

FIRST PERSON ACCOUNTS OF YOGA MEDITATION YIELD CLUES TO THE NATURE OF INFORMATION IN EXPERIENCE

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ABSTRACT: Since the millennium, first person accounts of experience have been accepted as philosophically valid, potentially useful sources of information about the nature of mind and self. Several Vedic sciences rely on such first person accounts to discuss experience and consciousness. This paper shows that their insights define the information structure of experience in agreement with a scientific theory of mind fulfilling all presently known philosophical and scientific conditions. Experience has two separate components, its information content, and a separate ‘witness aspect’, which can reflect on all forms of experience, and with training be strengthened until its power of reflection identifies it as the innermost aspect of ‘self’. The Vedic sciences, *Sankhya*, Yoga and Vedanta develop these themes. *Sankhya* identifies the different aspects of experience, outer and inner; Yoga practices lead the mind to inner states without information content (*samadhi*) in which the experience of the witness (*sakshi*) is strengthened and deepened. Vedanta states the nature of the ‘self’ is to know itself directly without intermediary. All this requires the witness to have a *singular loop structure*. The information structure of experience therefore has two aspects, information content plus a *singular loop* endowing it with a subjective sense of ‘Self’.

KEYWORDS: Experience; Information; Feedback; Knowledge; First Person; Self; Consciousness; Meditation

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INTRODUCTION

The Vedic culture of ancient India distinguished two kinds of experience¹, gross (*sthula*) which was derived from perception through the five gross senses, and merely rational mental processes, and subtle (*sukshma*), which was derived from the corresponding subtle senses, and mental abilities like seventh sense communication², intuition, and well-characterized phenomena known as *ritambhara pragya*³, and *jyotishmatti pragya*⁴. The latter were developed by special techniques contained in advanced Yoga practices^{5,6}, and represented subtle means of directly accessing facts and truths about creation⁶ and its structure⁷, not limited to the gross, physical universe, but also concerning the subtle 'levels of reality' (*lokas*⁸), accessible by the soul. The Brihadaranyaka Upanishad states that there are many levels of *sukshma* reality⁷, and that these subtle levels control the gross level known through sense perception. This overall structure makes the Vedic sciences, in principle, far more powerful than the modern sciences, so that they can access and describe classes of phenomena inaccessible to the methods of modern science.⁹

In support of these statements, the Vedic sciences outline training programs through which the individual can rise to the heights of the subtlest levels of reality^{10,11}, and transcend them in order to attain the ultimate, supreme level of *Brahman*¹² from which all creation manifests. In this way, having defined the subtle levels, the Vedic Sciences clarify the nature of experience, and outline training to actualize levels of subjective refinement of conscious experience, through which their findings can be verified. They form a description of creation in both its subjective and objective aspects that are profound and complete.

Although first person accounts of experience have traditionally been excluded from scientific consideration, the work of Varela and Shear¹³ has clearly defined the conditions under which they may be accepted as philosophically valid. They now form potentially useful sources of information about the nature of mind and self. Most Vedic science sources rely on such first person accounts to discuss experience and consciousness.

As an integral aspect of their program of investigation of the universe of sense perception, the Vedic sciences contain many sections where profound statements about the nature of subjective experience are made. Such statements, made from highly refined levels of consciousness, can be taken as authoritative. In fact, they turn out to be in agreement with many statements from western science and philosophy about the nature of the self and awareness, and can even be used to judge the level of refinement of different philosophers¹⁴ in the domain of development of consciousness. Certain great poets, like T.S. Eliot, in 'Four Quartets'¹⁵, and Thomas Traherne, in his poem, 'My Spirit'¹⁶, give descriptions that can really only be understood with reference to the

Vedic literature, since they concern the realization of the ultimate levels of creation. Jonathan Shear¹⁷, in particular, has shown that these statements transcend all cultural boundaries, and can be found in descriptions of meditation from all great cultures in East and West. This article presents detailed statements selected from the ancient Vedic literature describing the structure of conscious experience, to establish a basis for the scientific description of the phenomenon. In this, the Vedic literature provides a unique and unparalleled resource. Its methods outlined in Yoga^{18,19} provide a means of accessing states of conscious experience free from the veiling effects of information content²⁰, so that the real nature of the experiencer shines forth, and can be accurately cognized and expounded, as is done in the Vedanta sections of literature^{21,22}.

