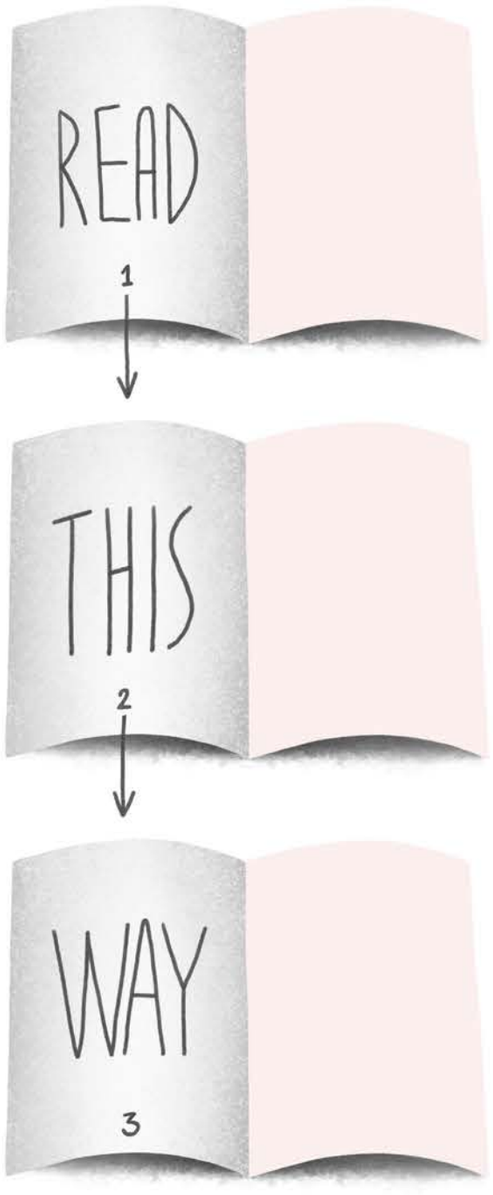
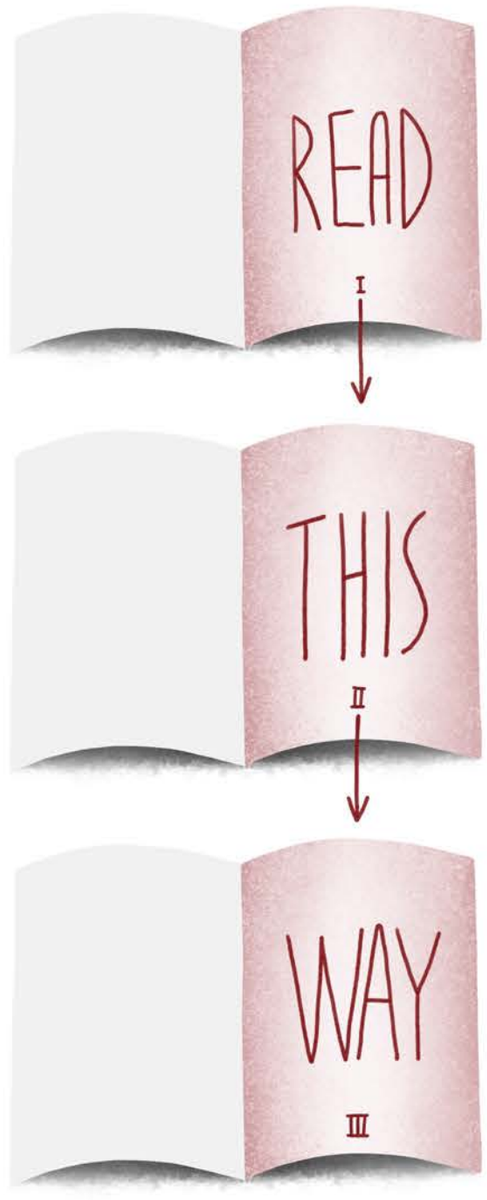
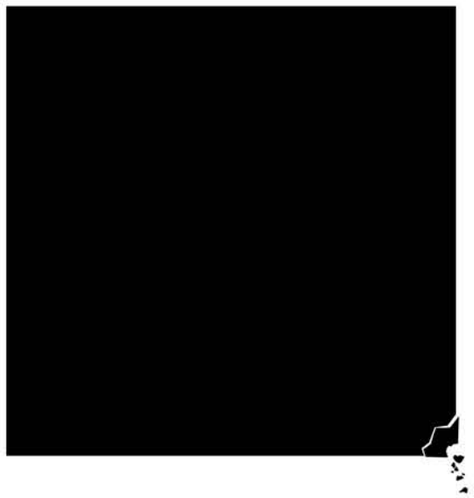
Dear Reader,

