The Nature of Contemplative Science and Some Prospects for its Future Development

ABSTRACT: Contemplative science is usually conceived either as an introspective investigation of the meditative mind or as following methods of other scientific disciplines to study the mind in meditation. Here, I suggest a conception of a comprehensive contemplative science that includes both. Drawing on Paul Hoyningen-Huene's work in the philosophy of science, I develop an understanding of contemplative science based on the idea that science consists of systematicity in nine dimensions of scientific activity. Hoyningen-Huene uses everyday knowledge as the main contrast to scientific knowledge, claiming that the latter is more systematic than the former. Since the contemplative traditions already exhibit a high degree of systematicity, these traditions are used as an additional contrast. This results in a description of the nature and current state of contemplative science and an indication of how it should develop in the future in order to become more systematic and thereby more scientific.

1. Introduction

What is contemplative science? The word "contemplation" is tied to Western intellectual history. In order to define it, we can look to classical sources and point to contemporary equivalents of it, such as meditation, the definition of which is receiving increasing attention (Lutz et al., 2007; Lutz et al., 2015; Noa, 2015; Schmidt, 2014). Defining "science" provides more of a challenge. Philosophers of science have, in recent decades, more or less given up on the attempt to state what the nature of science is in a way that covers all disciplines that aspire to be scientific (Hoyningen-Huene 2013, p. xi). However, this is not stopping anyone from referring to "contemplative science". Currently, the term is used in two different senses (Laumakis, 2011). Sometimes it means, roughly, the study of the contemplative mind using the methods of other sciences (Farb, 2014; Komjathy, 2015, p. 26). At other times, it means using contemplative methods to study phenomena within consciousness, or consciousness itself (Luisi, 2009, p. 66; Wallace, 2007). In the first instance, contemplation is taken as an object to be studied by external means; in the second, it itself provides the method. I will refer to these as external and internal contemplative sciences respectively.

External and internal contemplative sciences might indeed be fundamentally different, or it might be that they are sufficiently similar to be considered one discipline. However, in order to compare and possibly unite them within an overarching idea of contemplative science, it is necessary to rely on a comprehensive theory of what science is. Given the state of the philosophy of science, such an endeavour seems problematic. Luckily, Paul Hoyningen-Huene's (2013) recent book, *Systematicity: The Nature of Science*, provides a solution.

Hoyningen-Huene's account has several advantages. It is able to describe the way in which scientific knowledge is special and why it is valuable and successful and therefore warrants higher recognition than other forms of knowledge. It provides a comprehensive account of science, aiming to include "everything that is taught at a research university" (Hoyningen-Huene 2013, p. 9), i.e. natural sciences, mathematics, social sciences and the humanities. It integrates the strengths of the main scientific ideas through history (see below) and includes insights from classical and contemporary thinkers. Thomas Kuhn and Karl Popper are not treated as opponents but rather as philosophers who agree that critical testing is an essential feature of science. From Feyerabend, Hoyningen-Huene has learned to remain sensitive to the diversity and historical embeddedness of our knowledge practices and his theory has also been received favourably by the scientific community (Carrier, 2015; Ruse, 2013; Thalos, 2015). Most importantly, however, it provides us with a framework that is both sufficiently general to accommodate contemplative science, which is currently interdisciplinary, as well as specific enough to give indications as to how it should further develop. And, as I will try to show, Hoyningen-Huene's theory allows for a definition of contemplative science in a broad sense that includes both the internal and external forms.

Hoyningen-Huene's claim is, as the title of the book suggests, that being scientific consists in being systematic. Based on this fundamental idea, he develops a comprehensive idea of science. The theory is contrastive, meaning that it relies on a procedure of contrast as a means of definition, and the contrast to scientific knowledge is everyday knowledge. The aim is to show that scientific knowledge is *more systematic* than everyday knowledge. How does contemplation relate to everyday knowledge? Some forms of contemplation may be said to be part of daily life, such as calmly watching a sunset or dwelling on the memory of a loved one. Deeply contemplative experiences may enter into everyday life on rare occasions; for instance, flow states can be compared to meditative states such as jhana (Yates, 2015 et al., p. 231). However, in everyday life, there is no practice of accurately describing, explaining and reproducing such states. The task of contemplative science includes doing

exactly that in a systematic way. However, there exists a family of contemplative traditions: historically connected communities sharing certain spiritual practices that are transmitted either orally or through texts. These already embody a high degree of systematicity, and thus a further contrast needs to be made between those traditions and a more universal contemplative science.

