment.

Indeed, the concept of an environment is problematic in Leibniz's view. This is one major difference between his and the present perspective, which takes the logical structure of the full environment very seriously. Intelligence is embodied, situated and autonomous.<sup>19</sup> Therefore, environments are real and must be given their place within the theory.

3. Every intelligence operates with respect to three environments (or domains): an external world, an internal body, and a social network.

The behavior of each intelligence constitutes its solutions to the problems and tasks posed by its world, its body, and its network. An intelligence therefore operates within three types of niches, an external one, an internal one, and a social niche. Each is created according to how an intelligence classifies information from the relevant domain and how it acts back into that domain.

This principle of three environments provides the basis for the claim that intelligence is situated, embodied, and autonomous. A situated intelligence is one that operates within a physical world.<sup>20</sup> An embodied intelligence must operate within a material body.<sup>21</sup> And finally, an autonomous intelligence is one that exists within a social network.<sup>22</sup> An intelligence interacts with these three domains individually and together.

plexity (again, information content) of  $\Delta$ , 5) the valence of  $\Lambda$ , and 6) the consistency (or reliability) of  $\Lambda$ .

18 Montgomery, G.R. (Trans.) (1902/1973). *Leibniz: Discourse on metaphysics/ Correspondence with Arnauld/ Monadology*. La Salle, IL: Open Court.

19 Pfeifer, R. & Scheier, C., *Op. cit.*

20 No one debates the importance of the external environment, but not all see it in the same way. Direct perception [Gibson, J. J. (1966). *The senses considered as perceptual systems*. Boston: Houghton Mifflin] argues that the stimulus is complete and sufficient for perception, which consists of the direct „pick-up“ of species-relevant information. Constructivists [Gregory, R. L. (1966). *Eye and brain*. London: Weidenfeld & Nicolson], on the other hand, argue that the stimulus is inadequate and that a perception must be constructed. This paper's perspective argues that both are correct. Direct perception is about P, the classification of conditions. Constructive perception is about  $\Delta$ , the generation of a transformation in conditions. Full intelligence is based on the most accurate classification and the most precise action, the best perceptions and the best constructions.

21 The recognition of the importance of the body in understanding intelligence has been very slow in coming. See Damasio, A. (1999). *The feeling of what happens. Body and emotion in the making of consciousness*. San Diego: Harcourt; Leder D. (1990). *The absent body*. Chicago: University of

In fact, though certain intelligent functions may be centered within or weighted with respect to one or two of the domains, the consequences of any intelligent process are ultimately determined by all three domains. Thus functionally, every intelligence operates in all three domains continuously and simultaneously. This is a primary factor distinguishing natural intelligence from all existing forms of artificial intelligence.

The three environments have a logical relation. The physical world is the encompassing environment of every intelligence in that all realities have substance and consequence. It is also the primordial environment since primordial intelligence would not distinguish between the three. Part of the growth of all intelligence has to do with coming to differentiate the bodily environment from the physical domain, and differentiating the social network from both the physical and the bodily domains.

The three domains are interwoven but nonetheless can be distinguished by the facts that each generates its own type of information, and each creates its own type of consequences. Thus there is natural selection<sup>23</sup> with respect to each of the domains. The external world, the body, and the social network will each have their own set of selection pressures. For example, within the body all organs must evolve relative to constraints generated by the location and the operation of other organs. Within the social network, mate selection has wide-ranging consequences.

In fact, social networks are of special interest. Not only are they domains within which intelligence functions, they can also be the basis for the evolution of new levels of intelligence.

4. Every intelligence is composed of a group or population of interacting agents that collectively express  $\Lambda(P\Delta)$  functionality according to the integrality of their organization and dynamics.

Plato provided three different characterizations of intelligence as interacting groups of intelligences. These are found in *Theaetetus*, *Phaedrus*, and the *Republic*.<sup>24</sup>

In *Theaetetus*, while discussing the difference between „having“ knowledge and „possessing“ knowledge, Socrates says, „Now let us make in each soul a sort of aviary of all kinds of birds; some in flocks separate from the others, some in small groups, and

Chicago Press; Bermudez J. L., Marcel, A., and Eilan, N. (Eds.) (1995). *The body and the self*. Cambridge, MA: MIT Press.

