Reflections

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Science of the Mind**

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ABSTRACT

The popular concept and practice of science as an exclusively objective exercise ignores the study of rich and unavoidable subjective phenomena relating to mind. This article proposes that as a process of generating knowledge from perceptual experiences, science-skill is innate to man, which demands precision and effective management of bias, and relies on faith for communication. It manifests in man along two dimensions, one of precision and the other of need and interest. Two more dimensions influence its practice and communicability. This dimensionality accommodates scientific study of diverse human experiences, including religion and spirituality. Evolution of scientific study of mind requires complementing the existing objective techniques with development of techniques for investigating subjective and intuitive experiences. It would also benefit by borrowing concepts and methodologies from ancient Indian philosophies and spiritual practices. Swami Vivekananda's observations are presented in this connection.

Key Words: *Faith; Mind; Religion; Science; Spirituality; Swami Vivekananda*

Introduction

Popular concept of science is modelled upon physical sciences, which rely exclusively on objective data. Recent interest in studying anomalous phenomena,

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** *This title could also have been 'Science of the Mind and Some Reflections of Swami Vivekananda Thereon" as suggested by a reviewer. However, I choose this title as this article is primarily about science of mind, describing the need to expand the scope of science to include subjective experiences in the process of investigation, and to suggest that spirituality is a science of the mind whose concepts and investigative techniques would be useful to borrow and study. Selected quotations from Vivekananda are quoted in this article only as supporting statements as he is considered a renowned representative of Indian philosophy.*

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mind, consciousness and the like, has facilitated the emergence of investigative techniques to study diverse subjective data.

It was over this background that, in the mid-1970s, I had an opportunity to demonstrate to sceptical psychiatry residents that practice of psychotherapy follows hypothetico-deductive model of science, just as does the rest of clinical medicine. During those decades, psychotherapy out-come studies were highlighting the importance of such subjective phenomena as confidence, motivation, faith etc., suggesting that science cannot afford to ignore these predominantly subjective entities. Here, and in subsequent text, the word 'faith' is used only in the sense of complete trust or confidence on the basis of authority or assumed correctness. At that time, I realised the dimensional quality inherent in science in relation to the objective-subjective nature of phenomenal data. For example, the physical sciences deal exclusively with data generated from objective, physical events. Psychology and psychotherapy deal with both objective and subjective or experiential events. At the other extreme is the study of those phenomena like telepathy, consciousness, whose data are predominantly subjective experiences**.**

Over the years, my understanding of science evolved into a set of simple principles and concepts that could integrate both objectivity and subjectivity, faith, and spirituality into the fold of scientific enquiry within its standard hypothetico-deductive frame-work. This article is a brief description of these principles and concepts divested of complicated and controversial issues, with a view to stimulate further debate on these issues, without attempting to answer all the questions. They are arranged in the following order:

- Characteristics of science that are well established, as I have understood them;
- Some recent findings that indicate that scientific approach is innate to man;
- A few corollaries that arise out of the above characteristics presented as propositions;
- Current status of scientific study of mind and suggestions for the future.

Relevant statements of a renowned Indian saint-cum-scholar, Swami Vivekananda of the 19th century, are quoted as and when appropriate as representative of paradigms from Indian philosophy[#].

[#] *In response to the advice by a reviewer to critically evaluate Swami Vivekananda's observations, may I explain my reasons for not attempting to do so. It is on two counts: (a) Firstly, I am not fit to evaluate them, critically or otherwise. I am using his statements: (i) in the same sense as we quote the opinions of any reputed expert/researcher, that we may consider as a paradigm to think about; (ii) just like that of any renowned scientist in the discipline of spirituality; and (iii) as I believe them to be true. Whoever has done the spiritual practices that Swami Vivekananda did, will have the authority to critically evaluate his statements. For example, consider Kurt Godel's 'Incompleteness Theorem.' Anyone who knows and is familiar with the mathematics used by him will be competent to critically evaluate his conclusions. Rest of us are free to accept or reject his theorem. (b) Secondly, of course, one does not have to believe Vivekananda. And, there is always scope for any reader to publish his dissent about this, and any other, published material.*

