

Radhakrishnan
Memorial Lecture
2000

Consciousness and Scientific Knowledge

D.P. Chattopadhyaya



INDIAN INSTITUTE OF ADVANCED STUDY SIMLA

RADHAKRISHNAN MEMORIAL LECTURE

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RASHTRAPATI NIVAS, SHIMLA-171005

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Foreword

The Radhakrishnan Memorial Lecture is, perhaps, the most important annual academic event of the Institute. The Lecture was instituted to honour the memory of Dr. Sarvepalli Radhakrishnan. It is also a mark of our gratitude to him for his gift of Rashtrapati Nivas to the Institute. Every year, an eminent scholar—from India and abroad—is invited to deliver the lecture on a topic of his choice.

The 2000 Radhakrishnan Memorial Lecture was delivered by Professor D.P. Chattopadhyaya, an eminent philosopher, original thinker and extraordinary scholar. His lecture was on the subject of “Consciousness and Scientific Knowledge”. Consciousness is one of the most burning topics among a variety of scholars—neuroscientists, philosophers, micro-biologists, computer experts etc. The inspiring lecture by Professor D.P. Chattopadhyaya raised many questions and issues in respect of the theme of consciousness. The lecture was well-discussed by the Fellows and the scholars. The lecture along with the discussions was one of the most exciting academic events of the year at the Institute.

I do hope that this intellectually stimulating lecture would be of much interest to scientists as well as spiritualists and would give a direction to the study of this important theme. It is my privilege to present here the 2000 Radhakrishnan Memorial Lecture of the Institute to the world of scholarship.

1.10.2001

V.C. SRIVASTAVA
Director

Consciousness and Scientific Knowledge

I

Introductory Preliminaries

What is the nature of *Consciousness*? What we understand by *Science*? How are they related? These are the three basic questions I propose to discuss in the presentation.

There is a special reason for choosing the central theme of the relation between Science and Consciousness on the occasion of Radhakrishnan memorial lecture at the Indian Institute of Advanced Study. Radhakrishnan was a leading philosopher of his time, deeply familiar with the main issues of Indian thought and religion, and has written extensively in English language having the western audience, modern age and scientific questions in view. Most of his influential works of lasting value were written between the two World Wars when Relativistic Physics, Quantum Mechanics and, under their dominating influence, Scientific Philosophy had their hey days. One's presentation of one's view is determined, among other things, by the assumed target group, its basic questions and problems, cultural settings and historical context.

At the outset I must say that I do not propose to give an exposition of Radhakrishnan's thought which is available elsewhere and from the pen of numerous competent scholars, Indian and Euro-American.¹ Instead, what I intend to do is this. Bearing Radhakrishnan's philosophical, religious and scientific concerns in the back of my mind I would primarily present the modern philosopher's perception of the substantially similar issues in the course of subsequent development of related thoughts.

Consciousness, Knowing and Being

It is not easy to *define* what Consciousness is. In English language the word Consciousness has many synonyms, viz., sensation, perception, apperception, appreciation, cognition, recognition and realization. Also may be added to the list some such words as comprehension, under-standing the intelligence. Each of these words in different sentential and/or thematic contexts add and shed some or other of their received senses. Besides, consciousness has often been discussed mainly as an ontological concept. For example, when it is said that consciousness *is* reality the sense pertains to the very nature of reality comprising both its “what” and “that”, empirical and transcendental, aspects. Being-there (*Da-sein*) and being here-and-now are at times claimed to be identical at bottom. “To know” and “to be” are said to be interchangeable expressions. Epistemology is substantially assimilated under ontology. *Brahmavid brahma iva bhavati*, says the Vedantin. To know the Brahman one has to *be* or *realize* Brahman itself. This knowing-being identity view has its several versions as it is evident from the works of Śaṅkara,² Sri Aurobindo³ and Hegel.⁴

But that is not always the case. For example, the anti-metaphysical identity theorists engaged in studying artificial intelligence strongly claim that consciousness *is* nothing but a *functioning* brain. They dispute or even discard the transcendental notions of consciousness. They are committed to the belief that body *is* consciousness.⁵ Plato thinks the seat of consciousness is head, while Aristotle maintains that it is located in heart. Patañjali speaks of six centres of consciousness in the human body. Satprem, following Sri Aurobindo, claims that every bodily cell has its own mind.