22 Many have long argued for the importance of the social network. See, e.g., Cole, M. & Scribner, S. (1974). *Culture & thought*. New York: Wiley & Sons; Hutchins, E., *Op. cit.*; Vygotsky, L. S. (1978). *Mind in society*. Cambridge, MA: Harvard University Press; Wenger, E. (1998). *Communities of practice*. Cambridge: Cambridge University Press; Wertsch, J. V. (1985). *Vygotsky and the social formation of mind*. Cambridge, MA: Harvard University Press.

23 Darwin, C. (1859/1968). *The origin of species*. London: Penguin Books.

24 All quotations are from J. M. Cooper (Ed.) (1997). *Plato. Complete works*, Indianapolis, IN: Hackett Publishing.

others flying about singly here and there among the rest."<sup>25</sup> Each bird is knowledge<sup>26</sup> and the owner of the aviary possesses these birds but must make an effort to capture and therefore have any one of them. Socrates' point is that knowing is not a simple product of memory. Rather, it is the achievement of a kind of wholeness within the mind, and all component intelligences must actively come into positive relation for this to occur.

In *Phaedrus* we find the well-known image of the two horses and the charioteer.<sup>27</sup> Though the charioteer is „in charge“, each horse constitutes an autonomous intelligence. Each, especially the „bad“ one, has a mind of its own. Once again, wholeness is achieved by all component intelligences, horses and charioteer, coming into proper relation.

The final example is the most extensive, and the most relevant to the present perspective. In the *Republic*, Plato characterizes intelligence as a functioning city. In the course of the dialogue, Socrates, in pursuit of the concept of justice, proposes a characterization of a perfect city as a model of a perfect person. He says. „... let's first find out what sort of thing justice is in a city and afterwards look for it in the individual, observing the ways in which the smaller is similar to the larger.“<sup>28</sup> What follows is an elaborate theoretical construction of human intelligence in terms of multitudes of functionally organized intelligent agents.

Though there are important differences between the present perspective and Plato's city, the two also have much in common. The functionality of the city is a product of both its architecture, i. e., the functional organization of its citizens, and its operational dynamics. It is with respect to the latter that Socrates finds the meaning of justice, which is understood as a general quality of harmony among the population of interacting intelligences. This harmony is the foundation for the city's ability to operate as an integral unity.

Similarly to Plato, Marvin Minsky defines the „society“ of mind<sup>29</sup> as a

... scheme in which each mind is made of many smaller processes. These we'll call *agents*. Each mental agent by itself can only do some simple thing that needs no mind or thought at all. Yet when we join these agents in societies – in certain very special ways – this leads to true intelligence.<sup>30</sup>

Minsky, as was Monod, is reticent to acknowledge the intelligence of agents. Within the present perspective, however, agents are intelligences and every intelligence is a society (or city) of agents.

25 *Theaetetus*, 197d.

26 „... by the birds we must understand pieces of knowledge“, 197e.

27 „... we divided each soul in three... – two parts in the form of horses and the third in that of a charioteer“, *Phaedrus*, 253d.

28 *Republic*, 368e-369a.

29 Minsky, M. (1986). *The society of mind*. New York: Simon & Schuster.

30 *Ibid.*, pg. 17.



The integrality of a society of agents relates to the wholeness or harmony within a population of agents and to the efficacy of a given level of intelligence. Wholeness or integrality is not given *a priori*, nor is it emergent. Wholeness comes about because, as both Plato and Minsky emphasize,<sup>31</sup> the interacting population of intelligences takes on a particular functional organization and operates according to certain dynamic principles.

5. Integrality requires operational specificity, which results from the fusion of functional and spatiotemporal operators in the formation of the components of  $\Lambda(P\Delta)$ .

Operational specificity means that the intelligence does something *in particular* that results in *particular* consequences. It derives from the stereospecificity of the P and  $\Delta$  components of the  $\Lambda(P\Delta)$ , though neither P nor  $\Delta$  individually create operational specificity. P alone has no consequence, whereas  $\Delta$  alone has no antecedent and thus no consistent context of operation. It is the combination  $\Lambda(P\Delta)$  that creates specific consequences under specific conditions and thus possesses operational specificity.

Both P and  $\Delta$  are productions,<sup>32</sup> P performing a stereospecific classification and  $\Delta$  performing a stereospecific action. Both kinds of productions can be conceived as the fusion of functional and spatiotemporal operators. Functional operators perform the energy driven process, whether of a fixating or transforming nature, which constitutes the activity of a P or a  $\Delta$  production. For example, in a protein that binds another molecule, as in Cairns-Smith's example quoted earlier, those amino acids which actually perform the binding are the functional operators. There will be several such operators. All or some portion of the remainder of the protein will constitute the spatiotemporal (or in this case, simply spatial) operator. This configures the protein as a whole such that the functional operators can do their job and a specific molecule is bound.