Essential Characteristics of Science

Philosophy of science reveals the following three characteristics of the skilful practice of science:

1. Scientific enquiry requires an attitude of critical rationality with efforts to eliminate errors in perceptual or experimental observations and reasoning.
2. Methodology of science is the well-known Hypothetico-deductive Model, consisting of five stages:
   - Rigorous observation of facts often with aid of instruments or experiments. Subjective phenomena accessible to conscious awareness also constitute as data.
   - Based on certain qualities or patterns in the observed facts, one or more verifiable hypotheses are generated either by logical reasoning, or intuitive inspiration, often called 'brain-wave.' Hypothesis is a statement of relationship or cause-effect explanation about observed facts in the form of mental model or analogy.
   - These hypotheses, either inductive or predictive, are verified as true or false by more observations or experiments designed for the purpose.
   - The results are reviewed and interpreted to form tentative conclusions, propose a theory, or modify earlier explanations. Greater the number of consequences of a hypothesis that are verifiable and found true, greater is the probability of that hypothesis being true.
   - The whole process is repeated in a similar or improved form by same or different investigators at different times, contributing to repeatability/ replicability.
3. Nature of phenomena, investigative techniques, and number of variables. As different disciplines of science study phenomena that are qualitatively different, they require different investigative techniques. For example, even classical philosophy studies such entities as nature of knowledge and logical reasoning by methods of observing, analysing, debating, and even rigorous thought experiments. As a logical extension, study of mind requires an investigative technology most suited for it. Vivekananda exemplifies this fact:

   Every science must have its own method of investigation.... It is comparatively easy to observe facts in the external world.... but in the internal world we have the (trained) mind as the instrument.... Yoga is the science which teaches how to get these (internal) perceptions. (*Vivekananda,1992a*[15])

There is also a quantitative dimension to the number of variables that influence a phenomenal event in a given discipline. For example, the number of variables influencing a social event are more, and virtually impossible to control by experimental designs. In such instances, a large amount of precisely recorded descriptive data, both cross-sectional and temporal, are essential.

Recent Findings

Recent findings in developmental psychology, in humans and animals alike, demonstrate the natural emergence of science-skill in infants and children, a few examples of which are recorded below:

- The brain grows through the activity of exploration and problem solving (Mehlhorn *et al*., 2010[9]; Qin *et al*., 2004[11]). Even emotional reactions such as empathy contribute to brain development from childhood to adult hood (Greimel *et al*., 2010[4]).
- Mental activities bring about changes in the brain. For example, it is possible to intentionally control seizure discharges through EEG-bio-feedback (Tan *et al*., 2009[14]), and psycho-therapeutic experiences are associated with fMRI changes in the brain (Beutel *et al*., 2010[2]). In this context, it is interesting what Vivekananda said in the 1890s:

  (*By this Pranayama practice) In many of you certain physical changes will come, ... Do not be afraid .... The whole body will have to be rearranged as it were. New channels for thought will be made in the brain, nerves which have not acted in your whole life will begin to work, and a whole new series of changes will come in the body itself. (Vivekananda, 1992b[16])*
- When given extended opportunities to conduct repeated trials, most children, even in their pre-school years, begin to show increasing use of more effective strategies for designing and interpreting experiments, using new strategies when it was appropriate (Lehrer & Schauble, 2006[7]). Babies behave like little scientists, continually over-throwing theories that no longer fit evidence, testing their theory of the world against evidence around them (Gopnik, 2003[3]).

These findings suggest that man is hard-wired for a scientific manner of acquiring knowledge irrespective of what he chooses to study. The mental process that happens in the mind between intentional perception and the consequent knowledge involves scientific process.

In other words, man has innate science-skill.

Few Corollaries of Innate Science-Skill

An obvious question is how to explain the wide variability in its manifestation in man. In this section, I propose a few concepts to account for and explain this variability based on common observation. In man, the innate science-skill manifests along two wide continua, the dimension of precision, and dimension of need and interest. In addition, the practice of science is influenced by a dimension of objective-subjective nature of phenomena. Besides, people vary widely on yet another dimension -- ability to make sense of what is observed

and communicated. Each of these dimensions follows Gaussian distribution, just like all natural phenomena or any other human ability.