There are other ways of understanding what Consciousness is. “Whose Consciousness?”, “what Consciousness?” and similar concrete questions are clearly admissible in our ordinary language discourse. When we try to answer these questions we come down *ava-gamana* from the “high” metaphysical level to the ground-level epistemology or theory of knowledge. The

knowledge which rests on subjects-object or knower-known dualism is berated as *ava-jñāna*, nether or scientific knowledge. Viewing consciousness as relative to this person or that person, we leave the ontological issues of consciousness well behind and bring the same down to the experimental and narrow verificational level. Consciousness in that case varies from person to person, becomes relative and obviously questionable and endlessly corrigible.

Variation of consciousness is clear when its object and content vary. For example, *consciousness* of the sun is different from the consciousness of the *image* of the sun. It is further different from the *experience* of the sun. Then what brings the sun, a heavenly body, its image and its experience *together* in our consciousness? Added complexity of the epistemic situation is brought out when one tries to understand the properties in consciousness which enable one to discern “between” consciousness, on the one hand, the *mental* image of the sun (as content) and the sun over there (as a *physical* object). The critic may rightly observe that the preposition “between” is a howler. For, strictly speaking, there is no gap or interregnum between consciousness, the mental image of the sun and the physical object the sun itself over there. The critic may rightly affirm that there is a constructive or creative power *in* consciousness and perhaps *of* consciousness itself which enables the concerned person/percipient to *form* image partly out of the sensible given and also to posit the sun over there in the physical space. It has been rightly observed that all objects are in effect objectification of this or that knowing consciousness under the aspects (a) of certain *given* experience and (b) proactive propensities and dispositions (*vr̥ttis* and *saṃskāras*).

III

Extensions of Consciousness and Forms of Knowledge

The complex, creative as well as suppressive characters of consciousness may be explicated by carefully analysing the Sanskrit synonyms for the English word “consciousness”, viz., *cetana*, *vedanaṃ*,

anubhaḥ, antaḥsaṃjñā, bodhaḥ, antarbodhaḥ, jñānam, ahaṅkāraḥ and *cidātmakam*.⁶ All these pro-claimed synonyms, etymologically analysed and semantically spelt out, show that these are not, strictly speaking, synonymous. Difference for their senses may be easily brought out by appropriate uses.

Cit, citta, cetana and *citra* are meaning-wise words of kindred type. *Cit* in its verbal form means to perceive, to fix the mind upon —, attend to —, be attentive of —, and take notice of (of something/object). *Citta* in its nominal form means what has appeared, what is visible, attending, observing, thinking, reflecting, the heart, the mind, memory, intelligence, intention, aim and their cognates. *Citra* in its adjectival form stands for what is conspicuous, excellent, distinguished, clear and bright, variegated, strange, manifold etc. *Cetana* means what is visible, conspicuous and discernible; in its nominal form the term implies understanding, sense, intelligence and consciousness. It also functions as an attribute of some or other percipient, sentient and intelligent person.

Another word which is very close in its meaning to *cetana* is *vedana*. It means perception, knowledge, making known, feeling, sensation and so on. The relation between words like *cetana, vedana, vedas, vid* and *vidyā* are not only very close but also obvious. All these terms are of cognitive and scientific in their import and pertain to learning, scholarship and philosophy.

