

Music and Naturoids: The Third Reality

Massimo Negrotti

Sometimes an analogy can prove useful for the understanding of certain basic aspects of a topic under discussion. This article seeks to propose an analogy between the reproduction of mental states, such as emotions, through music, on the one hand, and the development of artificial devices that aim to reproduce natural objects and events on the other.

For the study of this latter human activity, which has a long history, I introduced, in the late 1990s, the term *naturoid* to designate any artificial object explicitly intended to imitate and reproduce some natural object through materials and strategies that differ from those found in nature [1–3]. The world of naturoids can be viewed as a *third reality* that lies between nature and the products of conventional, non-imitative technology, although it has not as yet gained the real power to modify our conception of the natural or artificial worlds, as some have tended, prematurely, to believe [4].

Musical composition, in turn, like any other art (and, more generally, like human communication), includes a component of reproduction—namely, of the mental states of the composer and the performer. Therefore, the analogy I propose could perhaps contribute to the emergence of some new interpretative perspective.

My starting point is therefore the concept of *technological reproduction* of natural objects or events. One of the more significant teachings in this recent branch of research is without doubt that put forward in the late 1960s by H.A. Simon, with his now-classic work *The Sciences of the Artificial* [5].

Even in the field of naturoids, the range of possible cases for study that presents itself appears, to use Simon's word, "impressive," since it comprises countless devices or machines, such as robots, hardware- and software-based simulators, prosthetic limbs and organs, artificial intelligence and artificial life projects. Many other naturoids already populate our daily lives: from flavors to light, from snow to grass, from landscapes to sounds, and so on.

In many respects, works of art and the messages formed in human communication also make up a part of this same world because, in each of these cases, there are evident reproductive aims akin to those that form part of the definition of naturoids. As in the field of naturoids, artists and ordinary people try to reproduce their mental states in works of art and in messages through various linguistic "technologies" and styles, through which they hope that the recipients will understand

or feel what the creator had in his or her mind. In fact, artworks and messages are real objects on which we rely in order to understand each other and, therefore, they can be studied as such. The possibility, therefore, of tracing properties common to the design and realization of all naturoids will surely prove a worthwhile challenge.

THE ORIGINAL AND ITS REPRODUCTION

The objective of this article is to place the matter of the ability of composers to reproduce, through musical works, their mental states in the more general context of humankind's attempts to reproduce objects observed in nature. The use of the term *reproduction* in relation to works of art was discussed, perhaps for the first time, in an influential 1936 article by Walter Benjamin, entitled "The Work of Art in the Age of Mechanical Reproduction" [6]. Benjamin's analysis, however, specifically regarded reproductions of works of art and is not, therefore, directly related to the naturoid tradition, which aims to reproduce natural occurrences.

Yet Benjamin's account of the *reproduction of a man-made work* allows us to see that the theory of naturoids appears to be applicable even when the object to be reproduced (the *exemplar*) is not natural. For instance, in the field of music, digital surround-sound effects may attempt to emulate the man-made effects of Gothic churches, just as stereo effects are objective attempts to reproduce the acoustic spatial effects introduced by Giovanni Gabrieli in the church of San Marco in 16th-century Venice. In the late 1970s, digital technology allowed the Japanese company Yamaha to emulate an acoustic piano; although, for various intrinsic reasons, such a piano cannot be compared to, say, a real Steinway D and its aura, to use Benjamin's word.

MENTAL MODELS AND IMAGES

Musical composition, like all artistic composition, possesses all the characteristics of an attempt to reproduce something generated in the composer's mind. After all, if art always includes an expressive component, then the artist *expresses* something; that is to say, recalling the Latin roots of the term, he "presses" something out of himself. What will come out will not be the mental state in itself, of course, but, rather, a reproduction of it, that is, a naturoid.

ABSTRACT

At a high level of abstraction, it can be shown by analogy that attempts to reproduce natural phenomena occur not only in technological endeavors but also in human communication and the arts, including music. This paper presents the parallel development of artificial devices—or "naturoids"—in the fields of technology, message communication and musical composition, highlighting the transfiguration that unavoidably affects the resulting device, message or musical work. In the technological field and, to an extent, in the communications field, the transfiguration of the natural object is taken as a more or less unsatisfying outcome. By contrast, in the arts, and mainly in music, the transfiguration effect is exactly what the artist pursues through placing him- or herself at a non-ordinary observation level.