- The dimension of precision relates to an individual's ability to observe, reason, and verify in a consistently precise manner. At one end of the continuum are the scientists and philosophers, and at the other are the others. But, the mind can be trained to acquire precise perceptual abilities. As Vivekananda says:

  The Yogi *has a science that manufactures an instrument for the study of his own mind, and that instrument is in the mind... (attaining) power of finer perception (by practice of* Rajayoga*) which no instrument will ever be able to attain. (Vivekananda, 1992c[17])*

- In the 'dimension of need and interest', different individuals use their science-skill selectively according to their needs and interest. This science-skill has survival value and progressively evolves from generation to generation at both individual and social levels. For example, even an illiterate expert sailor uses his science-skill to learn and refine his navigational skills. For managing other areas of his life, he relies with faith on the knowledge of others, whom he believes as experts.

  Perhaps, it is this dimension of man's innate science-skill that has yielded codes of moral/ ethical conduct that are roughly similar across cultures as means of safeguarding the long-term welfare of a society and its members. Similarly, man's persistent enquiry about the cause of all existence might have contributed to evolution of religious and spiritual practices whose core tenets across cultures are similar. As Vivekananda (1992d[18]) says:

  For thousands of years such (extraordinary mental) phenomena have been studied, investigated, and generalised, … and the practical result is the science of Raja Yoga ...waiting to be verified... Rajayoga does not deny facts which are difficult to explain. [Emphasis added; Vivekananda, 1992d[17])

- In the 'Dimension of objectivity-subjectivity', external events in the physical world that can simultaneously be observed by other observers exemplifies the objective end of the continuum. Either spontaneous or introspectively generated subjective and intuitive experiences exemplify the subjective end. Disciplines like psychology and psychotherapy deal with both types of events. In this respect, scientists of mind have to evolve the techniques of recording and analysing subjective data. What is important to note here is that objective and subjective sources of facts are complementary and not mutually exclusive. For example, many discoveries in physical sciences originated from the subjective experiences of its originators. Investigative techniques suitable for subjective data are being developed and used by investigators studying anomalous phenomena, which can be found in publications of the Society for Scientific explorations, for example, [see http://www.scientificexploration.org/journal], and in *Rajayoga,* as quoted earlier (Vivekananda, 1992a[15]).

- Within the realm of the dimension of objectivity-subjectivity is the 'Dimension of communicability and understandability.' In this dimension, people vary widely in the degree of their ability, either innately or by training, to have certain types of subjective experiences or to understand communicated facts or concepts. For example, almost all people are able to understand information about either physical objects they have seen, or ideas expressed at the 'concrete' level. But, all may not be able to understand either the subjective experiences they have not experienced, or abstract (subtler) ideas. For example, even in physical sciences, certain data or abstract concepts cannot be understood by all, as in the case of the emission- absorption bands in a spectrum of light, a concept which does not make any sense to the un-trained.

Two life events exemplifying understandability of subjective experiences

Two events in my life narrated below exemplify this problem of understandability of subjective experiences. The first was on a morning in 1951 when my mother narrated to me her dream the previous night in which there were two large trees, and one of them fell down. She was apprehensive about the life of my cousin brother in the village, 40 km away. We two cousins were the only surviving boys among the male descendants of our grand-father. The same evening, a relative from the village brought the news of my cousin's unexpected death the previous night. The second event occurred one night in October, 1963, when I was sound asleep in an Air Force barrack near Allahabad. I got up suddenly before midnight with a sense of vague dread, but could not recollect any dream. This dread continued the whole night. Next morning, around 10 o'clock, I received a telegram that my father had died early the previous night at my native town 1500 km away.

The events reported above may not make any sense to those who have not had similar experiences. But, for those who have, they are comparable to objective data. There are abundant research reports on such phenomena in journals of Society for Psychical Research (www.spr.ac.uk/) and American Society for Psychical Research (www.aspr.com/). Bem (2011[1]) has recently reported proof of such phenomena.