Vidyā as science, traditionally speaking, comprises (1) *trayī*, the triple veda; (2) *ānvīkṣikī*, logic and metaphysics; (3) *daṇḍa-nīti* or *arthaśāstra*, the science of Government; (4) *vārttā*, practical works such as agriculture, commerce and medicine. (5) It is interesting to note that Manu mentions *ātma-vidyā*, knowledge of soul or of spiritual truth, as a science. Also he refers to the *Purāṇas, Mīmāṃsā, Nyāya* and *Dharma* as examples of *vidyā*. 64 *Kalās* or arts at times have been counted as science or *vidyā* in the Indian tradition. The rigid distinction between science and art under the common head of *vidyā* is only of recent origin and basically administrative in character, i.e. *not* truly indicative of their intrinsic nature(s).

Now when we are concerned with the relation between

consciousness and science in the specific contest of our time, it would perhaps be advisable to take the concept of science in a relatively well-defined sense. At the same time in the process of rigorously defining or delimiting the nature and scope of science one must not lose sight of the essential characteristics of science or *vidyā*. If the Sanskrit words for consciousness enumerated before and carefully looked into, it becomes clear that knowing involves knower and also his capacity to go out of himself in search of the object of knowledge. The talk of “going out” may sound somewhat metaphorical. In his acts of scientific knowing the concerned subject “goes out of himself” only in a simulated sense. Obviously there is no literal going out. For the object known and the knowing subject, notwithstanding their seeming (epistemic) duality, are co-present and have a unitary (functional) character. If subject and object really *stand* apart, then they tend to *fall* apart, and thereby making the formation of knowledge well-nigh impossible. The received ideas of scientific knowledge defined in terms of subject-object difference, the knower-known duality, interestingly enough, simultaneously has its necessity as well as limits.

In some way or other the knowing subject is required to “appropriate” the knowable object, somehow get into it, and then return to itself, retaining the yield of its appropriation of the “visited” object. All acts of knowing are induced by some or other specific longing interest of the knower’s self-consciousness. In other words, knowing is not a passive happening. It is an active (*pravṛtti*-rooted) enterprise. The whole enterprise may also be understood in terms of *intentional* consciousness of the knowing self.⁷ Intentionality or *ākāṅkṣā-dharmitā* of consciousness may or may not be essential to all states of consciousness. For example, the highest form of knowledge-by-identity (*parāvidyā*) embodied in self-realization rules out the possibility for active presence of intentionality in the knowing consciousness. But at the sensibility-linked level of scientific knowledge some kind of intentionality or objectwardness (in the phenomenological sense) needs to be postulated. Otherwise the very necessity or urge to know what is *possibly* knowable remains inexplicable, a mystery without any rationale.

IV

Experience, Science and Its Building Blocks

There is a widespread misconception (i) that science is essentially based on experience and (ii) that it must be quantitative in character. Certainly these two views are true but it gives a very restrictive and partly incorrect characterization of science.⁸ The basic building blocks of science, —concepts, laws and theories, properly analysed, make it clear that something other than experience,—imagination, intuition, speculation or, to use Einstein's favourite word, *Einföhlung*, intellectual love of experienceable objects, enters into the basic structure of science. The concepts of science are ordinarily viewed under three heads, —classificatory, comparative and quantitative. If any of these kind of concepts is excluded from science, it becomes impoverished. The notion of measurement also enters, directly or indirectly, into the process of formation of all types of concepts. Extensive magnitudes, time and length are interwoven into different sorts of physically relevant scientific concept-formation. However, analysis shows that quantitative concepts are no gift of nature. They are the outcome of *human* application of numbers to natural or cultural phenomena. We see, for example, colours in different natural objects, provided we are not visually handicapped. But nature, which has coloured objects in it, does not have numbers in it. We introduce number, different kinds of it (natural, rational etc.), for facilitating our understanding of natural and cultural objects and processes. The fact that to understand different levels of objects, macro and micro, we require different kinds of numbers suggests that objects, which are said to be outcome of objectification, have their independence of a sort. Choice of the kind of number for grasping and articulating the objective world cannot be arbitrary. Even without committing to the full-fledged Platonic theory of numbers one can attach a type of objectivity to numbers themselves. If numbers in the human mind have intention (*ākāṅkṣā*) in them, objects in the world have appropriate fulfillable (*yogyatā*) *dharma* in them.