The protein in this example constitutes a P production, since it performs a classification. Likewise,  $\Delta$  productions are comprised of a spatial operator that gives configuration to some set of functional operators. The functional operators, by their type, determine whether a production is a P or a  $\Delta$ , but it is the spatiotemporal operators which are the basis for a production's stereospecificity.

Lacking operational specificity, the activity of a  $\Lambda(P\Delta)$  would be noisy, random and erratic. Natural selection<sup>33</sup> would tend to eliminate such an „intelligence,“ though it may persist for awhile. If the  $\Lambda(P\Delta)$  is operationally specific, however, though elimination remains a possibility,<sup>34</sup> such an intelligence is now capable of being *supported* by

31 See also the relevant discussions in Pfeifer, R. & Scheier, C., *Op. cit.*

32 The concept of productions has been around for a while. The classic conception follows Newell, A., *Op. cit.* My interpretation is simple. Productions are material entities that perform spatiotemporal operations having some consequence.

33 Understood as selection in each and all of the three domains.

34 Natural selection will generally eliminate intelligences suffering from inaccurate classifications, imprecise actions, or an inconsistent relation between them (see Footnote 17). It will be most selective, however, with respect to intelligences having high accuracy, high precision, and high re-

natural selection. This is what makes operational specificity a critical aspect of integrality. Through specificity in its operation, an intelligence organizes its world into one that supports its existence.

For all but primordial intelligence, both the functional and the spatiotemporal operators comprising an upper-level P or  $\Delta$  will, in fact, be  $\Lambda(P\Delta)$  intelligences. In other words, the operation of an intelligence will define it as either a functional or a spatial operator. Given mixed populations of both types, they will combine to form higher-level P and  $\Delta$  productions. Thus, the evolution of levels of intelligence is driven, in part, by  $\Lambda(P\Delta)$  intelligences differentiating into functional and spatiotemporal operators which then combine to form P and  $\Delta$  productions. These then combine to form  $\Lambda(P\Delta)$  intelligences which differentiate into functional and spatiotemporal operators which then combine to form P and  $\Delta$  productions, etc., etc.

## The realization of intelligence

The five principles presented above address the general structure and process of intelligence. Obviously, a great deal more needs to be said concerning each one, and just as obviously, they only provide part of the full theory of intelligence. Nonetheless, they are sufficient to allow us to address two critical issues. The first concerns the realization of intelligence within the physical universe.<sup>35</sup> The second concerns the realization of intelligence by other intelligences.

The physical realization of intelligence relates first to the origination of intelligence within the purely physical. How is this possible and by what means does it come about? Second, realization concerns the material cause of intelligence. How is the ongoing operation of intelligence related to physical processes? Can intelligent processes be reduced to physical processes? If not, why not? The two aspects of realization are interrelated, since solving the problem of nascent realization helps clarify intelligence's material cause and *vice versa*.

Generalizations of the previous problems also underlie the realization of intelligence by other intelligences. First, how do lower level intelligences realize higher level intelligences? Second, if lower level intelligences are material causes of a higher level, can the operation of the higher be reduced to the functions of the lower? Are conscious states reducible to mental states? Mental states to brain states? Brain states to cellular states?

gularity. Interestingly, such selection is not necessarily in favor of the intelligence. High accuracy, precision, and consistency can sometimes *guarantee* negative selection.

35 Kim, *Op. cit.*

## Physical realization

Purely physical processes obey the laws of thermodynamics.<sup>36</sup> Though intelligence is often discussed with respect to the second law<sup>37</sup> of thermodynamics,<sup>38</sup> the concern here is the first, which relates to energy conservation. By this law, physical processes neither create nor destroy energy. They only move it around or change its form. As a result, there is continuity in the flow of energy from initial conditions to subsequent events and consequences. This is the hallmark of physical processes.

The physical realization of intelligence occurs where physical processes, which of themselves obey the first law, are combined in a manner that effectively neutralizes its constraints. We will say that primordial intelligence severs the flow of energy from conditions to consequences, subverting the law of energy conservation. It achieves this feat through 1) the arbitrary coupling of P and  $\Delta$  productions, and 2) the natural selection of  $\Lambda(P\Delta)$  functions.