This contrast will be one of the main focuses of what follows. As will become evident, there are some ways in which contemporary contemplative science surpasses the systematicity of the traditions, but in other ways the traditions are still much more thorough. By contrasting them, we can indicate the potential inherent in a future contemplative science. It should also be clear, however, that a future contemplative science will not necessarily have to set aside or replace the traditions. One of the main potentials of contemplative science is exactly that of including the knowledge of the traditions within a more comprehensive whole, which is indeed part of what it means to be systematic. Just as increased knowledge of human physiology has increased performance in sports without eliminating the traditional forms of sport, so could contemplative science increase the effectiveness of the practices within the contemplative traditions without eradicating them.

2. On the Term "Contemplation"

For reasons of space, I can only give a very brief description of the meaning of the term "contemplation". Its historical origin lies in the ancient Greek and Christian culture (Wallace, 2007), and I will presuppose that there are enough similarities between the contemplative traditions to warrant speaking in a general way when comparing them to science. For example, it can be shown that there are structural commonalities between the progression of *dharana*, *dhyana*, and *samadhi* as found in Patanjali's *Yoga Sutras* and the progression of discursive meditation, acquired contemplation, and infused contemplation in the Christian tradition. I understand the practice of contemplation simply to be the practice of different forms of meditation. Defining meditation is an ongoing project and clarifying the term "meditation" will also contribute to clarifying what contemplative science is.

As stated above, contemplation can be studied using the methods of other sciences but it also provides its own method. The two can be seen to be related to each other in the following way. Contemplation cannot be an object of study without someone following or having followed a contemplative method. We can use contemplative neuroscience as an example. In the basic sense of the term, "contemplative method" is the same as meditation. There could not be a contemplative neuroscience without a meditating subject. Hence,

contemplation as a method, as a prescribed set of practices that a subject follows, is more fundamental. Contemplation can take place as an activity without it being taken as an object of study, but without contemplation as an activity, there would be nothing to study. However, there is a way to understand contemplative science as including both the internal and external senses of the term. Internal contemplative science relates mainly to the dimension of *description* discussed below (3.1), while external contemplative science could be seen to be mainly concerned with the *epistemic connectedness* (3.6) of contemplation to other areas of knowledge, such as neuroscience. Together they are part of realising the *ideal of completeness* (3.7). It is this *comprehensive* sense of contemplative science that I will be concerned with unpacking in the next section. Hence, a comprehensive contemplative science essentially consists of meditative investigation embedded within a larger endeavour of systematic inquiry. This approach is similar to neurophenomenology (Bitbol, 2012; Gordon, 2013; Thompson, 2007; Varela, 1996) but is broader and situated within a recent theory of science.

3. The Nine Dimensions of Systematicity in Contemplative Science

Science is perhaps the part of culture that has had the biggest overall impact on human life over the past century, especially via the way it has led to the development of new technology. We have seen radical changes in the ways we communicate, in medicine, transportation, etc. All these technologies were conditioned by scientific progress. Yet it has proven very hard to say exactly what science *is*. The last of the main influential thinkers in the philosophy of science in the last century was Paul Feyerabend, who argued against the claim that all science is centred around a clearly defined *method* (Feyerabend, 1975). Since then, philosophers of science have been focusing on the particular nature of the different disciplines that lay claim to being scientific and have either explicitly or implicitly been taking the view that an overarching idea or nature of science that is inherent in all disciplines does not exist.

Here, I will follow Paul Hoyningen-Huene's recent suggestion that the nature of science is *systematicity*. Systematicity means different things for different disciplines and, in Hoyningen-Huene's analysis, expresses itself in *nine* dimensions. Before I consider these in relation to contemplative science, I will give a short summary of the view of the history of science and what motivates Hoyningen-Huene's approach.