Secondly, it may be pointed out that all that we claim to be in nature is not given in or presented through experience. Theoretical entities like electro-magnetic field and sub-atomic particles are not observable in the received sense. These concepts are posited, inferred and then indirectly tested by related observables.

Laws of nature are also not directly observable. Their existence is justified through empirical laws derived from them through correspondence rules. The nature which we can plainly describe can also be described structurally in terms of laws and theories. For example, it had been known before Newton that apples fall to the ground and the moon goes round the earth but none before him could predict the outcome of the experiment with the torsion balance. This is a classical example of power of a theory to predict a new phenomenon not previously observed. The law of gravitation made the things simple and intelligible.

About the ontological status of laws of nature scientists themselves ordinarily do not enter into any dispute. They take for granted.⁹ Newton himself, while liberally using hypothesis in his *Principia*, surprisingly observed that hypothesis has no place in science. It is left to the philosophers of science who offer different views about the nature of laws. According to some of them, laws are integral part of nature itself. That fire burns and that river flows down stream are said to be due to the laws of nature and have nothing to do with human perception or interpretation. But some others in the light of past non-linear development of science assert that the proclaimed laws of nature are often found to be modifiable, precisifiable, if not refutable, due to new observational or crucial experimental findings. From this it is argued that what we call law of nature, on analysis, turns out to be human attribution to nature. Laws are described also as *instruments* of prediction. Attempts have been made to bring close the realist and the pragmatic or instrumentalist accounts of laws of nature. If the laws are said to be *purely* instrument of prediction, then their claim of objectivity is seriously diluted, if not altogether denied. If on the other hand, laws are claimed to be *simple* description of the structural features of nature, then there arises some other avoidable difficulties. There are some theoretical laws of high order and abstract character which work at vanishing distance and cannot be easily established by experimental, or even observational, evidence. Some laws of cosmology and historical development belong to this category.

One way of handling the attending problem about these laws

is to admit modestly that these laws are basically *guiding principles*, guiding our research work, or *rules of inference*, enabling us to infer one set of conclusions from one or more sets of premises. The line of distinction drawn between experimental and theoretical laws seems to be fuzzy or too tenuous to be defended as scientific. If theoretical laws are *not* empirically defensible even in principle, their claim as law appears to be untenable. A line has to be drawn *somewhere* between speculation which leads to factual findings and which fails to do so.¹⁰ Rules of inference must not be unruly, i.e. are required to have their own factual accountability.

If the excess of theoretical presupposition or speculation, leading to empirical finding, proves scientifically idle, the opposite error due to the *reductionist* zeal is comparably pernicious.¹¹ If the scientific claim of all forms of knowledge is said to be dependent upon their reducibility to the laws of nature of physics in particular, that creates an impasse. It is not easy to demonstrate, for example, that water is H_2O or that temperature is mean translational kinetic energy. In both these cases the emphasized, i.e. italicized "is" is although indicative of the identity claim of the concerned statements, but the claim cannot be easily established. Identity statements or so-called bridge laws seem to be mere definitions. Definitions of the terms which figure in the reduced theory can be deduced from the reducing theory supported by certain definitions. For example, the laws of thermodynamics are said to be deducible from those of statistical mechanics, coupled with such definitional statements as referred to before. This reductionist strategy has been criticized on the ground that the proclaimed identity of the concerned statements is mere *contingent* correlation, and not *strict* identity. Even the so-called identities of the terms in analytical definition like "water is H_2O " needs some sort of empirical investigations to establish their truth claim.

