

Conceptualism of Consciousness

By Anton P. Železnikar

1 Introduction

Three main concepts of consciousness dominate in man's knowledge (science), investigation (research), and story (literature, imagination) nowadays: the *physical* (materialistic), the *informational* (interconnectionistic, transitional), and the *phenomenal* (idealistic, philosophical).

Physicists prepare the ground for the scientific physical understanding of conscious phenomena. The field of quantum physics seems currently to be the best approach to a true breakthrough in the new physical philosophy and possibilities of mathematical formalization. The hope to bridge the gaps between the reality, experiment, and theory remains—as it often happens in hard sciences—positivistic. The physicists are aware that more experiments, innovative measurement and a less reductionistic theory is a necessity on the way to the goal: to entangle the mystery of consciousness in a materialistic and phenomenal spirit.

Informationalism connects and governs the physical and the living systems, is itself a consequence of the physical phenomenalism. In this respect it enables also an arbitrary artificialness, modeling, and prediction—that is characteristically consciousness abilities. Computers and other man-made machines enable the most sophisticated measurements needed for consciousness investigation. In this sense, the informational supervenes on the physical—in the nature as well in the artifact. Informationalism connects not only different phenomenalisms, it builds informational loops in the domain of a phenomenalism itself. Consciousness becomes a paragon for and of the informational phenomenalism, its metaphor, generalization, and informational universalization. Informational principles and formalism fit best consciousness phenomena.

In its historical-philosophical development, phenomenalism is a conceptual broadening (universalization) of phenomenology, and as such belongs to physicalism as well as to informationalism. Maybe, phenomenalism can best be identified by observing of conscious processes, that is, consciousness phenomena. Mentality is one of

the best examples of informational phenomenalism, and consciousness can be recognized as the top achievement of the live (and one day, maybe, also of the artificial) mentality.

Conceptualism—as a form of *informational phenomenalism*—particularly concerns the realm of consciousness. Within a living consciousness, conceptualism becomes a conscious informational phenomenon by itself, informing consciousness and being informed by the conscious intentionality when forming a concrete concept. In the last few years, the concept of consciousness excites anew the actors of various scientific disciplines—and brings them together. The Tucson Conference [1] is, beside the others, the most relevant event in this direction and, with this issue, *Informatica* is an additional trial on the way of the literary presentation of such a research activity.

Interdisciplinarity of consciousness seems to be the most natural process by which the scientific thought has to be joined, refined and diversified, to give push to certain scientific breakthroughs, within which the science of consciousness could become a regular and legal field of investigation. Within this perspective, the investigation of consciousness must remain in the domain of epistemological objectivism¹ as, for example, expressed by Ayn Rand (1966) [3]. Rand's objectivist epistemology can be put clearly and efficiently into the context of consciousness, as cognition and measurement, concept-formation, abstraction from abstractions, concepts, definitions and axiomatization of consciousness, and consciousness phenomenalism and identity. Such a program fits the modern philosophy and theory of consciousness, and supports the formal-theoretical development of the abstract (formalistic, mathematics-like, *μαθησικς*-like) apparatus. As such it is also on the way to a new machine (technologies, procedures, methodologies)

¹In contrast to subjectivism, objectivism as a meta-ethical view believes that certain truths remain true whatever anyone or everyone thinks or desires. As a cognitive-theoretical orientation, objectivism stresses the existence of objective truths and values being independent of the subject. Objectivists are also those cognitive theoreticians who believe that contents of experience is given objectively, and as such determines the entire cognition.

development—for instance, the so-called informational machine [6].

Consciousness belongs to the most important universals ever thought and in this sense it comes not only into the focus of the contemporary philosophy but falls also into the domain of the newest information-processing technologies. That what this new direction of investigation and design needs is the validity of innovative consciousness concepts, first of all, in the philosophical structure and methodological organization and, last but not least, in the development of new formalism. Such a formalism should concern a new sort of abstract space conceptualism, in the form of informational space, giving the consciousness studies new possibilities for the pretentious and interdisciplinarily perplexed formalistic and methodological research. In principle, the new formalism must support the multidimensional approach to the *web of informational knots, informational topology and informational graph theory*, performing as a complex circularly organized informational system.

2 Existence, Identity, Unit—Consciousness

The primordial existentials is subject of archaic and modern philosophy. In Heidegger [2], Dasein² (Being-there, Being-in-the-world, etc.) is one of the most well-recognized “existentiells”. Dasein, possessing its own understanding, functions as a consciousness *per se*.

Concept—another existential within consciousness—puts the question of the concept of a concept. According to Rand, the concept “existent” develops in man’s mind by three stages. First, there is an awareness of objects, things, and phenomena, which rises an implicit, vague determined (indefinite) concept “entity” (in German, *das Seiende*).