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The technological reproduction of a natural object involves the predisposition of a model that will privilege certain properties, modes of behavior or performances that are accepted, by the scientific community and by much of the general public, as indispensable. Thus, for example, the model of an artificial heart will need, as an *essential performance*,

the description of the observed object *only through categories and properties that are compatible and consistent with the adopted observation level*. For instance, the description of a flower from a mechanical observation level will bring to the foreground features that differ greatly from those brought forward at, say, a chemical observation level.

assigning to it its own high-level materiality, whose complexity may even exceed that of the exemplar.

As a general rule, therefore, a naturoid is intended to reproduce a certain *essential performance* of a natural *exemplar*, as described at a certain *observation level*—all of which results in the creation of a peculiar and autonomous reality. In the case of an artificial organ, for example, even if it functions well, lending its services usefully to the host organism, various precautions are required in order to avoid undesired side effects. Furthermore, it always carries the risk of sudden, unexpected (and therefore unplanned) events.

Many of the same considerations apply to the arts and to communication. We need only think of misunderstandings, of widely varied mental associations, and, above all, of the non-verifiability of subjective semantics. As the Italian dramatist Luigi Pirandello summed it up in 1908, “In the passage from one mind to another, modifications are inevitable” [9]. Susanne Langer, in turn, underlines the illusory character of a work of art as the effect of an enterprise that enlarges, and therefore changes, our daily perceptions [10].

In the case of music, we might say that the extra-musical content—for instance, sounds that mimic natural phenomena—is intended to reproduce not an *illusion* but rather an *allusion* to existential or natural factors that become immediately surpassed by, and recomposed in, the artistic composition. This is why Ottorino Respighi’s introduction of recorded birdsong in his *Pini di Roma* (Pines of Rome) is particularly instructive, in that the definite separation between the natural phenomenon and the accompanying music clearly indicates the distance between the sense experience and the artistic reproduction.

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the capacity to pump blood through the circulatory system. In music, the *mental image* of a natural phenomenon plays the same role as that of a model in the technology of naturoids. Yet in musical composition this happens on the basis of observation and description by the composer, which are decidedly more subjective than can necessarily be reconstructed by merely performing the work; this is different from the case of a technological naturoid described in a technical journal, for instance.

From a methodological point of view, anyone who wishes to reproduce a natural object—be it, say, a flower, an arm, intelligence or a sense of smell—cannot but establish a *model*—that is, a representation, at first purely mental, that subsequently may become graphical, symbolic, mathematical or logical. Thus, the concept of *model* absorbs and generalizes that of *image*. Every natural object possesses an empirical configuration that is impossible to grasp synthetically and that can be approached only by means of some reductive operation—that is, via the construction of a model. Reproduction is therefore not a simple two-phase process—not merely the observation of the world followed straightforwardly by its reproduction. Instead, there is a third, crucial, intermediate methodological phase, which is that of constructing a model.

MODELS AND OBSERVATION LEVELS

A model is, in turn, the result of a process that, beginning with our interaction with some object or phenomenon, leads to its description according to some *observation level*. As a logical consequence, a model will allow—and, indeed, will impose—

The concept of *observation level* bears some similarity to that of *description level* in some theories of complexity. It also recalls, to some extent, the *perspectives* of C. Morris’s “objective relativism” [7] and the thesis put forward by T. Kuhn regarding the ability of scientific paradigms [8], during the phases of “normal science” or “normality,” to direct the observer mainly toward that which is consistent with the dominant paradigm. My preference for the term “observation level” arises from the fact that the selective, and sometimes constructive, character of the observation characterizes not only scientific exploration but also any sense-based interaction we may have with the empirical world, and, subsequently, any description of an observed object. We may describe an object at more than one observation level, but we can adopt only one such level at any given moment. The sciences themselves constitute, for all practical purposes, the institutionalization of the observation levels thus far discovered or constructed by scientific reasoning.