This issue tends to bedevil the relation between psychological and social sciences, on the one hand, and physics, on the other. The outcome, negative or positive, of the reductionist programme has an important bearing upon the so-called identity theory of mind and body. Also it has bearing upon the important problems

like the reverse reducibility of physical bodies into consciousness, science into consciousness,—consciousness as such (*caitanyaṁ kevalam*) or human consciousness. Also it is relevant to the understanding of the relation between one person's consciousness and its relation with the unique Consciousness (with capital C) or consciousness (with small c) of other persons. Are they identical at bottom or persist to be different even at the end? Do the different human bodies individuate or articulate a supposed universal consciousness? On the answer to this type of questions depends the universalizability or the intersubjectivity claim of scientific knowledge.¹² Does the individuality of human personalities dissolve in Brahman (as Advaitins like Śaṅkara¹³ affirm) or does it survive in Īśvara (as qualified Vedāntins like Rāmānuja,¹⁴ Sri Aurobindo¹⁵ and Radhakrishnan¹⁶ assert in different ways)? Admittedly Radhakrishnan's position on the issue is somewhat liberal like Vivekānanda's.¹⁷ All Vedāntins of our time, especially the named ones, have tried to uphold the validity of scientific knowledge and the lasting value of human individuality. B.N. Seal has gone to the extent of trivializing the traditionally drawn distinction between *līlāvād* and *māyāvād*, characterizing *māyā* as the perfectly coherent "principle of materialization". It is clear from the writings of modern Vedāntins that they recognize no conflict between religious spiritualism and scientific rationalism. Religion and science are claimed to be two different modes of the same consciousness, both cognitive.

V

The Subjective and the Objective in Science

For making scientific knowledge possible, it seems, two requirements need to be satisfied. First, the subject as knower must maintain an identity of its own,—strong, weak or even interrupted of its own. Secondly, the object of knowledge, whatever that may be, must also have a sort of identity of itself. The denial of the first condition creates a number of problems, raising, doubt about the very possibility of knowledge. If a knowing subject or self becomes schizophrenic in a very serious way, it cannot possibly sustain its claim as knower. If the

identity, or at least unity, of the knowing self is disrupted, causing a sort of split in the concerned personality, then the knowing self S_2 at the time T_2 would not be able to remember what he had known what he was as S_1 at the time T_1 . In other words, if the different states of the knowing self, S_1 at T_1 , S_2 at T_2 , S_3 at T_3 and so on turn out to be entirely different, separated from each other, having no identity *of* them, or no unity *between* them, then what S_1 knows as at T_1 as an object, O_1 , cannot be cognitively available to S_2 at T_2 .

The identify issue of the knowing subject may be approached from both ends, subjective and objective.¹⁸ If the subject dies or disappears at every moment or within a humanly surveyable segment of time, rendering it unable to survive beyond T_1 , then it would not be able to re-identify itself as knower S_1 at the time T_2 (which may be another moment or segment of time). The additional complexities of the issue, which has both ontological and epistemological ramifications, may be brought out by introducing the actual course of time, from the past to the present and beyond or in the reverse direction, i.e. from the present to the past along the memory lane. Though remembrance of the past is not knowing in the strict sense, yet it suggests the identity of a person who can remember *now* something which he himself experienced in the past. This form of continuous presence of the knowing self is undeniable. Objects of knowledge or items of experience as excerpts of the world the knower lives in are copresent or apperceived by the concerned self. In the being of the self the objective world is somehow held together. The world is witnessed by the self as a unitary whole, not given as a simultaneous totality, but as ordered in space and time and further organized in terms of the categories like quality, quantity and causality.