Entity possesses a kind of informational envelope—specific attributes—distinguishing it from other entities. The second stage—entity’s attributiveness in the realm of perceptual fields—maintains and brings to the surface another implicit concept, called *identity*. Thus, identity of a

²Dasein always understands itself in terms of its existence—in terms of a possibility of itself: to be itself or not itself. ([2], p. 33.)

concrete entity comes into existence.

The third phenomenon of consciousness consists of grasping informational relationships among the distinguished entities and bringing similarities as well as their contrary natures into the foreground. After the entity and identity phenomenon, a firm (implicit) concept “unit” can arise informationally. The ability to understand entities as units is consciousness distinctive phenomenon of cognition into arbitrary abstract depths and informational complexity.

So, existence, identity, and unit of consciousness can be grasped as informational entities, that is, units with specific attributes, informational structure, and organization. This issue of *Informatica* is on the way to such a cognition.

3 Consciousness Measurement

What could measurement mean within the consciousness conceptualization? We need a generally suited notion of measurement within conscious phenomena. Measurement would mean, for instance, to introduce a kind of metrics into the informational space, not only the physical measurement (length, velocity, acceleration, mass, energy, time, etc.) but also much more sophisticated informational and consciousness measurement (for instance, different kinds of interpretation, meaning, contents, intention, *modus*, intelligence, relationship, and the like).

By measurement, we usually evaluate and interpret the results concerning an entity attributiveness (in the form of numerical values, information as data, structure, organizational principles), in more or less reductionistic, categorized, scientific (mainstream-fitted, rationalistic, real, reasonable, “true”) and field-narrowed (disciplinarily legal) manner. In such or another way, a measurement fits the observer’s intention, his/her goals, feeling, and methodology. In this respect, an observer can be understood as a concrete consciousness situation and attitude, together with possible unconsciousness and exterior phenomena impacting the observing and measuring system.

In a broader sense, mathematics is the science of measurement (Rand). Metric and vector spaces (with the so-called scalar measures as distances, angles, scalar products, arithmetic relationships, numeric functions, etc.) are paragons of mea-

surement philosophies and axiomatics. Measurement identifies a relationship—the quantitative and the informational—in arbitrarily complex abstract and real circumstances. One of the aims of measurement is to integrate the emerging knowledge to the limited perceptual experience and, thus, to enlarge the man's consciousness capabilities in various abstract domains. Through the study of consciousness, measurement becomes an innovative informational field in which the measures of meaning, contents, and interpretation emerge as expressible and explicit informational entities (identities, units).

4 Formatting the Concept of Consciousness

If one accepts that concept is a mental phenomenon then there is a short step to the conclusion that a concept phenomenon phenomenalizes informationally. Informing in this case is certainly conscious. But, what we need is the conscious concept of consciousness. What can be transparently felt is that the last sentence (the conscious concept of consciousness) hides circularly perplexed possibilities. At the end of this conclusion remains definitely the cognition of the informational nature of consciousness, as it appears in the everyday happening of the conscious experience of man.

As soon as one articulates the question concerning the informational nature of consciousness, the problem of the initial concept of consciousness—in fact a symbolic marker, say \mathfrak{z} —comes into the foreground. A decomposition of the initial symbolic situation \mathfrak{z} calls for the search, analysis, and intuitive identification of various reasonable consciousness components, the consciousness characteristic units (informational subentities, subidentities, subunits), by which, in a circularly perplexed informational system, consciousness can perform in the characteristic conscious ways. Such a system unites everything imaginable in the realm of consciousness, its entities, identifications, units, attributes, informational generations, qualities, relationships, interpretations—that is various possible appearances of conscious, subconscious, and unconscious phenomena.

We consider that the nowadays concept of consciousness is formatted physicalistically, infor-

mationally, and philosophically (phenomenologically). For these views different sorts of phenomenalism are characteristic. All views concern the abstraction being a selective, professional, or disciplinary focus for certain aspects of the consciousness reality. Thus, consciousness becomes a perceptual concrete, measured by the physical, informational, and phenomenal measures—the abstract and the empirical ones. Each of the disciplines develops a specific language for its own consciousness concept, a disciplinarily oriented cognition, fitting the characteristic tradition but being also on the way to a new discipline—its scientific and empirical legacy (truth, experience, methodology). These languages and their transformations to the formalistic expression (formulas) become the domains and tools of the consciousness concepts.

In the described epistemological approach, language transforms the consciousness concept into entity (e.g., into an informational entity of consciousness—a complex informational system). By additional definitions more and more identity is provided to the initial, loosely decomposed consciousness system. Through permanent metaphysicalistic, externalistic, and internalistic decomposition, consciousness becomes more and more identified, that is, determined informationally.