METHODS

Careful selections from the ancient Vedic literature are made, yielding precise statements concerning conditions on the nature of conscious experience, and our understanding of it. The Upanishads are used to define the most extensive range for phenomenal experience, and to define its precise nature – that it has a two-fold structure, combining the essence of the objective, with the essence of the subjective. The *Sankhya Karikas* then define key levels of subjective experience; selections from the Yoga Sutras show how key levels of experience can be accessed, developed and refined, leading to the ultimate levels of reality, the nature of which and its inherent dynamism are explained in selections taken from Vedanta.

RESULTS

The book, *Principal Upanishads*²³, includes the two shortest, the Mandukyopanishad²⁴ and the Ishopanishad²⁵, which give some of the clearest messages about consciousness and its development in the entire Vedic Literature. The Mandukya Upanishad²⁴ – the shortest – describes the three usual states of consciousness, the Waking State (*Jagrat*), Dream State (*Swapna*), and the Deep Sleep State (*Sushupti*), comparing them to the three letters making up the syllable A-U-M. To these it adds a fourth state, *Chaturtam*, often called *Turiya*, which it compares to AUM itself, saying that just as ‘Aum’ may be considered the source of creation, the fourth state may be considered the origin and foundation of conscious experience.

The Ishopanishad²⁵ concerns the importance of regular practice of techniques to develop the full potential of consciousness, how progress on the path to enlightenment¹⁹ can only be achieved by persistent regularity of practice, and factors motivating that achievement. However, it is the Mandukya Upanishad²⁴, which actually describes the fruits of regular practice for the development of consciousness, stating that one can rise to successive states of realization of ‘A’ in the waking state,

‘U’ in the dreaming state, and ‘M’ in the deep sleep state.*² These statements are essentially coded; their meaning is that, in some yet-to-be-defined sense, the waking, dream and deep sleep states are all accompanied by the fourth state. By persistent practice one can grow to experience their coexistence: the fourth state lies at the foundation of the other three. It is always there, but lies hidden behind the veil of sensory and physiological experience.

Another Upanishad, the Mundakopanishad²⁶, clarifies this. It likens the structure of subjective experience to two birds in a tree: the first is said to ‘peck the fruit’, while the second is described as ‘looking on’, i.e. the overall structure of experience consists of two parts, one involved in experience, and the second as a witness, *Sakshi*. In practical terms, this permits greater control and makes possible refinement of understanding and appreciation. We may therefore equate the 4th state of consciousness described in the Mandukhyopanishad²⁴ with that of the witness, which is strengthened by specific processes of neural plasticity induced by regular transcending. The final result is that the *Sakshi* witness property²⁷, first experienced in *Turiya*, the 4th state of consciousness, strengthens, comes to be clearly experienced, and then acknowledged as underlying each of the first three states of consciousness.

The *Shad Darshanas*, the Six Systems of Indian philosophy, clarify this further. Known as the subordinate limbs, ‘Upangas’, of the Veda, they represent six sources of illumination of the Vedas and their meaning. We shall use two systems, *Sankhya*²⁹ and *Yoga*³⁰, the former describing categories of subjective experience taken largely from Taittiriyanopanishad³¹, and the latter, the means to attain the requisite experiences, abstracted from several Upanishadic sources, mostly in the Brihadaranyaka³² and Chandogya³³ Upanishads.

Sankhya describes two major categories of experience, *Prakriti*, in which experience content of four possible categories – *Ahamkara* (the little Ego or narrative self), *Buddhi* (Discriminative Intellect with likes and dislikes), *Manas* (Base for Mental and Affective information content, with subconscious and emotional reactions), and the *Panchendriyas*, variously Five Senses, and Five Organs of Action, responsible for all interactions with the outside world. Each of these can be increasingly clearly experienced as reflective self-perception is refined by processes of meditation. As long as identification is with objects of sense experience, involving a flow of information like an arrow from the observed (object) to the observer (subject), identification of ‘self’ will be with the physical body – i.e. autobiographical ‘self’.³⁴ When a meditation practitioner becomes more aware of the state of his/her own mind,

*²In Maharishi Mahesh Yogi’s system, these states are known as ‘witnessing’ – witnessing the waking, dream and deep sleep states successively, and exhaustively described by practitioners in private videotaped sessions.

identification will be with personality, character, and component traits – information structures in conscious experience.

As mastery is gained over states of mind, and the nature of the *Buddhi*, or discriminating power of the intellect based on information content and associations becomes dominant, identification of self turns to higher, less sense-based experiences, more concerning higher domains of life. Finally, comes the realm of the little ego (*Ahamkara*), which is realized to be a formless, point-like centre of one's sense of identity, passing through time, beyond which lies a seemingly unbounded, infinite realm of pure intelligence, pure creativity and pure energy, eventually realized to be the source of all that exists – of all objective existence as well as all subjective existence(s). For the individual, the name for the subjective cognition of this seemingly infinite realm with no identifiable qualities is '*Purusha*' – pure spirit, which, in contrast to the various states of *Prakriti*, has no information content, in terms of either quality or quantity.