You are having in front of you three books about light. Up to the *Concluding remarks* (signed by both authors), on your left-hand side you will find an illustration of scientific thinking regarding light, whereas on your right-hand side you will discover a religious thinking approach on the topic. Please, read both sides carefully, chapter by chapter, in the order you prefer, and try to trace the correspondances arising from considering both ways of thinking, in their dialogue. If you follow our advice, a third book will emerge at the crossroads. This third book, a fruit of our endeavor fulfilled in the mirror of your thought, is written by you.





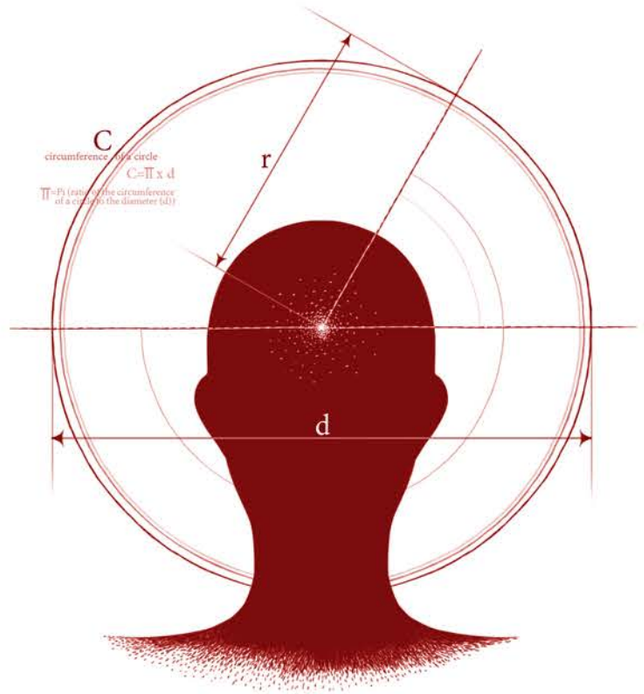


Scientific experiment

Physics is an experimental science. Its investigations are firstly motivated by experiences, which are reconfirmed by experiments. Experiments play the role of reassessing experience under controlled and repeatable conditions. The idea is then to separate the important and relevant aspects of the phenomena under investigation from the less-important details, by constructing a simple, visual 'model' to that end. Using the predictive power of this 'simplified reality,' this is tested against cleverly designed new experiments.

Models and construction

For a physicist, a model should capture the essence of the phenomenon. With low input complexity, a good model should be able to reproduce experimental results in a satisfying manner. Low input complexity means that the model should rely on only a few free (undetermined) parameters, here labelled appropriate parameters. A reduced number of appropriate parameters is confirmation of the fact that we have captured the essence of the phenomena, based on a few postulates only. If the model has multiple appropriate parameters, a physicist loses interest and confidence in it, since the generally high output complexity of such models would allow us to describe practically anything merely by choosing proper values for the appropriate parameters. American physicist Richard Feymann has joked about this, claiming that a model with four free parameters



Religious experience

The term 'religion' derives etymologically from the Latin *re-ligō*, where *re-* means 'again' and *ligō*, 'to tie', 'to bind', 'to join', 'to unite'.

By definition, religion entails restoration of the *connection* with the divine, which equates to the (re)discovery of unity in multiplicity and the revelation of continuity in discontinuity. Paradoxically, the *connection* with the principle *outside* the network of existence is achieved *inside* the network, through a renewed, unclouded view of all parts in their connectedness. The principle of the network, envisioned as 'the One beyond' or as 'nothingness', 'vacuity', is completely different from any one part of the network, on one hand, and from the network taken as a whole, on the other.

This is why what we call 'religious experience'—the privileged subject (or object?) of religious studies—is difficult, if not impossible, to delineate. Religion recoups or claims harmoniously to reintegrate all the dimensions of human being by reinstating their connection with the divine. This *modus vivendi* causes the practitioner to live within a 'religious horizon', where advancement along the path becomes the only vector for action or activity. I do not speak here about popular and fragmentary religious practices, but rather I refer to that guiding aim of religious discourse that is recognised by the practitioner as the ultimate expression of the final achievement.