A curious fact of human life is the inseparableness of mind and subjective experiences, which cannot be observed by others as objective events. Here, replicability of subjective experiences in different people at different times accords them the same degree of credibility as objective observation does in physical sciences. Therefore, the science of mind must necessarily include subjective experiential events as data within the framework of its scope and develop suitable technology to study and analyse them. In this respect, the characteristic of repeatability/replicability constitutes an important component of science of mind. The role of this replicative credibility as a component of scientific corroboration is described by Singh and Singh (2003[13]).

This repeatability/replicability contributes to the scientific basis of spirituality, as well as to faith in science, by the credibility that 'given the same conditions, the same events will repeat.' This is the basis of faith that is hidden in science (Knight, 2005[6]). This faith is the basis of common man's faith in science. Moreover, scientific communication is impossible without the scientist's faith in it. Thus, science and faith are inter-dependent in the field of scientific knowledge.

This repeatability/replicability is also the basis of the science of *Rajayoga* in the sense that whosoever practices Rajayoga according to its teachings will be able to perceive and experience states similar to those reported in the past by others who succeeded in doing so.

Another facet of the objectivity-subjectivity issue is reflected in an old adage, "objectivity is commonly agreed upon subjectivity". In this context, it is interesting to note that the standard concept of 'objectivity' in science is what has been commonly agreed upon by consensus among a large body of eminent philosophers of science and scientists as an essential requirement in scientific practice. Hopefully, a similar body of experts in future may also accord equal status to subjective data.

Current status of scientific study of mind

Currently, the study of mind is being practiced in two independent directions, as if the two bodies of knowledge are incompatible. The first concerns studies in conventional psychology whose research trend is heavily weighted towards brain and behaviour. The second concerns studies of such anomalous phenomena as ESP, telepathy, reincarnation-type cases, mind-matter interaction etc., and their investigators are busy refining their investigative techniques.

Both these streams have kept their distance from yet another stream, the science of mind, perfected over millennia in India by practitioners of *Rajayoga*, as quoted earlier by Vivekananda (1992d[18]). He also said:

All our knowledge is based upon experience. What we call inferential knowledge … has experience as its basis…. (truths taught in all religions) are the results of the (direct) experiences of particular persons... The teachers all saw God; they all saw their own souls; they saw their future, they saw their eternity, and what they saw they preached ...What right has a man to say he has a soul if he does not feel it, or that there is God if he does not see Him? (parenthesis added; Vivekananda, 1992e[19])

What is required now is to integrate all the facts, concepts, and techniques of investigation available in the three streams of knowledge mentioned above by cross-fertilisation. Moreover, concepts from *Raja Yoga* and related philosophy are capable of explaining the phenomena in the other two streams of psychology.

A few examples are provided below in respect of mind-body relationship, energy like nature of mind, and the scientific nature of *Rajayoga* as a form of spiritual practice.

Mind-body relationship

Vivekananda says:

With the exception of the (immaterial) Soul, the rest is all material, but the mind is much finer matter (than the rest). The material of which the mind is composed goes also to form the subtle matter called 'Tanmatras,' which become gross and make the external matter. Thus, between the intellect (inside) and the gross matter outside there is a difference in degree. (Vivekananda, 1992f[20])

For example, sage Vasishta (Mitra, 1891[10]) says "…body is the creation of the mind …" The concept of grossness-subtleness in Indian philosophy can be analogously understood as: ice being grossest and water-vapour being subtlest. That is, the mind and physical body are on a continuum of degree of subtleness, explaining psychosomatic relationships.

Energy-like nature of mind

Vivekananda said in the 1890s,

The whole of this universe is composed of matter and force; ... everything that we call matter, solid and liquid (and even gas), is the outcome of one primal matter which Sanskrit philosophers call 'Akasha' or ether; and the primordial force, of which all the forces that we see in nature are manifestations, they call 'Prana.' It is this Prana acting upon Akasha, which creates the universe. It is this Prana by which we breathe and by which the circulation of the blood goes on; it is this energy in the nerves and in the muscles, and the thought in the brain. All forces are different manifestations of this same Prana, as all matter is a different manifestation of the same Akasha (Vivekananda, 1992g[21]).