The original conception of science consisted of a combination of the idea of *certain knowledge* and *deductive proof*. This conception lasted from antiquity up until around 1600, when the idea of deductive proof was replaced by the idea that science was based on a certain

method. This "scientific method" was understood as the procedure that, if followed strictly, leads to certain knowledge. Historically, the method was *induction*: formulating natural laws on the basis of observation. In other words, there was a shift from rationalism (deductivism) to empiricism (inductivism). Around the middle of the 19th century, the notion that scientific knowledge is certain started to fade as Euclidian geometry and classical mechanics became relativised. From about 1900 until our own time, the mark of science has been *falsifiability*, combined with the idea of science as method. But this only lasted until the works of Kuhn and Feyerabend, who showed that the idea of science as being limited to following a strict methodical procedure is not credible. What remains today as the mark of science is only its *falsifiability*.

However, since most, if not all, empirical knowledge is *falsifiable*, it seems we cannot say that there is anything special about scientific knowledge. Is it possible to save the idea that scientific knowledge is somehow special and deserves higher recognition than other human knowledge practices? Can we be more confident when giving financial support to scientific rather than non-scientific endeavours? Are worldviews which are built on science better than those which are not? If falsifiability is the only thing we can point to, we cannot say yes to either of these questions, since both scientific and non-scientific knowledges are fallible. Hence we need a theory of science that can account for why it is a special kind of knowledge.

Hoyningen-Huene intends to build a theory of the nature of science that *includes* the central features of science in history, while at the same time being informed by the most recent philosophy of science. For instance, he does not think it has been fruitful to use the notion of *pseudoscience* as a contrast to *real* science (Hoyningen-Huene, 2013, p. 199). The reason for this is that defining pseudoscience relies on using a demarcation criterion and no such criterion has been established since Popper suggested that falsifiability is what distinguishes scientific and pseudoscientific claims. Popper's thesis is problematic because it allows for pseudoscience to remain scientific by proposing further testable hypotheses and, furthermore, "it is far from clear that, for example, astrology or Freud's psychoanalysis are indeed pseudoscientific when judged according to Popper's standards" (Hoyningen-Huene, 2013, p. 202). Rather, Hoyningen-Huene points to everyday knowledge as both the basis of and contrast with scientific knowledge. His thesis, which is inspired by Einstein's claim that science is a refinement of everyday thinking, states that: "Scientific knowledge differs from other kinds of knowledge, in particular from everyday knowledge, primarily by being more systematic" (Hoyningen-Huene, 2013, p. 14). In order to substantiate this contrastive claim, it

must be shown that science in one way or another is *more* systematic than everyday knowledge. As it turns out, however, it is not possible to give a single definition of "systematicity"; it means different things in different disciplines and there are different ways of being systematic *within* the same discipline. Initially, Hoyningen-Huene relies on our general sense of being systematic – such as being orderly, comprehensive, methodical and so on – and thinks we will recognise enough of a family resemblance between the different forms of systematicity to call them all systematic.

Furthermore, Hoyningen-Huene's theory is descriptive and based on already established scientific disciplines. Since I aim to use his framework as a basis for suggesting how contemplative science should develop, I will take it to have normative significance, something that systematicity theory is indeed open to (Hoyningen-Huene, 2013, pp. 196-199). In addition, the attempt at formulating what the nature of contemplative science is will be based on insight into what other sciences are like. For the current state of research, it is an open question whether contemplative science has a specific methodology of its own or whether it should, rather, be based on already established methods found in other sciences; this question will not be settled here. However, I will make specific suggestions on how to move the field forward in a way that adapts already existing methods for the purpose of contemplative science. Again, I will use the contemplative traditions and not just everyday knowledge as a contrast to contemplative science. The bar of systematicity is already set quite high by the traditions but there are certain differences between the modern standards of science and those of the traditions and uncovering these will give indications of how a contemplative science should develop in order to become even more systematic.