SELECTIVITY OF THE MODEL AND THE AUTONOMY OF NATUROIDS

A naturoid is always something “other” if compared to the natural exemplar, not only because of the recourse to materials that are different from those that nature adopts but also because nature is already literally transduced into the model. Every model determines boundaries and properties of a natural object according to some dominant observation level, thereby transforming it into a strongly reduced and different reality. Nevertheless, in the phase of the reproduction process, the recourse to matter and energy will bring a naturoid back into the real world,

DECEPTION AND PERSUASION IN ART AND TECHNOLOGY

Even in this regard an interesting analogy holds true for the technological reproduction of natural exemplars. One of the leading pioneers of the artificial kidney and artificial heart, the late Willem Kolff of Kolff Labs in Salt Lake City, Utah, emphasized in a personal communication in 1995 that the objective of an artificial heart is fundamentally to “cheat the body,” because the body has to be persuaded that blood comes from a natural heart. Thus, the real methodological aim of all naturoids is to pass a sort of generalized Turing test,

provided that the observation level does not change.

The history of art is not lacking in examples of descriptivism that seek to deceive people in various “realistic” ways. Beyond figurative painting, we need think only of theater scenography, or of the numerous *trompe l’oeils* from the Baroque era onward, or in music, not only of the descriptive tradition but also of the deliberate onomatopoeics of Couperin, Vivaldi and Tchaikovsky, and even of Johann Sebastian Bach, with his *Capriccio in B-flat*, “On the departure of a beloved brother” (BWV 992). A similar objective is pursued in such constructions as the Villa of the Papyri, rebuilt in Malibu by Paul Getty, the Lied Jungle, a high-tech tropic-like zoo built in Omaha, Nebraska, or the domes of Japanese architecture.

In the technological reproduction of a natural object, a certain level of realism is often compulsory if the resulting naturoid is not to be rejected by its intended natural context, as nature seems to exhibit a permanent disposition to reject that which is not homogeneous to it. The deception is therefore intentionally pursued, in order to allow the essential performance in a given natural context.

In bioengineering, the deceit is omnipresent almost by definition and is of course welcome. Bioengineers are obtaining success in their attempts to link the human nervous system, both peripheral and central, directly to sensors that will then determine the movement of an attached artificial device. Even here, the nervous system will act as if it were commanding a natural muscle system rather than various electromechanical actuators.

Unfortunately, in many cases the natural context will discover the extraneousness of the artificial and will present the bill, so to speak, usually in the form of rejection or unforeseen side effects. As a result, the technology of naturoids often proves unsatisfying, and the inefficacy of the deceit is perceived as a failure of the models themselves.

TRANSFIGURATION IN MUSIC AND TECHNOLOGY

Regarding the above-mentioned themes, we might define the *transfiguration effect* as the inevitable difference that any artificial device exhibits with respect to the natural exemplar. In other words, the transfiguration is the result of a design process that starts from an observed natural object and, thanks to the use of technologies and materials different from those nature adopts, gives birth to a na-

turoid. Technological research pursues the minimization of such transfiguration effect, of course. By contrast, art heads in more or less the opposite direction, as it has no actual objective benchmark within natural reality and therefore no proof of satisfactory functioning, unless it be in terms of public appreciation. The model generated by the artist is, in a sense, always precise and complete, because the artist has nobody to deceive (although deceit is technically possible and has at times been realized).

A composer concludes one of his works when he believes he has reproduced, as well as possible, his own transfigured image of an event or scene, and not when he thinks that anybody could recognize the scene in question by virtue of its musical description. He seeks to reprocess the sense data according to his own poetics; that is to say, to produce a deliberate transfiguration of his own mental state.

In words attributed to Gustav Mahler, “If a composer could say what he had to say in words, he would not bother trying to say it in music” [11]. If I were attempting to render a precise emotion common to my mind and someone else’s, my adoption of a musical language would amount to taking the most difficult, winding and often misleading road. Such would be the case for Franz Schubert’s *Lieds*, for example, or that of the reconstruction of pictorial affinities in *Paintings at an Ex-*

Composers always leave, in their compositions, some trace of their own existential situations and of their own relationships to the natural or social world. However, among the human activities aimed at reproducing something natural—including mental states and events such as emotions—music is situated on the plane most distant from that of shared meanings and, therefore, that of the recognizability of the objects reproduced.