One cannot regard the 'religious experience' as an experiment. The practitioner

could reproduce even an elephant, and with a fifth parameter you could even make its trunk move.

As physics evolves and knowledge acquired through experimental investigations and modelling is applied in technology, we gain increasingly sophisticated and sensitive apparatus for experimenting with new phenomena or refining our previous experiments. In doing so, we detect not only the very essence of the phenomena, but also more subtle aspects and connections. The simplified reality of our basic models is not enough to capture these new aspects and consecutively the model has to be refined and made more complex. This does not mean however that the number of free parameters has to be increased. On the contrary, the free parameters of the basic models are measured and fixed using new and more precise experiments and new appropriate parameters are used in the upgraded modelling paradigm.

To make this clearer, let us look at an example. We have all learned about gases and the basic laws that link their volume, temperature, pressure and mass. Understanding these laws was first motivated by our experiences: we noticed that inside a container when the temperature rose, the pressure increased too, and the same thing happened when the amount of gas increased but the temperature remained constant. A first step towards arriving at the simple law of gases was to consider multiple well-controlled experiments under simple conditions and using quantitative investigation. These experiments led us to the empirical law of simple gases. Our desire to discover the cause underlying these laws made us consider a simple model for gases, named the ideal gas model. In this model one assumes that gases are made up of point-like simple particles moving about randomly inside the container and colliding with the walls. The pressure was thought to be the result of these collisions, and the temperature was associated with the total kinetic energy of the particles. In this simple model, interactions between the particles were ignored, and it was assumed that the particles interacted only by colliding. In order to write up this model mathematically, linear proportionality between the total kinetic energy of the particles and the temperature of the gas was required, and this was the free appropriate parameter of the ideal gas model. Historically, the mass of the particles, which was required when estimating the pressure from collisions, was also an appropriate parameter. This simple visual model, together with the basic assumptions of classical mechanics, was sufficient in order to reproduce mathematically the simple laws of gases. Thanks to technological advances in the precise measurement and control of pressure, temperature and mass, and thanks also to the ability to investigate gases under higher or lower temperature and pressure conditions, we found that the simple law of gases is merely a first approximation for a much more complex reality. In fact, the laws derived for these ideal gases proved to be valid only within the limit of high temperatures and for rarefied gases. More sophisticated experiments proved that under high pressure

himself does not know exactly when his or her attitude or behaviour is 'religious' or not. He or she usually tries to connect all the aspects of his or her life to 'that horizon,' endeavouring, as far as possible, to maintain his or her connection with the principle (envisioned either in its 'personal' qualia or as a privileged state).

For the initiate who has reached the final stage of the path, every moment of existence is an expression of this 'religious' connection with the principle and with a multiplicity that has been restored to unity by virtue of the same principle.

Consequently, 'religious experience' can be delimited (or even 'produced') only at the incipient stages of the path, when the world is still fragmentary and the unifying power of the principle has not yet been recognised or recouped.

For the initiate who has attained the final stage of achievement, the whole of existence is 'religious', the shift being radical and religiosity having vanished as a *desideratum*.

Religious experience is never repeatable in its personal and personalised manifestations. Consequently, it cannot be reproduced or analysed, and it cannot be taught in the manner we are accustomed to employ when passing on knowledge via our educational system.

Nonetheless, we find 'religious schools' and 'religious discipline' as initial constructs meant to act as guiding instruments for the neophyte.

One can be trained in the doctrine, theology or philosophy of a particular religious school, but this learning process does not guarantee the emergence of 'religious experience'.

Religious experience, unlike scientific experiment, is unique and unrepeatable even for the same practitioner during his or her lifetime.

It is impossible to generate 'similar conditions', for the simple reason that every person is different and has a different context. Consequently, although the teachings might seem similar, they are assimilated, interiorised and practised in unique personalised forms, resulting in unique personalised experiences.

How, then, is religious experience communicated and how can an initiate transfer his or her 'knowledge' to his or her disciples? Is there any repeatable form helpful in reiterating at least the preconditions for enabling the emergence of such an experience?