The correlative difficulty concerns the *object* of knowledge in question.¹⁹ When we speak of the remembrance of the self what we do not explicitly state is the object of remembrance. No remembrance is bare remembrance. Positively speaking, every remembrance is remembrance *of* something, of some object or of some experience. The same thing can be said of knowledge. Every knowledge is knowledge *of* something or *of* some object. Viewed thus, every remembrance, every feeling has a tacit and

minimal cognitive component in it. Every feeling has something felt in it and the felt content, on demand, can be reidentified by the feeling self. Denial of this truth negates the very ground of aesthetic judgement. Similarly, consciousness, in its cognitive mode, is obliged to be (more or less) *objective*, i.e. *object*-relative. To put it differently, in its cognitive mode consciousness cannot be *purely* subjective. In that mode or modification it ceases to be consciousness as such. A duality, knower-known duality, appears in it. From my emphasis on the synthetic-cum-constitutive character of self-consciousness or, its subordinate partner, mind, one must not think that I refuse to recognize duly the objective-realistic claim of the world of science. On the contrary, my arguments and presuppositions, taken together, force me to believe that (a) the identity of self-consciousness is as important as (b) the unity of the world discovered *gradually* by science. Neither the ascending generality of the laws, theories and axioms of science nor their successful application to the micro spheres of body, life and mind should be attributed unilaterally to the constitutive power of consciousness. Even the combined powers of perception, imagination and thought cannot unify all items of experience of nature unless nature itself is credited to have a pre-epistemic or ontological unity of its own.

If nature is said to have a unity of its own, the question may be pertinently raised what contribution the unifying activity of the mind has to do for making nature possible? A possible response to the question may be offered along this line. To speak of nature as it is in itself, independently of being experienced by the human mind, is a presupposition, not proposition having truth-value. The notion of nature-in-itself may even be said to be a matter of animal faith,—faith at least to start with. The scientist or even the scientifically disposed ordinary man is not prepared to live on mere faith. He wants some sort of confirmation, direct or indirect, in the object of his faith. Besides, what is very important is the fact that in the self-perception of every man, including the scientist, is his own situatedness within a world of experience, experience of nature. Human individuals are situated not only in nature but also in some or other culture or society which is defined, among other things, by language and social institutions. While natural

objects in most cases are directly or indirectly *perceptible*, cultural objects are understandable in terms of *meaningful* social facts and actions. The meaningfulness of social facts and action mainly differentiate them from natural objects and their configurations made intelligible by testable laws and theories. And here lies the basic difference between natural sciences and social sciences. From nature a steady flow of information pours into him, assuming his organs of perception and action are minimally functional. The fluxist character and plenitude of experience oblige us to trace their origin and account for their intelligibility. Consciousness sustains and is the meaningful mainstay of all modes of experience, including those of both science and religion.

Concepts, laws and theories of science are expressive of the human attempts to comprehend nature in its unity, regularity and complexity. In a way the embodies human existence itself is a part of nature, i.e. embedded into it. A two-way relation obtains between man and nature.²⁰ Therefore, there is no escape for the scientist or even an ordinary man from knowing the incoming nature underpinned by bottomless consciousness. The scientist's activities and achievements are purported to be critical confirmation of what he believes intuitively about the world he is situated in. For him nature is a structured complexus of *actual* objects, events and processes nesting endless, predictable and, in most cases, computable possibilities within it. In many cases the law-governed and theory-envisioned general structures of nature are not replicated in their enfolded substructures and that explains inexactitude, if not outright falsity, of numerous predictions and computations and discovery of hitherto covered truths or unknown objects, distant and proximate, galactic and sub-atomic.

VI

Idioms of Consciousness, Science and Inquiry

Earlier we have noticed that consciousness have many synonymous terms in Sanskrit. Comparative philologists point out that the Indo-European words for knowledge (*jñānam*) have a striking family resemblance, both phonetic and semantic, between them. The main

two idealized root words seem to be *weid-* and *gno*. With *weid* one can easily relate *vidyā* (Skt.), *woida* (Greek, “have seen”), *videre* (Latin) and several other Latin, Greek and Balto-Slavik words like *watt* (>watch), *witon* (>vision) [Old English], *wizzan* (old High German), *vedeti* (Slovak and Bohemian), *vedat* (Russian, archaic) and *vid-* (Avestan). It is interesting to note that in most of these languages knowledge has been paradigmatically likened to vision (*darśan*). It is not surprising that in the Indian tradition philosophers are regarded as seer or *dārśanik*.²¹