Sankhya thus arrives at a picture of the realm of subjective experience at any level as having two aspects – one, various kinds of subjective information content, and two, an abstract qualitiless aspect, free of all information content. *Sankhya* considers the two realms as separate, and does not overtly discuss their relationship. That is made possible through Yoga.

THE ROLE OF YOGA

The Science of Yoga plays a special role in training the mind in refined functioning. The first chapter, *Samadhi Pada*¹⁸, of the Maharishi Patanjali's, 8-limbed (*Asht-anga*) approach to Yoga, YogaSutras, directs the mind to a state without information content, *Samadhi*, Limb No. 8. Regular experience of *Samadhi* is presented as the central means of gaining spiritual enlightenment, *kaivalya*³⁵, the overall concern of the whole text. The text describes *Samadhi* not as a state of low awareness or no awareness, but rather of heightened awareness, practicing which, and residing in which, for longer periods of time, permits the development of higher abilities.³⁶ Indeed, research on the self-transcending process taught in Maharishi Mahesh Yogi's Transcendental Meditation, has shown radical increases in brain blood flow, EEG alpha and theta power, EEG coherence, performance on tests of Field Independence and Creativity, and decreases in Hearing Thresholds.³⁷ Of these, it is possible to consider the perfect coherence, all values unity, in EEG coherence as a marker for transcendence, because the information measure of the coherence information matrix then becomes zero. An EEG coherence matrix, M , is defined as having the power, P_a , in each channel, a , on its diagonal elements, M_{aa} , and coherence between channels a and b as its off-diagonal elements, M_{ab} and M_{ba} , (matrix M is symmetric). In any encoding system with symbols s_i occurring with frequencies p_i , the Shannon information content per symbol

is equal to the sum \sum_i over all values of i of $p_i \ln p_i$, where \ln is the natural logarithm, i.e. log to the base e . In the case of an EEG coherence matrix, being symmetric the matrix can be diagonalised to a standard diagonal form, in which the corresponding information value is given by the sum of $P_a \ln P_a$ along the diagonal. In matrix algebra, the product of two diagonal matrices is simply a diagonal matrix where each element is the product of the corresponding elements in the two matrices, while the sum along the diagonal is called the Trace and written as $\text{Tr}\{M\}$. The sum \sum_a over a of $P_a \ln P_a$ can therefore be written as $\text{Tr}\{M \ln M\}$, and represents the information content of matrix. For perfectly coherent matrices, it is zero. Intuitively this result follows because correlations are a form of order, and maximizing correlations will create a matrix with maximum order and zero entropy.

In meditation, the perfect orderliness in the EEG shows that the process of entering *Samadhi* is not like going to sleep, i.e. losing awareness, nor is it a trance. Rather the brain waves are actively being maintained in a state of perfect orderliness. Subjectively it is described as entering a completely abstract state of 'Pure Consciousness', in which consciousness becomes 'Fully Awake within Itself', in a state of 'Pure Self-Knowledge'. The Yoga Sutras only partially describe the dynamic structure of this state: in Pada 3, *Samadhi* is defined as the state where 'the mind is as if empty of content'³⁸, while the transformation 'from a distracted to an undistracted state', *samadhi parinama*, is described eight sutras later.³⁹

The highest form of *Samadhi* is described most clearly in the Vedic science, Vedanta, and its commentaries. For example, in his *Atmabodha*, Adishankaracharyastates, "The Self appears to be finite because of lack of understanding and experience. When these develop, it is recognized to be infinite and absolute. The Self reveals itself by itself – like the sun when the clouds are blown away".⁴⁰ Similarly, the great modern sage, Ramana Maharshi⁴¹ stated, in answer to a question concerning how the Self is to be known, that the subject-object relationship must be transcended until only the seer (*drik*) remains knowing ItSelf.

Vedanta's perspective on pure consciousness is that, in that state of consciousness, *the knower knows him/herself directly*: "the Self knows ItSelf through ItSelf", and "by ItSelf"⁴²⁻⁴⁵. In other words, Self-Knowledge is an intrinsic attribute of the Self.⁴⁶ This insight, however, creates an inherent paradox, that demands either its resolution or its rejection: normally, information flows from the object of knowledge, the known, to the knower, so by what kind of information process could "*the knower know him/herself*"?