5 Abstraction of Consciousness

Consciousness is a word representing the concept (meaning) of a process which is never completed in regard to its development of components, although it is already a state of cognitive integration (composition). Consciousness is an emergent, informationally arising concept. This concept already possesses the distinguishing characteristics of consciousness and its components in itself. Informational consciousness is a paragon of such an abstraction leading deeper into the research area of consciousness as an informing entity, identity, and unit. In its components, consciousness informs as their conceptual common denominator, keeping them within the horizons of possible consciousness-informational development.

Abstraction of consciousness begins by its informational decomposition in an emerging, spontaneous, also instable and chaotic manner. As

in any concept, consciousness components are abstractions per se when decomposed into deeper and greater details. In fact, each abstraction in the domain of consciousness—at least on the linguistic level—is an emerging abstraction of and from abstractions in a circular, also spontaneous way. Thus, different theories (orientations, intentionalities, schools), discussed in the preceding section, can come into existence.

The formation of a wider concept of consciousness requires more knowledge, experience, and components, and better developed and known contents of components and consciousness structure and organization. Because concepts are regularly circular structures and components depend conceptually on other components as well as on themselves and on the title component 'consciousness', they all gradually become more and more complex, when the overall complexity of consciousness rises. In fact, in an informational loop (knot), each component can be expressed informationally by other components and itself, through the so-called principle (axiom) of component rotation in a loop (see, for instance, [9, 11]).

Informational concepts—like consciousness—remain informationally open which means that the process of identifying new concretes and their emerging in the future is completely open for the development in unforeseeable circumstances and possibilities. In this way the concept of consciousness—like a concrete living consciousness—is never developed to an end. As any informational entity, consciousness with its components phenomenizes conceptually, saying traditionally, inductively, deductively, and abductively, and in this way remaining within a scientific terminology. Through its informing and observing, it remains within the fundamental postulates (principles, axioms) of informational phenomenism.

6 Concepts of Consciousness

Informational concept of consciousness considers (can consider) any other possible (imaginable) concepts of various scientific and philosophical disciplines and, in this respect, offers the way especially directed to the formalism of an integral theory of consciousness. Wilber (1997 [4]) discusses a frame overview of consciousness concept

in regard to various scientific disciplines without the informational view. Let us see and comment the particularities.

1. *Informational theory* comprehends consciousness (as any other informational entity) in terms of a spontaneously and circularly arising informational phenomenon where consciousness phenomenism is a system of consciousness externalism, internalism, and metaphysicalism. Consciousness components emerge dynamically in accordance with the interior and exterior situations and between them certain informational transitions (operator connections) [10] come into existence, change, and vanish. In fact, consciousness represents a case of the top complexity in which the most pretentious possibilities of an informational entity are imaged. Any hierarchical³, intentionalistic, interpretative, circular, spontaneous, etc. structure and organization can exist in an implicit or explicit form. For a concrete component of consciousness, it can be expressed in an implicit form within a loop, or in an explicit form where the component figures as a title operand of a loop [9].

2. *Cognitive science* prefers functional schemas of the brain/mind with complex emergent/connectionist models, integrated hierarchically.

3. *Introspectionism* argues that consciousness is best understood in terms of intentionality (first-person models, immediate awareness, lived experience). Introspectionism concerns philosophical and psychological intentionality, existentialism, and phenomenology.

4. *Extrospectionism* concerns processes of cognition directed outward, apprehending existents of the external world. Introspectionism is a form of consciousness internalism and metaphysicalism [5]; extrospectionism is a form of consciousness externalism and metaphysicalism. Both views—

³It has to be studied carefully what a hierarchy within the informational could mean. Informational organization of an entity is circular, and the hierarchy of operand components could be determined upon the distinguished intentional impacts of components, for instance, by the intention of a title operand of a loop. However, the informational hierarchy could also be determined by the most influential informational impact of a component upon other informational components.

internalism and externalism—are decompositionally connected via informational metaphysicalism within the informational phenomenalism of consciousness. Action of consciousness regards the informational impact of its environment and of itself. Contents, meaning, and reference of consciousness are embedded in its structure and organization (e.g., observation, reasoning, learning, perception, evaluation, interpretation, feeling, emotion, reminiscence, conception, imagination, understanding, etc.).

5. *Quantum consciousness* stresses that consciousness is capable to interact with and alter the physical world. Quantum interactions take place at the intracellular level and in the material world.

6. Neural systems, neurotransmitters, and other brain mechanisms are subject of *neuropsychology* in the sense of biologically based approach. Consciousness resides in organic neural system of sufficient complexity.

7. For *Eastern and contemplative traditions* consciousness is a deeper or higher mode of awareness, evoked by specific injunctions (yoga, meditation). On the other side, in Vedanta philosophy, Brahman is grasped as the most general principle of consciousness pervading the universe (being present everywhere and anytime).

8. *Developmental psychology* views consciousness as a distributed entity in the form of a developmentally unfolding process. It includes higher stages of exceptional development and wellbeing, and the study of gifted, extraordinary capacities as higher developmental potentials latent in humans.