From the other idealized word *gnō* we have *gnórimos* (Greek) and *gnascere*, later on *nōscere* (Latin), *kunnān* (Gothic), *geenāwān* (old English), *zinoti* (Lithuanian), *zanāti*, (Slovak), *zān-* (Avestan), *jñā-* (Sanskrit), and *knān* (Tocharin, Sinkiang, Chinese). Indo-European words which are kindred in meaning to knowledge are thinking, belief, understanding, reflection, “be of the opinion”, “be acquainted with” etc. The Sanskrit word *jñā-* stands for not only knowledge, acquaintance, perceive, apprehend and understand but also to recognize, ascertain, investigate etc. Additionally, *jñā* has the implication of Śakti, power of the knower of the knowing self. Sanskrit words for knowledge and its cognates are numerous, viz. *buddhi-*, *cint-*, *cit-*, *man-*, *dhī-*, *dhyā*, *śraddhā*. The counterparts of these words in the Indo-European languages carry the scientific senses of “bringing together” (“knower” and “known”) “being acquainted with”, “investigating”, “seeing”, “doing” and “being”. It must be added here that the senses of the words with the passage of time and change of context add new senses and often shed the older ones.

The main point to be borne in mind in the context of scientific knowledge is that from the conceptualization to hypothesis-framing and theorization the scientist is mainly engaged in bringing together different items of experience, connecting and unifying them and also to test the same in the light of new experiences, particularly the surprising ones. Analysis makes it gradually clear that all these activities are sustained by a kind of consciousness which can and do last well beyond the fleeting and discrete items of experience and bring together, i.e. systematize, meaningfully apparently isolable concepts under the scope of laws and theories. Consciousness not only makes scientific

experience possible but also attempts to interrogate continuously its outcome. *Jñāna* and *jijñāsā* are interwoven and interactive. In both terms the root word *jñā* occurs very significantly. In the quest for wisdom and scientific knowledge the spirit of questioning and inquiry is essential and indispensable.

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 11. For a fuller statement Ernest Nagel, *The Structure of Science: Problems in the Logic of Scientific Explanation*, Routledge and Kegan Paul, London, 1968. See, in particular, ch. 11 "The Reduction of Theories" and ch. 12 "Mechanistic Explanation and Organismic Biology", pp. 336-446. Also notable is Carl G. Hempel's "Theoretical Reduction" in his *Philosophy of Natural Science*, Prentice-Hall, Englewood Cliffs, New Jersey, 1966, pp. 101-110.
 12. In his *Critique of Pure Reason*, particularly "The Final Purpose of the Natural Dialectic of Human Reason", Kant offers a concise view how Natural owes its unity to intuitions (sense-perceptions), concepts and ideas and why "reason in its speculative employment, can never with these elements [of origin] transcend the field of possible experience". A703/B731, pp. 549-570 [Norman Kemp Smith's tr., Macmillan, London, 1973]. Also see K.C. Bhattacharyya's "Subject As Freedom" in his *Studies in Philosophy*, ed., Gopinath Bhattacharyya, Vol. II, Motilal Banarsidass, Delhi, 1983. Influenced by Kant and exploring the Vedantic cues KCB tries to show step-by-step how beyond physical objectivity, psychic subjectivity and spiritual subjectivity human "I" is rooted in Brahman-like ABSOLUTE SUBJECT which is a matter of *faith* and *not* object of any form of *knowledge*.
 13. Śaṅkar-Bhāṣya in [I Adhyāya, I Pāda, 4] referring to the Aupaniṣadic principles like "In the beginning all this was Self, one only" (*Aiṭ Āraṇyak*, II, 4, I, 1) and "This is the Brahman without cause and without effect without anything inside or outside, this self is Brahman perceiving everything" (Br. Up. II, 5, 19) etc. affirms, rebutting all objections of Pūrva Pakṣa, that self and Brahman are essentially identical. The same point has been reiterated in many other places like II Adhyāya, 3 Pāda, 53, III Adhyāya, 2 Pāda, 27, and III Adhyāya, 3 Pāda, 16.
 14. Rāmānuja, differently from Śaṅkara, maintains that individual selves, on their release, do not totally lose their individuality in the highest Self, Brahman (as God). In support of his contention he refers to Mu. Up. III, I, 1, Ka. Up. I, 3, I, Br. Up. III, 7, 22, Viṣṇu Purāṇa, VI, 7, 30 and the Gītā which declares that the released soul attains the same attributes as the highest Self. Rāmānuja's Śrībhāṣya, I Adhyāya, I Pāda, I, Vide George Thibaut's tr., Sacred Books of the East Series, XLVIII, pp. 98-100, Motilal Banarsidass, Delhi, 1971.