TRANSFIGURATION AS FAILURE AND AS OBJECTIVE

The objective of any reproduction process, be it in the field of technology or that of daily communication, consists in the achievement of the highest possible level of realism. Nevertheless, this objective is pursued not only through suitable technologies or languages but also, and above all, by reducing the holistic reality of the natural object to the form of a phenomenology polarized toward a dominant profile or level of observation. In fact, in describing any natural phenomenon, we may adopt an observation level selected from those made available by cultural models (e.g. a level suggested by a particular science), or we may construct new, albeit strictly subjective, levels. This explains why transfiguration, in the world of communication

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hibition by Modest Mussorgsky. To adopt a term introduced by Daniel Dennett, musical analysis sometimes amounts to a sort of “reverse engineering,” aimed at revealing the natural phenomena, mental states of the composer included, that may be “embedded” in the music [12]. This leads ineluctably to the separation of the two levels—musical and natural—in the tacit, but implausible, conviction that the beauty of music becomes amplified by the recognition of its possible naturalistic substrate.

Igor Stravinsky was probably right when he declared that “music is, by its very nature, essentially powerless to *express* anything at all, whether a feeling, an attitude of mind, a psychological mood, a phenomenon of nature, etc.” [13].

phenomena, so often assumes the form of equivocations, improper mental associations and sometimes almost complete lack of understanding, made all the more probable when several interlocutors do not share compatible observation levels regarding the topic under discussion.

Moving from ordinary communication to art, we may ascertain that the reproductive objective of the artist concerns not the sense-content of the artist’s human experience but rather the model, or the image, of the experience generated within the mind through a personal artistic “language.”

A technological naturoid, once positioned in its working context, will be submitted to objective inspection by those who are able to share the observation

level on the basis of which the naturoid was modeled, designed and realized. By contrast, no objective inspection is normally possible for a musical work, because it is the result of the creation of a model or image that already constitutes a subjective, musical reworking of the natural event that induced it. The composer, in short, does not intend to reproduce the sound of rain or thunder, as would, for instance, a sound technician in search of maximum verisimilitude; rather, he reproduces what he “sees” from his own musical observation level. The music critic Pierre Lalo, after having listened to *La Mer* by Claude Debussy, declared, “I have the impression of beholding not nature, but a reproduction of nature, marvelously subtle, ingenious and skilful, no doubt, but a reproduction for all that . . . I neither hear, nor see, nor feel the sea” [14]. As François Lesure has noted, Debussy was trying to express, not the visible image of the sea, but, rather, its recomposed memory [15]. Indeed, Debussy saw music as an art that, perhaps more than any other, is not intended to reproduce nature “exactly,” but aims, instead, at the “mysterious affinity between nature and imagination,” as he wrote in his well-known *Letters* [16].

INFORMATION, PERSONAL KNOWLEDGE AND MUSICAL REPRODUCTION

A technological naturoid comes from the objective description of a natural exemplar and aims at its reproduction in equally objective terms, in such a way that it may be recognized, at a certain observation level, as an acceptable reproduction of the original, minimizing the transfiguration effect. Thus, for example, an artificial olfactory device must exhibit at least some of the characteristics and essential performances of the natural olfactory organ.

An artist, by contrast, will tend to assume the transfiguration effect as the main objective, in accordance with his own aesthetic vision, introducing, in this way, the typical ambiguity of every work of art. While technological reproduction and ordinary communication of purely informational messages (such as, say, the announcement of a train departure) will tend toward a convergence between result and sense-based reality, a work of art generates divergence, both in the composition and in the eventual performance; and this explains why, as the Italian musicologist Massimo Mila has written, “We accept the Debussy of Gieseking and that of Cortot, the Cho-

pin of Paderewski and that of Rubinstein, the Beethoven of Fürtwängler and that of Toscanini” [17].