9. *Subtle energy* is a form of bioenergy appearing beyond the strong and weak nuclear, electromagnetic, and gravitational forces of physics. This energy plays an intrinsic role in consciousness (prana, chi) and should be the 'missing link' between intentional mind and physical body, acting as two-way conveyor belt, transferring the impact of matter to the mind and imposing the intentionality of the mind on matter.

10. *Social psychology* sees consciousness embedded in webs of cultural meaning, being a byproduct of the social system itself. Its objects are,

for instance the collective, mass, common, totalitarian consciousness, etc. (for instance, ideology, cynicism, postcommunism).

11. *Individual psychotherapy* treats distressing symptoms and emotional problems by introspective and interpretive methods. It views consciousness appearing in adaptive capacities of an individual organism. Jungian approach postulates collective structures of intentionality (consciousness), the fragmentation of which contributes to psychopathology.

12. *Clinical psychiatry* tends to view consciousness in strictly neurophysiological and biological terms: consciousness is the neuronal system correctable with medication. The Freudian metapsychology is being more and more abandoned.

13. For *psychosomatic medicine* consciousness is strongly and intrinsically interactive with organic processes (e.g., psychoneuroimmunology, biofeedback). This approach includes consciousness and miraculous healing, spontaneous remission, effects of intentionality on healing, art therapy, etc.

14. *Nonordinary states of consciousness* embrace dreams and psychedelics with the belief that consciousness could be grasped in general. In this context 'toxic side-effects' can act as a 'nonspecific amplifier of experience'.

The theory of informational consciousness tends to integrate all these views into a unique formal model of consciousness with the possibility of its own conscious emerging and development. For this purpose it unfolds and reveals a new (disciplinarily common) formalistic apparatus being capable to follow natural, artificial and research problems by the accompanying informational formalism (see, for example, [5, 7, 11]).

7 Definitions of Consciousness and Its Components

Definitions are statements or informational formulas⁴ representing or describing concepts. The-

⁴A defining informational formula uses an informationally particularized operator of the form $\rightleftharpoons_{\text{def}}$ meaning *means definitionally*. Thus, $\alpha \rightleftharpoons_{\text{def}} \beta$ reads α means β in a definitional way, where α and β can represent arbitrary informational formula or formula system.

ory of consciousness uses different sorts of definitions, e.g., the verbal, intuitive, and strictly formalistic. A definition clearly distinguishes a concept from the other concepts. Higher sorts of definitions can use the lower definitions in a hierarchical manner. Quite in the beginning of a consciousness theory definitions concern the basic operand and operator symbols and the adequate terminology. Axioms are in the beginning of a theory and are taken (given) as epistemologically objective, commonsense, true statements (as a kind of axiomatic definitions).

Informationally, every concept can be defined and communicated by other concepts. In general, an informational concept is a structure of other informational concepts (a kind of supervenience) and, at a sufficiently deep level, also of itself (an unavoidable informational circularity). Informational phenomenalism uses definitions which are concepts of informational metaphysicalism, serialism, parallelism, circularism, spontaneousism, gestaltism [8], graphicalism [11], etc.

Definitions of informational entities origin in epistemologically objective concept formations. The basic concept formation considers the informational nature of things, processes, phenomena, events, happenings, beings, consciousnesses, etc. and proceeds from axioms of informational externalism, internalism, metaphysicalism, and phenomenalism (EIMP) [5]. Informing as a metaphor for informational arising in a spontaneous, circular, and informationally perplexed way governs informational entities, being conscious, unconscious, materialistic, mental, organizational, etc.

Within the theory of consciousness, a special care is dedicated to the formalistic means, be they mathematical—formalistic (in physics, cognitive science, biology, etc.) or informational—introducing a new sort of formalism fitted for descriptive formulas and informational systems which in their nature are emergent, developing, changing during their existence. This kind of formalism fits the problems of consciousness phenomenalism, offering the possibility of a formalistic treatment of phenomena, without the usual reductionism, and with additional and adequate formal interpretation in a system-perplexed way.

Axioms and definitions of consciousness as informational phenomenalism must remain in the framework of the epistemologically objective and

possible, and must not contradict the reality as understood by the most advanced scientists. Axioms and definitions must remain in the context of the contemporary consciousness philosophy, cognitive science, and the advanced informational formalism by which verbal and logical concepts in the domain of new formalism can be supported and developed.

When conceptually improved, new formalism can suffice for a long period of pioneering investigations of consciousness in different fields of philosophy, methodology, application, and technology. Such a formalism does not only support the facts of reality, but is on the way to be advanced in certain cases in comparison with the non-formalistic research. A fitted formalism opens new ways of informal (verbal) cognition and can extend into a deeper and unforeseeable revelation, complexity, structural and organizational views.