15. Sri Aurobindo writes: "The Brahman alone is, and because of It all [everything that we see in Self and Nature] are . . . Brahman, the Ishwara, is all this by his Yoga-Maya, by the power of his Consciousness-Force put out in self-manifestation." In support of his views in the Chapter entitled "Brahman, Pursusha and Ishwara—Maya, Parakriti, Shakti" he refers to the Gita (XIII.17), Tait. Up. II. 1, Svet. Up. IV. 10 and VI, 1, 7, 8, 11. *The Life Divine*, Vol. 18, Birth Centenary Library, Pondicherry, 1970, pp. 322-323.
16. On the nature and content of religious experience Radhakrishnan writes: "The same God expresses itself at one stage as power, at another as personality, at a third as all-comprehensive spirit, just as the same forces which put forth the green leaves also cause the crimson flowers to grow." P. Nagaraja Rao, K. Gopalaswami and S. Ramakrishnan, eds., *Radhakrishnan Reader: An Anthology*, Bharatiya Vidya Bhavan, Bombay, 1988, p. 142. See also my "Radhakrishnan's Concept of Religion" in G. Parthasarathi & D.P. Chattopadhyaya, eds., *Radhakrishnan Centenary Volume*, Oxford University Press, Delhi, 1989.
17. See my "The Ideal of Human Unity and Vivekananda" in my forthcoming book, *Societies, Cultures and Ideologies*, referred to before [3].
18. See, for example, Sydney Shoemaker, *Self-Knowledge and Self-Identity*, Allied Publishers, Bombay, New Delhi, Calcutta, 1971. On the issues indicating the relation between the two poles of self-identity among the classics one must recall the works of Śaṅkara and Sri Aurobindo, in the Indian tradition, and of Kant and Husserl, in the Western tradition. Another book, *The Self and Its Brain*, co-authored by Karl Popper and John Eccles (Springer International, Berlin, New York and London, 1977) may still be profitably studied in the fast developing context of Cognitive Sciences.
19. In the Nyāya tradition many philosophers from Gautama and Vātsyāyana to Praśastapāda and Udayana have used memory (*smṛti*) as argument to prove self-identity.
20. D.P. Chattopadhyaya, *Environment, Evolution and Values: Studies in Man, Society and Science*, South Asian Publishers, Delhi and Madras, 1982.
21. Carl Darling Buck, *A Dictionary of Selected Synonyms in the Principal Indo-European Languages: A Contribution To The History of Ideas*, University of Chicago Press, Chicago & London, 1988, pp. 1198-1213. See also the entries like "Belief" (pp. 61, 263), "Know" (pp. 336-337), "Think"/"Thought" (pp. 418-575) and their cognates in J.P. Mallory and D.Q. Adams, eds., *Encyclopedia of Indo-European Culture*, Fitzroy Dearborn Publishers, London & Chicago, 1997.