3.1 Descriptions

Doing science starts with, or is based on, descriptions of the particular objects of the science in question. Chemistry describes chemical substances and their interactions; political science describes different forms of organising society. What does contemplative science describe? According to the way I have defined contemplative science above, contemplative science is based on contemplative practice and so what it describes can be said to be all aspects of that practice itself. Part of this is describing the *effects* of contemplative practice. These effects are usually most apparent to the mind of the practitioner (they are "private," though they can also manifest in different, externally observable ways). Because of this, the object of contemplative science can be rather elusive. We cannot simply go out into nature and

describe what we see, expecting that just about everyone would see the same things without much effort. However, we can still *systematically describe* what we experience in meditation. It is with such systematic description that contemplative science begins.

What is systematic description? One typical example is *classification*, which consists of organising objects into exclusive categories. One can also create taxonomies, establish a nomenclature, create periodic systems, employ quantification, make empirical generalisations, or simply undertake an accurate historical account of an event. In some cases, it is possible to create an axiomatic system. Such a system consists of basic sentences that are logically independent, consistent, simple and, as far as it is possible, complete. It is important to note that *descriptions* can be either historical (unique or singular) or non-historical (universal), while the events described are themselves always historical. The moment Caesar crossed the Rubicon is an event that is just as singular as the dissolution of salt in water in a specific laboratory at a specific moment in time. In order to formulate laws, it is necessary to make generalisations. In the case of salt dissolving in water, it makes sense to disregard the singular aspects of the laboratory setting; we want an overview of the lawful interaction of chemical substances rather than how this particular compound interacted with another one at this particular point in time and space. Chemistry is based on such empirical information but formulating laws requires abstraction. But in the case of Caesar, we want to know the particular historical details and it would be absurd to look for any general lawfulness between a leader of a nation crossing a river and universal, historically relevant, consequences.

If we look to the contemplative traditions, we will find systems of classification, taxonomies, and nomenclatures that are focused on describing the nature of the human being, particularly its mind, and how it relates to a larger cosmos. Often there is an underlying theme of a fundamental change that can take place in the human's life, such as bringing the human being into union with God or the end of cyclical existence. Periodisation based on this underlying theme and its accompanying anthropology/cosmology is also common, such as the many systems of describing the different stages of meditative development. Take, for example, the description of jhana in the Pali canon. These are divided into those with and without form (rupa) (Shankman, 2008). There are four jhana with form, described according to certain factors such as happiness, equanimity, one-pointedness, etc.; the progression through the jhanas is interwoven with the ultimate aim of reaching nirvana.

However, it is doubtful whether the systems of axiomatisation in the traditions can be said to be as precise, methodologically strict and universal as Euclid's elements or the Peano

axioms of natural numbers. Additionally, the different traditions are bound up with historical or legendary personalities rather than neutral empirical reports. On the Buddhist path, one seeks to attain the same realisation as the Buddha. In Christianity, we have ideas such as *imitato dei* and *theosis* (Chirban, 1986) but we also have different paths of practice that are tied to specific contemplatives, such as the Jesuit training based on Ignatius of Loyola's spiritual exercises (Loyola, 1991). How far are the practices attempts at imitating contemplative experiences that are uniquely tied to certain personalities? It is hard to tell. Did the Buddha actually reach nirvana? Can we make sense of such a statement outside of the traditional Buddhist framework? Again, it is hard to tell and this is one of the main points where the contemplative science inherent in the tradition differs from the contemplative science of the future. It would have to be more systematic than the traditions in investigating these questions by comparing all traditional accounts and creating new, universal taxonomies based on first person experiential reports.