A spiritual leader will not teach the disciple by providing precise data or recipes, nor will he/she reiterate his/her experience by transferring to or producing it within the disciple. Since every aspect or manifestation of life is unique in its spontaneity, the spiritual master guides the disciple in such a way as to enable him or her in order to discover his or her own personalised and authentic connection with the principle that is the source of any genuine religious experience.This is why there are spiritual techniques taught by spiritual guides that are repetitive forms designed to prepare and/or intensify the inner state and mental or bodily processes of the practitioner in order to advance along the path. Even

and low temperatures gases become liquid, and the connection between temperature, pressure, mass and volume is far more complicated than was initially believed. New and sophisticated experiments helped us to set the values of the free parameters in the ideal gas model. As a result of the new experimental findings, the ideal gas model was rendered more complex through the introduction of the previously neglected interaction between particles, and the assumption that these basic particles (molecules) are not point-like, but rather have a finite volume. Physics thus developed the real gas model, where the new appropriate parameters were related to the interaction strength between the molecules and their volumes. The story continues to this day, using increasingly precise experimental measurements and elaborating increasingly realistic models.

On postulates

In order for a model to become successful in physics it is desirable that it should also have universal applicability features. This means that a useful model is applicable to many other phenomena that might be closely related to each other or sometimes even to very different ones. The idea goes back to our desire to explain as much as possible of the surrounding universe employing only a few basic assumptions. One may of course question the soundness of this assumption, but this is how our science and logic work. German mathematician Kurt Gödel, and subsequently numerous other logicians, showed that you cannot construct any consistent theory where everything is proven. For any theory one needs *axioms* that govern our logic, and *postulates* that assume unproven truths about the Universe. Sometimes we do change our system of postulates and a new perspective on things or even on our universe results. However, there can be no complete logical system without postulates, and science definitely cannot prove everything. In this sense, we must admit that science remains a part of our life, rather than our life being a chapter of science. In order to have a language or common framework to describe things, or even an abstract construct like geometry, we rely on postulates. Interestingly, there is an even more astonishing result, which holds that in every consistent framework of axioms there will always be statements that might be true, although we cannot prove it. To be more precise, this is astonishing only in the case that we choose to postulate that everything that is true can be proven scientifically.

Is (the methodology of) physics rigorous?

A logical framework defined by postulates appears more elegant and more appealing to science the fewer simple assumptions it employs, and thereby we reach a high degree of complexity, which means that we can approach and understand a larger part of our 'world' through them. Although it is not as clear as it is in mathematics, in physics we also construct our theories and build our basic apparatus using postulates. We seldom accept new things that cannot be proven by the existing postulates. The problem, unfortunately, is that we do not

techniques such as these are usually personalised, since they are configured according to the level and abilities of the practitioner.

There are also common rituals or practices designed to bring community members together, but they are usually performed by reiterating a previous significant event. Discussing theophanic encounters in the Hebrew Bible, George Savran introduces the concept of 'externalisation': he or she who experiences a theophanic vision needs to communicate its message through visible signs to his or her group or community in order to commemorate and symbolically reiterate the event.

If religious experience cannot be reproduced and repeated as an experiment in the laboratory, once the preliminary techniques or practices have been assimilated, the practitioner may prepare the conditions for the emergence of an intense experience by provoking a particular state, a process called 'incubation' in the academic jargon. Even so, preparation alone does not ensure the emergence of an authentic religious experience.

Models and deconstruction

The religious practitioner will not focus on particular 'fragments' that have been reified as 'objects' of his or her experience. On the contrary, he or she will strive to escape the 'part' in order to grasp the principle and to return to the mundane realm with a renewed view. Within a religious experience, what is at stake is not understanding and analysing 'objects', but detachment from their common meaning and rediscovery of their connection to the source.

This is why the religious attitude entails a radical deconstruction of any envisaged model intended to explain parts or their concatenations.

Every explanatory model is conventional only. Embracing it is equivalent to moving aside from the path that leads to *the principle of all models*.

The assumption is that once united with the principle, the initiate may grasp the spontaneity of emergent worlds and dimensions, deploying infinite possibilities of existence and consequently infinite models (for someone who insists on extracting and conceptualising fragmentary mechanisms of generation). Such an attitude cannot coexist with the radically different gaze of an illuminated mind that receives all manifestations in their unique spontaneity, without imposing artificial, constrainable links for the stake of creating a useful model. Once the attention has fastened on the model, one loses the very spontaneity of the present and remains in the human-like petrified shadow of the principle.