The composer, in experiencing the world, seems to assume an observation level that partly superimposes his musical orientation. Claude Levi-Strauss noted an opposition between myth and music, in that the former is free from the sound but is linked to the sense, while the lat-

Art is a kind of communication, and therefore it generates artificial, transfigured objects.

ter is free from the sense but is linked to the sound [18]. Boris de Schloezer maintains, rightly, that music, thanks to the overlapping of signifier and signified, has no sense, because it is a sense [19]. The musical observation level is so powerful that it can allow the composition or appreciation of music even in the absence of sounds, or, as in the case of Ludwig van Beethoven, even when one has a progressively weakening sense of hearing. The allusion to naturalistic elements can even produce moments of collision or interference with the strictly musical objectives of the composer, as occurred in the case of the “damned bird” that interfered with Antonín Dvořák’s work at Spillville, Iowa [20]. The transfiguration effect is all the more obvious in the case of non-onomatopoeic music, however, because the recognition, by a typical member of the public, of the natural exemplar (be it a sunset, the waves of the sea or a sudden emotion), is almost always impossible, even if he or she is able to grasp the expressive power of the composition as such.

In painting, where the representational tradition has been much more intense and lasting, we can speak, likewise, of a pictorial observation level, but the transfiguration nevertheless allows us to grasp a sufficiently recognizable core. Meanwhile, music is formulated in a language that has little to do with the world of meanings and therefore constitutes *its own observation level* from the outset, generating an irreducibly musical emotionality. Beethoven’s famous remark, when commenting upon his *Pastoral Symphony*, that music is not painting, seems to me to clarify this point perfectly. We might say that, if music *were* painting, it would surely be, in the vast majority of cases, abstract painting. We need add only that the fruition of music itself of course

generates emotions, but that the deepest emotions arise when the listener also succeeds in placing himself at a strictly musical observation level, neglecting the extra-musical effects linked to certain aspects of his own existential experience.

Regarding this last point, I acknowledge that there is a strong controversy between the cognitivist and emotivist schools of thought, and I cannot but

agree with Jenefer Robinson when she observes that “the emotions aroused in me are not the emotions expressed by the music” [21]. Emotivists maintain that music really makes us happy or sad, while cognitivists hold that happiness or sadness are properties we recognize in the music [22]. Surely the fact is that music embodies the emotions that motivated the composer and is able to release emotions, perhaps already latent, in the listener; but such emotions are of a specifically musical nature and not of an ordinary kind. If one is happy, no sad music can change this mood; and conversely, a musical work inspired by happiness can be recognized as “happy” even by one who is sad. Therefore, musical emotions are a world apart that would disappear entirely if there were no music.

As Stravinsky underlined, music is “construction,” and the emotions it produces in us have “nothing in common with our ordinary sensations and our responses to the impressions of daily life” [23]. Unlike designers of technological naturoids, who fear the transfiguration effect, composers reproduce something natural—emotions included—according to their musical models and poetics, giving birth to a new reality that comes from an intentional transfiguration of the ordinary one.

It should be remembered that the emergence of peculiar observation levels, or of “senses” that are additional to the physiological ones, is not an isolated fact present only in the arts. The mathematical or geometrical observation of the world, for example, constitutes a dramatic human construction that, from Pythagoras to Mandelbrot, makes available a profile of reality that goes beyond our usual way of looking at things. The same might be said for the systemic or informational visions of the empirical world.

Hence we may grasp what Henri Poincaré meant when he said that mathematics is an “activity within which the human mind seems to take very little from the external world—an activity that acts, or appears to act, as it would on the basis of itself alone” [24].

In the field of music, maybe we shall see, in the near future, new forms of interaction among the composer, the performer and the listening public. The development of technologies oriented toward so-called Musical Open Works could multiply the options already proposed by the well-known *Klavierstück XI* of Karlheinz Stockhausen, allowing the public to intervene collectively in all the fundamental parameters of both composition and performance. In this way, such technologies could lead to a sort of overlapping of the originary emotions of the composer with those of the listener or performer [25], resulting in truly “open” phenomena of collective emotions. All of this would no longer constitute a musical reproduction of the composer’s mental states, of course. Rather—as happens in the so-called *living theater*—we would be faced with a kind of *panmixia*, or a kind of *soundscape*, dominated not only by the transfiguration that characterizes any individual artistic creation but also by a general emotional arbitrariness.

CONCLUSION: THE PYRAMID OF MEANING

The sequence of assertions presented here may be summed up as a sort of pyramid: a metaphor of the incremental loss of ordinary sense (depending on daily shared semantics) and the parallel incremental increase of specific sense (depending on the language of each specific art) in the transition from communication to art, and from art to music.