One reason the contemplative traditions are not based on such reports is probably that people used to be more willing to accept the authority of religious leaders and teachers. Another reason is perhaps that the traditions were more orally based. Today, standards have shifted. We want to know who experienced what, at what time, as a result of which practices and so on. Accordingly, the contemplative science of the future will be founded on actual reports and the categories we use to describe the experiences will have to be as neutral and phenomenologically grounded as possible. Having actual reports increases the transparency of the research; without them, we cannot know which experiences are real and which are merely based on what traditional texts state or what one thinks should be the case (a problem reported in Full et al., 2013). The descriptions should be phenomenological and neutral in order for experiences to be compared. One could envision a modern hybrid of the monastery and the laboratory where crossbreeds of contemplatives and scientists undertake a series of "Shamatha projects" (Wallace, 2000, p. 187) and similar endeavours; in other words, meditating through different stages of development, recording it with as much detail as possible, comparing notes and doing large-scale data analysis (as pioneered by the International Shamatha Project). There are many ways of going about this, but I think the general idea is compelling: the contemplative science of the future will differ from the one found in traditions by being documented. Empirical generalisations are often implicitly present in the contemplative traditions ("having done practice A and B, I got results X and Y"); in the future they will be explicit. Contemplative science will be based on contemporary experience, i.e. the actual and not legendary lives of human beings, and its claims will be

based on analysis of actual data and not on anecdotal evidence. In addition, since such analysis is likely to involve statistics and computational modeling, the level of quantification will be higher than in the traditions. Hence, the systematicity will be higher in that respect as well.

Such work is underway. William James set an example with *The Varieties of Religious Experience* (1902). In 1979, Jack Kornfield published an empirical study of meditation experience based on vipassana (Kornfield, 1979). In 1988, Daniel Goleman published *The Meditative Mind: The Varieties of Meditative Experience*, and, based on this, created a taxonomy of altered states resulting from meditation (Goleman, 1979). In the book *Transformations of Consciousness*, Daniel Brown mapped correlations in contemplative development in the *Mahamudra*, *Vishuddhimagga* and the *Yoga Sutra*s (Brown, 1986). In Germany, Harald Piron has developed the so-called Meditation Depth Index, based on interviews with authorised meditation teachers from different traditions (Piron, 2001). Many other studies could be mentioned (for instance Ataria et al., 2015; Full et al., 2013; Ospina et al., 2007, Shear, 2014). Qualitative methods such as microphenomenological (or elicitation) interviews (Petitmengin, 2006; Vermersch, 1999) have a special potential in that they help subjects describe their experiences objectively and with precision (Bitbol & Petitmengin, 2013). The method is already in use within cognitive science and is currently being applied in ongoing meditation research projects.

3.2 Explanations

Describing phenomena is only one part of science. Descriptions do not usually address the connections between phenomena. That is the role of explanations. While descriptions answer the question of *what* something is, explanations answer the question *why* something is. We can describe a stone falling to the ground but we may also want to know why it falls to the ground, why it takes the amount of time it does before it reaches the ground and so on. Or if we have a car that will not run, we need to find an explanation for that in order to make it run. We can understand such a case according to the Hempel-Oppenheim scheme of explanation. According to this, we start with a particular situation that is to be explained. The situation is simply: we have a car here that will not run. Why is this so? We would explain this by finding a regularity that covers the situation we are in, such as that a car without fuel never runs. We could now check to see if the car has fuel; if it does not, we would know what to do.

There are many forms of explanations. The simplest one, which is involved in the example above, is an empirical generalisation. Based on a series of events, we formulate a regularity that expresses the connection between phenomena. But we can also find explanations on the basis of larger theories, and that is often what is needed for us to get a sense that we really understand something. We could say that from experience we know that cars without fuel will not run, but we could also ask further: why is it the case that cars without fuel will not run? In order to answer that, we would have to get into the mechanics of the car and bring in larger theoretical frameworks such as physics and thermodynamics.

If we look at contemplative practice, we can see similar explanations at work. When doing a *focused attention* (FA) form of meditation, it can be noticed over time that the ability to concentrate on the object increases. Based on experience, we can say that there is a lawlike relationship between the amount and vigour of the practice, and the development of the skill of keeping attention on an object. But in order to go beyond empirical generalisations, we have to look to theories that can explain the regularities.

A common framework of explanation both in Eastern and Western traditions is that the human mind is impure and that contemplative practice will remove the impurities so that the true nature of the human being can manifest. In contemporary contemplative science, there are hardly any consensus models but researchers sometimes draw on the traditions in order to formulate explanations. Using a traditional framework, one can, for instance, appeal to samprajanya in order to explain why concentration becomes stable through FA-practice (Lutz et al., 2007). Samprajanya is understood as meta-awareness that checks to see if the mind is focused on the object. Through FA-practice, samprajanya becomes stronger and so the gaps between the moments of continuous focus decrease until the mind becomes unwavering and absorbed in the object of focus; awareness and meta-awareness merge.