The answer lies in control theory. In control theory, the fundamental concept is that of the feedback loop, a closed loop of information flow, permitting a two way flow of information from one part of the system to the controller and back again. The first section transmits necessary information about that part of the

system to the controller, while the second part transmits appropriate instructions from the controller to appropriately regulate the system (see Figure 1). Information about how the system is functioning after the change is then fed back to the control mechanism which issues further instructions as necessary. This forms a continuously functioning cyclic loop of information. Such cyclic information flows form ‘feedback loops’.

Figure 1: The Concept of a Feedback Loop in Control Theory

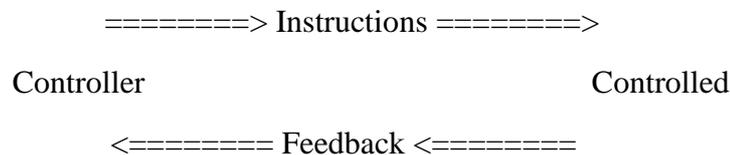


Figure 1: Figure 1 shows how the flow of information in a controlled system forms a loop.

In his foundational work on control theory, M.I.T. mathematician, Norbert Wiener, demonstrated how all systems of control require feedback loops. He went on to show that the physics of information flow round feedback loops contains unexpected new mathematical possibilities, known as singularities, because under certain conditions the flows could lead to infinitely large values – singular values – in one of the mathematical variables. The basic condition for the information flowing round a feedback loop to become infinite is for it to become larger each time it flows round the loop. In a physical system, information is carried round the loop by a physical quantity like an electrical current, so Wiener identified the key mathematical property of a feedback loop as the ratio of the current (or other variable carrying the information) at successive passes round the loop. This ratio he called the Feedback Gain, \mathbf{g} . Clearly, if \mathbf{g} is greater than one, $\mathbf{g} > 1$, the quantity will keep increasing with each pass round the loop and ‘blow up’. Wiener showed that a special mathematical property of being a ‘singularity’ applied at $\mathbf{g} = \mathbf{1}$ itself.

What was not explicitly stated by Wiener, but which can be used to understand the phenomenon of self-awareness, is that a ‘singular’ feedback loop with $\mathbf{g} = \mathbf{1}$ can be considered a *perfectly self-observing system*. This is because the information returns to each point in the loop entirely unchanged, so that whatever might have been considered its source at each point in the loop is receiving back exactly the same information as departed from it. Information flows from a transmitter to a receiver, and here the receiver is receiving back exactly the same information as it transmitted. It is in a state of ‘perfect self-observation’.

This property of a $\mathbf{g} = \mathbf{1}$ information loop can now be used to solve the paradox that is presented to us by the phenomenon of experience: every self-aware being is in a

state of continuous self-knowledge. In Vedanta, however, it is recognized that the self, or *Atman*, is too abstract to be attributed any qualities or properties, other than the ability to know itself.

A loop round which information flows unchanged represents, in a very precise sense, a similar system. It is a ‘perfectly self-observing system’, but the ‘self’ that is observing itself is devoid of any identifiable properties. Its dynamic structure can therefore represent the process of ‘self-knowing-itself’ that is at the core of consciousness, the essence of self-knowledge and self-realization. Conclusion: the ‘Self’ of the Vedic sciences may be described by a pure information loop transmitting information unchanged around itself. By this means ‘sentience’ can carry its ‘sense of self’, and the ‘sense of its own presence’ that is the essence of phenomenal experience.

This process of reasoning leads to the insight that subjective awareness with the intrinsic capacity to ‘know itself’ can be represented by a *singular* information loop.⁴⁷ The loop provides a model of knower (self), process of knowing (information arrow in the loop), and known (the supposed source of the information arrow) all in one structure. This representation of “the Self knowing Itself” constitutes a scientific model providing the Self with a completely abstract nature with no form (*Agama*) or quality (*Nirguna*), and which is a process.^{46,47}

DISCUSSION

At the same time, any information structure attempting to represent experience must also support information content, as stated in the Mundakopanishad.²⁶ The overall information structure must therefore comprise one aspect representing the information content, and a second, ‘dual’, aspect representing self-awareness by the singular information loop. The simplest way to represent such an information structure is by an arrow representing an information vector $\langle \text{=====}$, or vector mixture, together with an attached loop **O** representing the ‘self-being-aware-of-itself’ $\langle \text{=====O}$. The arrow $\langle \text{=====}$ represents the aspect of awareness, which ‘pecks the fruit’, the first bird in Mundakopanishad’s analogy²⁶, while the **O** represents the second bird, which ‘looks on’.²⁷

But do such information states occur in biology? Indeed they do: in complexity biology, where they are called criticality states⁴⁶, and are known to optimize biological regulation.⁴⁷ Criticality states are maintained by self-organized criticality, and are the normal states to which regulation returns, unless it is pathologically disturbed.