Usually, informational definitions are verbal and formal series of words, sentences, and formulas when establishing informational concepts. They are as true as possible close to the realistic, commonsensical, and non-reductionistic situations; they are, in a scientific-investigational sense, objectively epistemological and, in this respect, do not violate the principle of scientific cognition. On the other side, informational concepts remain free in that part of a concept formation where informational artificialness and constructivism are relevant for a further development of informational and particularly consciousness theory. Thus, new informational theories are not exceptions: they are rather innovations and conceptual extensions of existing and related concepts.

8 Concepts of Informational and Consciousness Axiomatism

Evidently, axioms identify fundamental and self-evident truths. The truth and falsehood of a theory rests on the truth and falsehood of the initial axioms, definitions, and rules of a theory decomposition (deduction, induction, abduction, revelation). In this view, informational theory fits in the best possible way the informational theory of consciousness, following the informational

axioms, definitions, and decomposition.

Axioms of informing (EIMP—externalism, internalism, metaphysicalism, phenomenism) [5] as informational axiomatic concepts identify the primary facts of informational reality (informing of things, entities, processes) and can be analyzed objectively, logically, and commonsensically (by linguistic means), although they cannot be reduced (this is primordially true for EI—externalism, internalism). They can be broken merely in their operand and operator constituents, but perform (inform) together as a compact, unbreakable formulas. However, these axioms serve as the starting formulas for informational decomposition when situations of a more detailed identification occur.

In general, the primary informational axiomatic concepts proceed from various concepts of existence (Being), identity, and consciousness. Informational concepts cover the existential, the identificational, and the conscious in the best possible manner. Namely, the verbal forms *be*, *identify*, and *be conscious* are comprehended as a unique verbal form *inform*. What exists and what is identified informs consciousness, and consciousness informs exteriorly (for others), interiorly (for itself in the sense of input and feedback), and metaphysically (intrinsically, in itself, self-consciously). Informational axioms satisfy the most rigorous requirements of objectivistic epistemology and, simultaneously, cannot be simplified or reduced to something more fundamental [7], physicalistic, or phenomenistic. They function as irreducible informational primaries.

Existence, identity, and consciousness are informational phenomena which can be experienced in a direct informational way and grasped through the unique and common axioms by their informingness and informedness. Existence and identity are informational existents and, as such, they inform (impact) consciousness. In this sense, consciousness is an informational process of awareness. All these concepts are conscious abstractions being metaphysically isolated and identified informational fundamentals. They are components of a widest possible consciousness integration and embrace and pervade the entire conscious experience. To resume: existence is informational being, identity is informational identification, and consciousness is informational consciousness. In

this way the informational becomes the fundamental of consciousness too.

One can recognize and agree that informational axioms EIMP build up a circular spontaneous informational realm and that every recognized existent, attribute, and entity can be—through them—grasped informationally. At the same time, informational axioms function as basic consciousness axioms when a general informational entity α (an existent, event, thing, phenomenon, process) is replaced by the distinguished entity β , representing (marking) consciousness in all its possible variance and modes of informational decomposition (see the article of the author in this issue). Thus, informational axiomatic concepts EIMP become constants (invariance) of informational consciousness, the cognitive common determinators which identify the informational and, within it, the conscious in the widest possible way. By axiomatic concepts, the informationally (and consciously) implicit is identified explicitly. It can be said that, so far, informational axioms constitute the foundation of the physical, phenomenal and informational *objectivity*. On the other side, these axiomatic concepts appear also as a foundation of the emerging and promising informational formalism—a new sort of logical and mathematical approach.

9 Formalistic Informational Concepts

Formalism becomes one of the most important and effective approaches in understanding and constructing complex, circularly structured (knotted) and spontaneously informing systems. The new formalism seeks for innovative formal means in the form of informational formulas which can integrate the traditional mathematical convenience and the informationally emerging phenomenal nature. In this respect, the new formalism is phenomenistic by itself in the framework of informational formulas. This means that informational formulas as formalistic expressions arise, change and vanish structurally during their existence and behave as informational entities of entities which they describe, simulate, represent, or express. In a given moment, a system of informational formulas is the instantaneous description of something. Such a formalistic situation es-

essentially differs from a mathematical system consisting of firmly (unchangeable) determined mathematical formulas (functions, equations, relations, statements, etc.) depending upon space, time, and other kinds of variables.

Also different kinds of circular situations which in mathematics are structured in such or another implicit form, in informational theory appear explicitly as circular formula systems, being structured serially and parallel. To some extent, circular informational formulas can be compared with mathematical equations (with one and the same variable appearing on several places) which can be 'solved' upon certain variables.