It might also be possible to find mathematical relationships between the qualities of the mind as revealed in and through meditation. Here is an example proposed by Shinzen Young: suffering equals discomfort divided by mindful awareness (Young, 2013). This is a suggested linear approximation that most likely has limited applicability. Nevertheless, this formula expresses that if one has a high level of mindfulness, then it is possible to have a very low degree of suffering, even if one experiences a high degree of discomfort. This “law” could be based on empirical generalisation but it can also be explained through a more complex theory about the relationships of the elements of the formula. We could, for instance, look into the meaning of mindfulness and its relation to equanimity, which could lead us to a deeper understanding of the relationship between equanimity and suffering,

realising that through resistance (non-equanimity) we increase discomfort and hence suffering.

Is there any unique way of explanation that belongs to contemplative science? In some ways contemplative activity encourages one to take the stance of a natural scientist to the mind, becoming aware of the basic constituents of moment-to-moment awareness and to find invariant patterns embodied in the constituents. Contemplative science also overlaps with psychology insofar as references are made to the subconscious activity of the mind. And since it deals with the self-interpretation of the human being and the ultimate aims of existence, it is related to the humanities. Here, I will not attempt to characterise the way contemplative science explains further. It has drawn on and will continue to draw on different forms of explanations, involving, in principle, all forms of explanations from the other sciences in order to give a systematic account of the meditative experiences and transformations of the human being. Furthermore, providing more systematic explanations than the traditional ones is predicated on having access to more systematic descriptions. It may be possible to undertake in-depth comparative work and find invariable structures of contemplative development in the traditions, and then start developing an all-encompassing, cross-tradition explanation of the features of these structures – that would indeed be an increase in the level of systematicity.

3.3 Prediction

Making predictions is part of everyday life. Often they are based on folk psychology, such as when it is said that suffering builds character. Based on such regularity, we would predict that someone who suffers will develop character. But how systematic is such a statement? What is it based on? Suffering can also traumatise. When is suffering traumatising and when does it build character? To answer this in a scientific way, we could carry out a large-scale statistical analysis, develop theories and models of suffering and then come up with a well-founded prediction for a particular situation.

The earliest forms of prediction based on systematic observation that we know was undertaken by the Babylonians, who, for religious reasons, put great value on being able make astronomical predictions. We do not know much about the earliest origins of contemplative practices; maybe ancient peoples started observing regularities in their minds. The general pattern of predication in the contemplative traditions is of the form: if you do practice A, you will get result X. A slightly more complex prediction would be: if you do

practice A, you will get the result X, but only if you balance practice A with practice B. If you do not balance A with B, you will get result Z and not X. Concretely, such predictions can be found within the Buddhist tradition, where śamatha (focused attention) practice is balanced with vipassana or insight practice. Without such a balance, it is possible to get into blissful states of absorption but the ultimate aim of nirvana will be unreachable (Catherine, 2008). Such claims are based on the traditional frameworks of understanding and the know-how developed in meditation communities throughout history. In other words, they are based on regularities observed by contemplatives and the theories they developed.

Contemporary contemplative science has made some advancement over the traditions when it comes to systematic prediction, but mainly in areas related to the effects of meditation on mental and physical health (Eberth & Selmeier, 2012). Currently there are, for instance, no established models that can predict the time and effort it takes to reach certain stages of concentration. In the traditions, there is also a discussion of whether or not meditative development is gradual and predictable or sudden and in principle unforeseeable. For that, theories seem to be needed that are built on systematic, empirical observation. Again, this will help ground contemplative science in actual experience rather than traditional doctrines, which are open to doubt with regards to how many have actually gone through the development described in them. One way ahead is to build computer simulations of meditation that can make accurate predictions based on a complex set of factors (Van Vugt et al, 2015). It remains to be seen how fruitful such approaches will be. Human development is, in general, difficult to predict. Let us say we make a computer model of how school children function. Could we ever feel confident that our model could predict which changes to their education would be most beneficial? Or do incalculable cultural factors, creativity and whims of the will make such endeavours futile? Only time will tell if it is possible to develop an understanding of "the mechanics of the soul" that can successfully predict the outcome of meditation practice.