Any form of communication consists in the reproduction of mental states and therefore generates artificial states—that is, messages. A message, considered as a naturoid, inevitably becomes transfigured by the linguistic technology—that is to say, by the syntactic, semantic and stylistic modulations that constitute it—and, of course, by the observation level the author has selected. The combination of the linguistic technology and the selected observation level generates an inevitable and often frustrating transfigu-

ration effect of a mental state by the time it reaches the interlocutor. The purely informational content of a message will generally be received, but its existential meaning will almost certainly be reinterpreted on the basis of the emotional categories of the listener or reader rather than those that the message’s creator intended to reproduce. When the communication includes only information, it has a high probability of being successfully conveyed, but when it incorporates the added value of subjective knowledge, success is far from guaranteed.

Art is a kind of communication, and therefore it, too, generates artificial, and thus to a greater or lesser extent transfigured, objects. In the case of figurative art, anyone who enjoys a work of art is sufficiently able to share its informational content precisely because the artificially reproduced sense references usually remain recognizable. Nevertheless, painting is not mere information, and therefore, also here, the personal observation level of the artist can largely escape capture—and with it, the mental state, model or image that he or she wishes to reproduce.

Music, in its turn, is surely a kind of art, and therefore also a kind of communication, but the observation level of the composer is not easily isolable and shareable. Indeed, the actual performance of a musical piece, conceived as an artificial object, constitutes an event similar to the actual placing of a naturoid in its real working context, be it a natural landscape, a human body or so on. However, the references to the original sense experience of the composer, even if often indicated explicitly in the titles, almost always escape our perception. There is no doubt that the composer lives in the sense-based reality, drawing from it mental states and emotions that trigger his musical inspiration. However, the fact that we cannot easily recognize the extra-musical informational content in the final artwork suggests that the composer, interacting with the world, resorts to a non-ordinary observation level that may be defined as intrinsically musical.

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Re-Imagining the Moon

Guest Editor: Sundar Sarukkai

Human exploration of the moon has become the subject of renewed interest, with upcoming space missions from all the space-faring nations, as well as private companies. In late 2008 the Indian Space Agency, ISRO, launched the *Chandrayaan 1* mission to the moon.

The moon has profoundly influenced the human imagination over the centuries, in the domains of myths, religion, art and science. A variety of cultures have generated rich narratives about the moon. The moon is more than a mere object—it is also an image, an illusion, a picture. It inspires stories about lunacy as well as love. It has regulated our lives in a fundamental way by catalyzing calendars based on its movement. Stories of navigation are incomplete without the shadow presence of the moon.

The engagement of poetry, art and literature with the moon has had a profound influence on these activities. The moon also has a political significance—new space projects related to the moon by countries such as Japan, China and India are fundamentally tied to the new articulations of what these countries are and want to be.

The *Leonardo* Special Section “Re-Imagining the Moon” will remind us of this historical, cultural and scientific trajectory in which the moon plays an important part even as it suggests new, *contemporary reflections* on the moon. The section aims to publish articles from a variety of disciplines and hopes to receive articles that explore various social and cultural aspects related to the moon as well as those that engage with the relation between the moon and the artistic and scientific imaginations. Reflecting the universality of this influence, we seek articles from countries and cultures throughout the world.

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The project is part of the activities of the Leonardo Space Arts Working Group: <www.leonardo.info/spaceart/spaceartproject.html>. The project follows on the Bangalore Space and Culture Symposium held in 2007, a collaboration of the National Institute for Advanced Studies, The Arts Catalyst, Leonardo/OLATS and the Srishti School for Art, Design and Technology: <<http://cema.srishti.ac.in/space/?cat=5>>.

Sundar Sarukkai, trained in physics and philosophy, has a Ph.D. from Purdue University. His research interests are in the areas of philosophy of science, philosophy of mathematics, postmodernism, phenomenology and philosophy of art, drawing upon both Western and Indian traditions. His books include *Translating the World: Science and Language* (University Press of America, 2002), *Philosophy of Symmetry* (IIAS, 2004) and *Indian Philosophy and Philosophy of Science* (CSC, 2005). Currently he is professor and dean of the School of Humanities and head of the Centre for Philosophy at the National Institute of Advanced Studies, Bangalore, India.