Informationally, consciousness is an entity, formally denoted by \mathfrak{z} . Consciousness \mathfrak{z} follows the general informational principles (e.g., fundamental axioms of informational EIMP)

$$\mathfrak{z} \models; \models \mathfrak{z}; \mathfrak{z} \models \mathfrak{z}; \left(\begin{array}{l} \mathfrak{z} \models; \\ \models \mathfrak{z} \end{array} \right)$$

Operator \models functions as an informational joker, with the general meaning *informs* or *is informed consciously*. It represents any kind of impactingness or impactedness which can be physical, informational and/or phenomenal. Both constituents, operand \mathfrak{z} and operator \models , can be particularized, that is, decomposed in a particular way, keeping the well-formedness of the emerging formula. A decomposition procedure of an informational transition $\alpha \models \beta$ [10] (when in the circular formula $\alpha \models \alpha$ the right operand α is replaced by β) can follow the axioms called informational modi (modi informationis [?, 42, 48]). In this way, from an initial situation \mathfrak{z} (being an informational marker) (in fact, $\mathfrak{z} \models \mathfrak{z}$) circularly (e.g., metaphysically) structured formulas can be obtained by spontaneous, instable, and chaotic decomposition, building up an informational system of \mathfrak{z} .

10 Editors' and an Author's Comments and Views

At the editing of the special issue of *Informatica* different views came into the foreground, which may be interesting for the authors and readers of this issue.

Suhrit Kumar Dey:

A Comment on Consciousness in Indian Philos-

ophy.

From time immemorial, philosophers in India looked into the topic of consciousness from very different angles. They are sometimes diametrically opposite. Charvak (1500 B.C.) developed the most materialistic view on consciousness. According to him, consciousness is just a property of human mind. When this material body was formed, mind was formed and consciousness was formed. When this material body disintegrates, mind disintegrates and consciousness disintegrates. Consciousness exists only when mind exists. Thus inanimate objects which have no mind, have no consciousness. The phenomenal universe is self-created and it contains both animate and inanimate objects.

Vedantists find contradictions in these assumptions. They say that if nature is self-created then all objects of nature are self-created which implies that energy must transform itself. This is a gross violation of the law of physics. Thus Vedanta admits that there must exist an operator—which is also a function in mathematics—which must cause all the changes being totally detached from them. This operator is consciousness—the central theme of all science and philosophy. It is also called the "Self" or "Brahman" in Vedanta.

There are myriads of objects in nature and each is continuously going through changes. Consciousness is the mathematical operator which is doing all the changes. When a person is completely detached from everything, mind becomes thoroughly focused, all thoughts subside and the state of consciousness becomes manifest. Although all objects of nature seem to have different selves or consciousness, Vedantists claim that this is an illusion. All individual selves are really manifestations of one sublime cosmic consciousness, which is the Absolute and Divine.

Once a person realizes his/her own "Self"—own identity—he/she sees divinity everywhere—one cosmic consciousness embodied by all—one sun having many reflections. The school of Sankhya admits that "Self" and "consciousness" are the same but claims that nature presents a vivid, colorful variations of many individual consciousness. Vedantists find a contradiction here. They claim that if the limiting point of all of our thoughts and deeds is one cosmic consciousness (as proved mathematically by Dey) how could qualitatively

individual consciousness differ from Cosmic Consciousness? The most prevailing doctrine of consciousness, accepted by most Hindu philosophers is the Vedantists' view: *Consciousness is the "Self". It is birthless and deathless. It transcends nature and as such it is beyond time, space and causation. It is the omnipotent, the omnipresent and the omniscient. It is that in which all exists. It is that which exists in all.*

Vladimir A. Fomichov:

It is possible to distinguish, in particular, the following actual directions of studying consciousness as informational phenomenalism.

— A number of specific properties of consciousness (such as continuous receiving and processing information from the surrounding world, the continuous emerging and evolution of dynamic mental structures) force us to look for non-traditional approaches to formal modelling the work of consciousness. In this connection, the A.P. Železnikar's informational theory of consciousness (published in this issue) and the psynet model of Ben Goertzel (Informatica, 1995, Vol. 19, No. 4, pp. 469–477) seem to indicate new promising ways for formal studies of the consciousness.

— One can observe a considerable growth of the number of works devoted to studying mental representations of information and mental operations with respect to their close ties with emotions, feelings, and motives of people.

— The researches on the theory of natural-language-processing systems (NL-processing systems) carried out in the second half of the 1980s and the first half of the 1990s in Canada, Russia, UK, USA have explicated a number of advantages of using NL-like formal representations of information for conceptual processing of information. The results of these researches provide a new background for formal and computer studying the role of NL in the development and functioning of consciousness as informational phenomenalism. In particular, this applies to the V.A. Fomichov's theory of restricted K -calculuses and K -languages (Informatica, 1996, Vol. 20, No. 1, pp. 5–32) provided a model of a complete collection of mental operations (consisting of only 10 operations) enabling the brains of people to form structured meanings of arbitrary NL-texts.