This description is analogous to currently debated Big-Bang theory of Cosmology, with its empty space containing fields of energy, eventually evolving into observable material universe etc. This concept of *Pranic* energy in mind can explain many phenomena ranging from 'will-power' to mind-matter interaction, even 'placebo-effect,' and the mind's field-like properties, evidence for which has begun to accumulate. For example, a review by Jahn *et al*., 2007[5], demonstrates the effect of intent on random binary sequences. Concept of 'will' is used by Lohne and Severinsson (2006[8]) reporting about patients with spinal cord injury. I have earlier (Shamasundar, 1999[12]) described the field-like qualities of the human psyche.

Scientific nature of spiritual practice of *Rajayoga*

Rajayoga is a popular method of spiritual practice for achieving self-realisation by direct experience, through control of the mind. It is described in a simple and lucid manner by Vivekananda (1992h[21]). I find that the pattern of essential facts and concepts that emerge from the above description has similar counterparts in the well-recorded biographical accounts of saints like Sri Ramakrishna Paramahamsa, Paramahansa Yogananda, and Lord Buddha. This pattern also fits in well with the hypothetico-deductive model of science as formulated below, offering a paradigm for future consideration:

1. Religion serves as a textbook of spiritual science, and spirituality is the experimentation proper. Saints are spiritual scientists.
2. The spiritual scientist dedicates his own life as a laboratory for the experiment, with the mind as the instrument. Introspective meditation, along with other proven methods of practices, constitute the methodologies, under the guidance of an expert who has successfully conducted the experiment.
   - The experiment starts with the objective (goal) of realising the Ultimate Cause of all existence in one's life by direct experience.
   - The predictions that a successful spiritual experimenter can subjectively verify are: (i) the practitioner's perceptual and intuitive ability transcends the senses and become subtler; (ii) he acquires control over the activities of his mind and body, and (iii) he has access to intuitive knowledge.
   - Objectively observable noble qualities like truthfulness, compassion, love for all, manifest in the experimenter/subject; and others experience varying degrees of positive influences in his presence.
   - Sincerity of purpose determines the outcome, just like in any other human endeavour.
   - The spiritual experimentation is an ongoing process.
3. In contrast to the present day scientists of the natural and social sciences, practitioners of spiritual science never enjoyed material benefits like salary, research grants, or pension for their months or years of dedicated labour. This absence of monetary/material gain for the labour involved may perhaps explain (i) why spirituality as a science has never been an attractive vocation either among the masses or scientists; and (ii) why scientists of the mind seem so far reluctant to attempt studying their own minds by meditative techniques available.

Task Ahead

For the purpose of developing the science of mind in an integrative manner as explained earlier, consideration of the following factors is essential:

1. The current practice of using methodologies borrowed from physical sciences

has to be counterbalanced by development and use of technologies for studying subjective and experiential data. This can be done by accepting subjective, introspective observation as important sources of data. Methods of qualitative comparison of subjective data have to be developed. However, methods of studying structural changes correlating with subjective experiences must continue to evolve.

2. We must examine the concepts and investigative techniques available in the Indian philosophies that are suitable for adaption and experimental verification. Since genuine spiritual practitioners may not volunteer as subjects for study, copies of their spiritual diaries, if maintained, can be used as sources of data for preliminary studies. Better still, the investigators themselves would do well to choose to study their own minds by adapting methodologies available, as in certain meditative, *Pranayamic*, and Buddhist practices.
3. Future textbooks in the field of mental health should include chapters on such topics as studies of anomalous phenomena, theories and practices relating to spiritual science.