The need for such a ‘double aspect’ representation of phenomenal experience was first realized by philosopher, David Chalmers.⁴⁸ After extensive discussions from

many perspectives in the academic community⁴⁹, and further refinement⁵⁰, Chalmers' proposals became the foundation of the modern school of consciousness studies. However, until the criticality model^{46,47}, the states of which uniquely fulfill Chalmers's criteria, and many others, no model properly realized them. The contribution of descriptions of meditation in the Vedic literature, the states of mind that meditation involves, and the structure of awareness with its witness component, combine to provide a series of steps that independently justify the introduction of the new concept of experience information.

The possibility of describing experience with its characteristic, reflexive self-awareness is thus a consequence of complexity biology, but the possibility was first posited in the context of modern scientific thought by the Oxford philosopher, J. Lucas⁵¹. Lucas was considering the consequences of Gödel's famous incompleteness theorem^{52,53} in metamathematics, which states that any system of axioms containing arithmetic must necessarily contain statements that can be seen to be true but are unprovable. Gödel showed how to use an arithmetic listing of mathematical statements (Gödel numbering) to construct a statement equivalent to the sentence, 'This statement is unprovable'. Lucas opined that the ability for humans to cognize the validity (or truth) of such statements meant that human intelligence was functioning outside the boundaries of formal systems (including all systems constructible from material objects) and could not be a mere algorithmic automaton. Thus consciousness must exist as a thing-in-itself. The reasoning presented in this paper is the first to explicitly show how biology can transcend its material basis, and its control systems function as Lucas surmised, and as Shear and Chalmers considered essential.

SUMMARY

The Vedic Sciences clarify the nature of experience, and outline programs to train the mind to attain cognitive states, in which their findings can be verified. First the Upanishads: Mundakopanishad states that experience has two aspects, which it compares to two birds in a tree, one involved in experience, and one 'looking on' i.e. witnessing it. The second aspect also enables the mind to reflect on its own contents, and gain greater understanding and control in all skills, including that of reflecting on experience. The Mandukya Upanishad presents four states of consciousness: the usual three, waking, dreaming, and deep sleep, and a 4th state, *chaturtam, Turiya*, consisting of experience of 'Self' alone. The 4th state is accessed through meditation, as prescribed in Yoga, specifically the process of eliminating mental content, including the technique being used, to attain states without information content, *samadhi*, the state identified as the witness, *sakshi*. 'Self-transcending' techniques⁵⁴ promote experience of the pure witness in the 4th state. Regular meditation, *sadhana*, strengthens the witness experience through neural plasticity, so that the mind, freed

from ordinary mental content, can experience it without interference, recognize it to be the witness, and acknowledge it to be a 4th state of consciousness underlying the other three. By reflecting on, and analyzing, experience in the 4th state, the Vedic science of Vedanta concludes that the structure of that experience is of ‘the Self’, *Atman*, awareness, directly experiencing It Self, through its own innate nature: the nature of the ‘Self’ is to know itself by itself, without any material intermediary.⁴⁰⁻⁴⁵

The Vedic sciences thus combine to reveal the information structure of experience: it combines two aspects, information content, and a second that is the key to experiencing the ‘Self’, a *singular* aspect of experience with the inherent ability to know itself directly. The problem of representing the ‘Self’ in terms of information is easily solved: it is an information loop – a ‘feedback loop’. But what kind of feedback loop? Here Yoga again comes to the fore. Yoga names the final, liberated experience, ‘*Kaivalya*’, which may be translated, ‘singularity’. Under the right conditions, information loops are indeed described by mathematical singularities. In information theoretic terms, the structure of information in experience is therefore a direct product of an ‘information vector mixture’ and a singular information loop – a special kind of ‘double aspect’ information structure already identified from purely philosophical considerations.⁴⁶⁻⁵⁰ This article recounts important aspects of the Vedic sciences’ analysis of the structure of phenomenal experience, particularly how Yoga practice and philosophy identify terms required to describe it. Further articles will describe the biophysics of the meditation process⁵⁵, its scientific investigation, and applications of meditation to benefit society at large.

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