— An entirely new approach to investigating the role of NL in the development and functioning of consciousness as informational phenomenalism underlies the study of V.A. Fomichov and O.S. Fomichova described in this issue. The authors distinguished a number of information processing abilities being salient features of the "good brains". Then they suggested a new method of effective developing these abilities at language lessons (lessons of a foreign language or of a mother tongue) with young children and teenagers. It appears that this result provides a new precious background for modelling the work of consciousness as informational phenomenalism.

Mitja Peruš:

— *Dey's* presentation of consciousness in Vedanta philosophy from the point of view of an Indian-American professor of mathematics is something peculiar in consciousness philosophy and formalization.

— *Farre* discusses the stratified virtual structures in physical systems and their informational nature, a topic which is often neglected, but very important.

— In the paper of *Jibu & Yasue* (co-workers of Karl Pribram) the significance of nanoscopic biophysical systems and quantum field theory for descriptions of system-processual backgrounds of consciousness is stressed.

— The original theory of *Marcer & Schempp* combines for the first time a rigorous description of quantum holography and neural processes in order to provide the explanation for an essential feature of consciousness—external phenomenal visual and auditory projections; i.e., according to their theory, quantum-holographic phase-conjugation realizes a back-projection of object's virtual image to the object's original location in space-time, so that the virtual image and the original object coincide giving us impression of external location and form of the perceived object; in the paper they combine their consciousness theory with incorporation of quantum-holographic processes into the neuron's physiology.

— *Raković* gives a rare contribution to the biophysical knowledge of altered states of consciousness with respect to the electromagnetic component of ultra-low frequency "brainwaves", i.e. bioplasmatic ionic currents, and their relativistic ef-

facts.

—Schempp's combination of quantum holography with functional magnetic resonance tomography provides a very promising tool for experimental cognitive neuroscience; his paper is an example of useful application of rigorous mathematical theory for practical purposes in medicine.

Peruš also gives the following comments:

—Qualia cannot be fully explained or even reproduced by physical or/and informational means only.

—Systems-processual backgrounds of consciousness are best described by multi-layer networks of formal neurons (real neural cells, cytoskeletal tubulins, electric and magnetic dipoles, spins, quantum particles, sub-quantum "points" or "beables", etc.

—Every complex system exhibits irreducible collective dynamics, so that specific virtual structures—parallel-distributed patterns-qua-tractors—emerge.

—Neural networks alone, or quantum networks alone, are not enough to explain consciousness; their cooperation, e.g. neuro-quantum coherence, is needed.

—Meditational, mystical and other altered states of consciousness provide an important, direct, introspectively empirical origin of knowledge on pure consciousness; there are good perspectives for consciousness studies in biophysical researches of altered states of consciousness, like neurological disorders which provide important data for cognitive neuroscience.

Dejan Raković:

—Out of physical approaches to consciousness, considered in this issue, the two of them are demonstrating the way the quantum mechanical level is coming into existence at macroscopic brain/consciousness level: via spontaneous symmetry-breaking (Jibu & Yasue) and via quantum holography (Marcer & Schempp).

—The quantum optical networks related to consciousness are essential in both cases, being suggested also in biophysical relativistic approach to consciousness where such an optical network might be related to the ultralowfrequency-modulated-microwave ionic acupuncture system, extremely significant for conscious information processing in altered and transitional states of

consciousness (Raković).

—An interesting analogy between the collective dynamics of neurons and quantum systems is demonstrated too, in corresponding complex valued formalism of quantum mechanics and neural-net-theory with oscillatory activities (Peruš), implying that nature is possibly mapping its general patterns of conscious-related phenomena on both quantum mechanical (describing microscopic probabilistic implicate order) and neural-net (describing macroscopic explicate order) physical levels.

—A very good attempt towards formalism of consciousness is given in the informational theory of consciousness (Železnikar), as already has been demonstrated by some experiments of Heideggerian understanding and interpretation.

Walter Schempp:

—The majority of scientists agree that now is the time to think scientifically about consciousness and its relationship to the mind, and most important of all, the time to start the experimental study of consciousness in a serious and deliberate way.

—Among the papers submitted to the special issue, the philosophy of the experimental approach has been clearly described in the contribution by Professor George L. Farre.

—The paper submitted by Mari Jibu and Kunio Yasue provides a quantum theory of consciousness; it is written in the spirit of K.H. Pribram's and S.R. Hameroff's microtubules approach to consciousness.

—The paper by Dr. Marcer and myself describes the role of quantum holography in the field of consciousness research.

—Finally, my paper is concerned with the application of quantum holography to human brain mapping by functional magnetic resonance imaging (MRI); it makes sure that the emergent field of quantumography allows to look into the living human brain and to monitor the neural activities; indeed, the article includes as an illustration the visualization of the motor task activation pattern in the cerebrum; the brain mapping technique performed by functional MRI presents one of the greatest promises in the field of modern brain research.