On continuity and discontinuity: object and subject

How do we delimit an 'object' from the religious perspective? What is the particular relationship between 'subject' and 'object' in religion? Which is the meaning of 'continuity' and 'discontinuity' in religious thought?

The world of a religious practitioner at an incipient stage of the path is fragmentary.

do so at the outset, but only occasionally, when we encounter difficulties in moving forward. When you learned physics, you probably encountered this many times. The teacher would say: 'we assume' or 'let us assume', or sometimes more politely: 'it is not absurd to assume'. A scientist is immediately aware at this point that either the teacher is not prepared logically to argue the new idea in terms of the earlier accepted assumptions, or that he or she is announcing a new postulate. Unfortunately, the students too are usually not aware of this, and if they accept such statements without hesitation, then they will probably further accept everything else in the teacher's logic. The main problem with physics is that this is the way we teach it, and even for a highly trained physicist it is not always clear what our basic postulates are, or what his or her working postulate-frame is. It is mainly due to this non-rigorous logic that most high-school years students lose interest in physics.

Physics and physicists are therefore not as rigorous as mathematicians. Unlike in physics, in mathematics we usually know what our basic postulates are, we are seemingly always aware of them, and we do not come up with new postulates while the theory is being developed. If we do, then we completely change our framework, as happened when we moved from Euclidean to Gauss-Bolyai-Lobachevski geometry. However, the apparently non-rigorous nature of physics was not an impediment to its astonishing progress. Most of the time, its being non-rigorous has helped physics to sidestep problems that would take too much time and energy to solve in a rigorous manner. There is a classic joke, which illustrates this nicely:

A physicist and a mathematician die and arrive in front of St. Peter to be judged. St Peter tells them that they are both inveterate sinners, they were selfish and concentrated only on problems useless to mankind, and so he condemns them to hell. But admitting that both of them worked hard and did not have time to enjoy life, he nonetheless offers them a last chance. St Peter points at a tunnel, at the end of which stands a beautiful lady, and tells the two scientists that before going to hell, they can have a date with that lady. But there is catch, he says: you can reach the lady only according to the following rules: in the first minute, you will travel half the distance to her, in the next minute, you will have to traverse half the remaining distance, and so on. In each following minute, you will cross the half the remaining distance. On hearing this, the mathematician despairs and starts to make his way directly to hell, saying that it is obvious even to a novice that this is an infinite series: to reach the lady would require an infinite amount of time, and so he gives up. The physicist makes a small calculation and concludes that in approximately ten minutes he will come to within about 5 cm of the lady, and for him that is quite enough! The joke captures the main difference between how physics and mathematics operate. Being non-rigorous can be useful for dealing and handling with the complexity of the Universe.

In his or her quest for the principle beyond multiplicity, he or she is trying to reconfigure the 'map' of existence while advancing under the guidance of a spiritual leader or spiritual entity. The closer he or she comes to the final stages, the more he or she regains the image of a reality that is intertwined by virtue of the unifying principle. The parts are no longer separate and there are no gaps between them.

When we divide the continuum of reality into 'objects', it is an epistemological process in which we depend on the habitual concepts or preconceptions we have inherited and which we perpetuate at the level of linguistic meanings, since language as a means of communication needs to petrify and instantiate 'common meanings' as conventions.

Once a particular meaning has been ascribed to an 'object' by virtue of this meaning, we excise and differentiate a body from the context, imprinting this new, limited and functional meaning on every occurrence of the term.

Consequently, implementing a change at the level of the content and meaning of 'objects' that have been detached from their non-conventional context produces a shift in the paradigm for approaching and understanding the world. It is clear that the nascence of 'objects' is univocally correlated to the 'subject' that creates and 'names' the respective 'objects.'

The endeavour of the religious practitioner when approaching and identifying himself or herself with the principle, first through resemblance and ultimately through a unitive experience, will redefine the 'fragments' of the Multiple as connected with their divine principle. In such a way, the 'objects' (and the 'subject') are emptied of mundane, conventional meanings and usage, and are ultimately redefined as expressions of the divine presence. Since the principle is the primal cause, i.e. the principle of the whole, nothing escapes its unifying force. The presence of the principle hic et nunc culminates in the 'objectless' perception of the initiate.