The logical form of a generalized process has three components, an antecedent, a consequent, and a relational rule. For physical processes, the relational rule is based generally within the laws of thermodynamics (and specifically within the laws of the relevant form of energy). The rule of thermodynamics is energy continuity. The energy of the event flows continuously from antecedents to consequents.

Let X be one kind of purely physical process and let Y be another. Further suppose the two are combined into a paired process, XY. XY is still expected to demonstrate energy conservation, and there should still be a continuous flow of energy throughout. As such, XY can never be an intelligent process. If there is energy continuity, there is necessity in the relation between X and Y. In this case, the action of XY is completely reducible to the combined actions of X and Y. Intelligence requires the subversion of the rule of energy continuity, though without violating any physical law.

According to the present perspective, it does this by creating itself as an analogy of physical process, but without the constraints. Within this analogy, an active classification replaces the antecedent X, and a generated action replaces the consequent Y. Physical processes X and Y are replaced by productions P and  $\Delta$ .

Imagine a variety of P's and  $\Delta$ 's existing within a population. Imagine further the coupling of these productions through the natural consequences of chance and circumstance. It was just argued that XY is not intelligent because its activity is completely explainable by physical principles. This is not true for P $\Delta$ . P and  $\Delta$  are not linked by the necessity of thermodynamic law.

The theory contends that physical law is subverted by P and  $\Delta$  being arbitrarily linked. It is conceivable, however, that they could be linked by some other predetermined rule. Would this be sufficient? No, intelligence could not arise. A combination of

36 Fermi, E. (1936). *Thermodynamics*. New York: Dover Books.

37 The entropy of a process stays constant or increases unless work is done upon it.

38 For example, see Leff, H. S. & Rex, A. F. (Eds.) (1990). *Maxwell's demon: Entropy, information, computing*. Princeton, NJ: Princeton University Press.

predetermined rules is still a predetermined rule. The activity of the resulting  $P\Delta$  would still be reducible to those rules. There would be no intelligence.

Intelligence can not be predetermined. Its most essential nature is the resolution of uncertainty. It achieves this not by imposing a predetermined process, but by finding and clarifying the natural structure within the uncertainty. Such a process must be free to try anything. Hence the coupling of  $P$  and  $\Delta$  must be functionally, if not actually, arbitrary.

Given that  $P$  and  $\Delta$  are arbitrarily coupled, the source of order in their relation must reside within the three-fold world of the  $P\Delta$ . It is communicated through natural selection. The natural constraints in the three domains modulate the set of possible  $\Lambda(P\Delta)$  functions. Surviving populations will possess an abstract logic of relation, a logic that is different from and independent of thermodynamic logic. Thus  $\Lambda(P\Delta)$  is not reducible to its constituent physical processes and primordial intelligence achieves efficacy.

These points also resolve the issue of material cause at its lowest level, that of physical realization. The same relations and factors operating in the original realization of intelligence apply to its ongoing realization. Hence all intelligence is fundamentally physical, being composed of matter and energy. Above this foundation, however, the intelligence's material cause consists of other intelligences. Here the problem concerns the realization of intelligence by intelligence.

### Intelligent realization

A menagerie of  $\Lambda(P\Delta)$  variants will not develop further unless it is able to organize in a particular manner. How it should organize is a very difficult question. Using the current scheme, we can make the following points.

First, natural selection dictates the logic of relation, given the set of possible  $\Lambda(P\Delta)$ s. Second, development beyond this primordial form requires a memory. In this context, a memory is a system capable of copying, storing, duplicating, and generating  $\Lambda(P\Delta)$ s. This memory is composed of  $\Lambda(P\Delta)$  and is therefore intelligent. The operations of this memory and its consequences relative to the growth of intelligence are very complex. Third, the process of intelligent realization, that is the process of generating a new level of intelligence from a lower level set of intelligences, is a function of this memory.

The realization of a higher level by a lower entails two aspects. First, just as primordial intelligence was operationally independent of physical law, so too an evolving higher level of intelligence must be operationally independent of the lower levels that form it. Second, the lower levels must be thoroughly capable of generating the higher level. This is the problem of competency, and it is central to the issue of intelligent realization.

Suppose we have two levels of intelligent phenomena. For the sake of argument, we can label these  $B$  for brain and  $M$  for mind, understanding that the process holds at all levels, not just mind-brain relations. We can say that  $M$  is realized by  $B$  in the sense that we are confident that  $M$ -stuff is composed of  $B$ -stuff and nothing but  $B$ -stuff. Let  $LLC$ , for lower-level components, be a theory of level  $M$  using  $B$  components. And let  $HLC$ ,