Concluding Remarks [See also Figure 1: Flowchart of Paper]

1. The core principles of science demand precision and effective management of bias.
2. Man has innate science-skill for acquiring knowledge. But people vary in the manifestation of this skill along two dimensions: (i) one, of precision-crudity according to the intellectual ability; and (ii) the other, of need-based interest, different persons being at their creative best in different areas/disciplines of their choice. Dimensions of objectivity-subjectivity of events, and ability to make sense of observations influence the practice of science.
3. Science and faith are inter-dependent.
4. Religion and spirituality are sciences.
5. Scientific study of mind and related phenomena requires developing suitable techniques of investigating subjective experiences, which can be borrowed from *Rajayogic* theories and practices.

Take home message

Further development of science of mind requires development of techniques of recording and analysing subjective experiential data. Core features of ancient Indian spiritual practices like *Rajayoga* do fit into the standard hypothetico-deductive model of science. Its theoretical concepts and investigative techniques can be useful as new paradigms for scientific study.

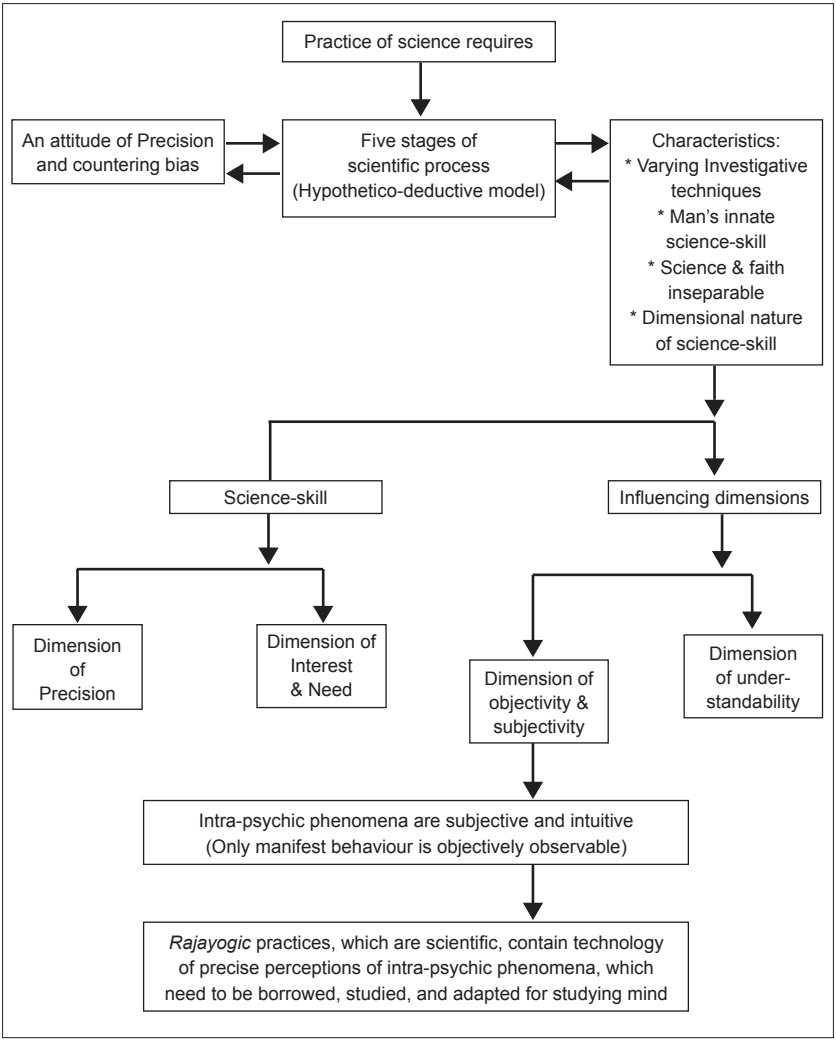

Figure 1: Flowchart of the paper: Studying mind as a science

Conflict of interest

None declared.

Declaration

This is my original unpublished work, not under consideration for publication elsewhere.

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Questions that the Paper Raises

1. In studies of spiritual practices, how do we distinguish subjective experiences and intuitive revelations that may resemble hallucinations or delusions?

2. How do we calibrate the sensitivity of the mind as an instrument of study?

3. How do we motivate mental health/brain scientists to study their own minds?

About the Author

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