The discontinuity discernable in the incipient stages is replaced by the continuity of the divine presence.

Is (the study of) religion scientific?

If science's aim is to produce knowledge for the material welfare and conservation of the human species, then the answer is *no*. Science needs to reinvestigate its goals in accordance with a more complex preliminary understanding of what humanity is if it is to create and further sustain a real strategy for development, taking into account all the dimensions which define humanity and its environment, without privileging corporeal and material aspects.

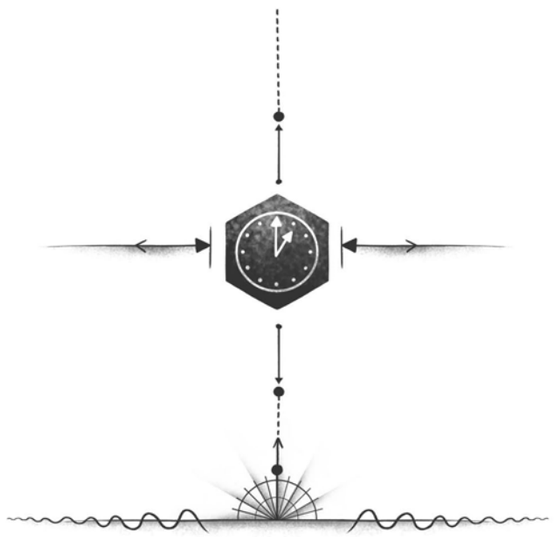
If the scientific community is prepared to include within the realm of science transformative knowledge acquired through dimensions of the mind other than those that can be investigated in the laboratory, then the answer is *yes*.

On the other hand, researchers in the field of the *Humanities* should

The stake: 'self-reflective' knowledge of the Universe

Occasionally, in physics there is time to take a short break from adventures and become rigorous again, otherwise we completely lose control of what we have postulated and what logically results from the earlier accepted postulates. Sometimes we also need to alter or adjust the old postulates and construct a new framework if we are to proceed further. Not realising what our postulates are can seriously fool us, and apparently clear and simple things might appear paradoxical in the light of new experiments. In my opinion, this was the case with the theory of relativity and quantum mechanics. The lack of any rigorous foundation for concepts such as the geometry of space, coordinate systems, and time created a great deal of unnecessary confusion and simple things began to look rather complicated or even paradoxical. One of the aims of the present dialogue is to highlight these issues, to present a rigorous construction for the basic apparatus of physics, and thereby to find some correspondence with totally different paradigms of knowledge, such as the philosophy of religion or even art. Here, I plan to provide a simple introduction to some conceptual questions in modern physics for the benefit of non-physicist readers interested in a logical construct, trying not to assume too many things and to clarify everything that we do assume.

The ultimate aim of physics is of course to find answers to everything what we experience in the Universe. It is an extremely risky ambition, which can lead to a totalisation of the postulates of physics as a discipline. The stakes are probably very high, and, as we may already have convinced the reader, even impossible. On the one hand, we have to take into account that our framework will always depend on the chosen sets of postulates, and that there can be no ultimate theory without postulates. On the other hand, in our approach to understanding the world around us we often use different systems of postulates, here illustrated by the complementary viewpoints we present in this dialogue.



re-orientate their attention and efforts in order to contribute efficiently, using their own instruments, data and knowledge, to the task of 'mapping the mind'. Most of the research in this field deals with 'relics' without being able to participate to present-day debates about who we are and what we need.

If approached in the right way, the spiritual heritage of different religious traditions could provide important scientific results, which might significantly change the way we understand knowledge, mind, and education. This aim can be achieved only within a community of researchers open to a joint effort with their counterparts—scientists—and who are also capable of approaching any religious tradition in a non-discriminatory, non-intrusive and non-ideological manner (which would seem almost impossible!).

The aim: 'spiritual technology'

Religion is not in opposition to technology. On the contrary, religious traditions develop specific techniques and devices meant to ease or accelerate mental processes, to provide vehicles for enabling travel to other dimensions, to reconfigure the functions of the body and its environment in connection with specific transformative mental processes.

Such 'spiritual technology' has not been treated scientifically *per se.* As a prerequisite, this stage supposes advanced scientific study of the mind's mechanisms as they relate to the body and as they are described in religious practices and discourses.