—The paper by Jibu-Yasue and my paper are

based on a heavy mathematical machinery; however, mathematics is the only lingua franca available in science.

Anton P. Železnikar:

— The paper of Vladimir A. Fomichov & Olga S. Fomichova presents a practical concept of developing the consciousness in the childhood based on ideas of artificial intelligence together with a methodology of emotional and imaginative teaching at lessons of a foreign language. This conception is the main constituent of a new theory of teaching suggested by the authors (developing the personality of the child, conflicts-free teaching, information transfer approach to consciousness), and as such should come into the focus of attention in teaching in general.

— Amy Ione uses a multilevel and multilateral model to explore how information, consciousness and culture interpenetrate. This model demonstrates how information exchange (e.g., informational transition [10]) must be a key component of consciousness studies if we are going to adequately acknowledge that how we build informational bridges connecting personal, cultural, and intergenerational perceptions cannot be separated from our living as individuals and cultures in time and space. Particular attention is given to illustrating that while information itself may be personal or impersonal, our conclusions about the processing of information must address consciousness, experience, exchange, and feedback multidimensionally.

— For Horst Hendriks-Jansen, cognitive science has traditionally assumed that all mental phenomena except consciousness can be explained by an information-processing account. The problem of explaining phenomenal consciousness then reduces to that of getting subjective experiences or “qualia” out of functionally and/or causally defined internal representations that can be “grounded” or “naturalised” through evolution. This paper proposes an alternative approach to explanations of human behavior that draws on ethology, developmental psychology, situated robotics, and dynamical systems theory. An evolutionary explanation of human behavior and mental phenomena implies that there is no specific physical, neurophysiological, or *software* ingredient that human beings inherit through their

genes and that makes them conscious. Nor can consciousness be conceived as a virtual architecture that is installed by learning in an exceptionally large and plastic brain.

— In the paper by Alexander D. Linkevich, models of anticipation, perception, language, and mind through the nonlinear dynamics of neural networks are discussed and suggested. Reflection and self are considered as mathematical constructions in the semantic space. Consciousness is interpreted as a process of neural activity structured so that a hierarchy of attractors appears in the activity space.

— The paper by Shigeki Sugiyama shows an initial and technical approach to the simulation of some consciousness functions. Sugiyama divides the consciousness whole into the lower and the higher consciousness, setting up two different primitive, to some extent invariant systems, each of them with its own theory. In the future, many engineering models of consciousness will be examined, especially by the improvement of the computer technology which will enable the most complex symbolic calculations within worldwide information nets.

— Let's presume that emerging of qualia in human mind cannot be explained by physical means; qualia is nothing else than a thought product with specific meaning. But people could agree that thought supervenes on the informational. Is qualia an informational phenomenon of mind or something else? Materialists will agree that the informational supervenes on the physical. At least, qualia supervenes on the physical but there is not knowledge for the explaining of qualia by physical means. On the other hand, the meaning or concept of qualia arises informationally and as such can be formalized in an arbitrary complex way through taking into account all available information concerning qualia. Thus an initial informational concept of qualia already exists.

11 Conclusion

The special issue of *Informatica* is edited upon several groups of topics which are the following:

- Consciousness Phenomenalism:
 - (1) Informational Theory of Consciousness (A.P. Železnikar) and

- (2) An Informational Conception of Developing the Consciousness of the Child (V.A. Fomichov & O.S. Fomichova).
- Philosophy of Consciousness:
- (3) Information and the dynamics of Phenomenal Consciousness (Horst Hendriks-Jansen);
- (4) Analysis of consciousness in Vedanta philosophy (Suhrit K. Dey); and
- (5) Information: description, cognition, invention (A. Ione).
- Neural Networks Modeling Consciousness:
- (6) Anticipation, Perception, Language, Mind and Nonlinear Dynamics of Neural Networks (Alexander D. Linkevich) and
- (7) A basic idea of Consciousness (Shigeki Sugiyama).
- Quantum Theory for Consciousness:
- (8) What is mind?—Quantum field theory of evanescent photons in brain as quantum theory of consciousness (Mari Jibu and Kunio Yasue);
- (9) System-processual Backgrounds of Consciousness (Mitja Peruš);
- (10) Prospects of conscious brain-like computers: biophysical arguments (Dejan Raković);
- (11) Model of the neuron working by quantum holography (Peter J. Marcer and Walter Schempp); and
- (12) Some brief remarks on information and consciousness (George L. Farre);
- (13) Quantum holography and magnetic resonance tomography: an ensemble quantum computing approach (Walter Schempp).

Editors for these items are, as seen from titles of the papers, Vladimir A. Fomichov, Mitja Peruš, Dejan Raković, Walter Schempp, and Anton P. Železnikar.

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