However, such concerns should not put a stop to the exploration of modern tools of theoretical modeling. One of the main questions that can come up when one encounters the contemplative traditions, which can at times be extraordinary, is whether or not people actually reach, let us say, the highest states of jhana, if not nirvana. The traditional approach to this is to trust the teacher and the tradition. In contrast, the modern mind requires that claims be supported by systematic observation. How long would it take for a person with this or that psychological constitution to have an initial glimpse of jhana based on a specific set of practices? Maybe this is the wrong question to ask – maybe it is even detrimental to

contemplative practice – but such questioning can potentially lead to the discovery of yet unknown, objective patterns of meditative development.

3.4 Defence of Knowledge Claims

Scientific knowledge is a kind of knowledge that is justified in a way that makes it more trustworthy and hence more valuable than other forms of knowledge. Part of this is how science validates and defends its claims. We tend to say that a claim has been confirmed by data. However, an influential standpoint in the philosophy of science has been that of Popper, who claimed that we never really confirm hypotheses through data. The background for this claim is the problem of induction. We can never be certain that a theory is true based on a finite number of observations. What we can do, however, according to Popper, is to falsify a hypothesis by deducing its empirical consequences and checking what the data says. If the data contradicts the empirical consequences, the hypothesis is falsified. What sets science apart from pseudoscience, according to Popper, is that science proposes hypotheses that are falsifiable. One of the main theoretical problems for this position is that we cannot single out *one* hypothesis to test; one hypothesis is always embedded within a network of other hypotheses and when we do a test, we are effectively testing them all. If the data contradicts the empirical consequence of a hypothesis, we cannot, therefore, really tell which of the hypotheses is the real culprit. Furthermore, Kuhn is known for having opposed Popper's view on sociological and historical grounds. Kuhn argued that science is much more dogmatic than Popper thought, and has not actually followed the normative ideal that Popper set out.

This is not the place to go into a long discussion of Popper and Kuhn. What Hoyningen-Huene suggests is that we can bracket the specific issues related to this discussion and be satisfied with noting that science is indeed concerned with the elimination of error. Both Popper and Kuhn would agree on this. Human knowledge is fallible but there are ways to make us less prone to making mistakes. Science differs from everyday knowledge in its attempt at eliminating errors, or finding ways of validating knowledge, because it is more systematic. One example is the double blind experiment. In order to find out whether a medical substance works, one has a group of test subjects take a pill containing the substance, and another group, the control, is given a pill that does not. The test will indicate whether or not the medicine has causal relevance. In order to eliminate subjective influences such as the placebo effect, neither the subject nor the persons handing out the pills know whether or not they actually contain any medicine. Such procedures may have flaws but the point here is that

it is easy to recognise that the degree of systematicity in the elimination of error in such cases is much higher than in everyday life.

To my knowledge, the contemplative traditions have not developed any means to empirically test knowledge claims with a degree of systematicity that can rival modern methods. Indeed, traditionally contemplative practice was, and to some extent still is, bound to the authority of a teacher or guru. The guru can, of course, encourage potential students to test certain claims for themselves but in such a context "test" does not mean large-scale statistical analysis with control groups and so on. Such tests are, however, common when investigating the actual effects on contemplative practice on the human mind, though, again, this is mostly limited to clinical studies.

However, double blind tests and similar procedures cannot be used without difficulty to investigate which meditation techniques are most effective for developing, for instance, concentration. Meditation cannot be prescribed like a pill; it always involves the mental activity of the meditator, which is susceptible to many factors that can exert causal influence. And even though competent meditation teachers may be employed to instruct subjects, some teachers may be better at teaching certain types of personalities than others. Human interaction is a complex back and forth process and it is difficult to judge when a meditation instruction has been adequately transmitted and made use of appropriately. Furthermore, although it is possible to compare groups using a meditation technique with one that does not, in general it is difficult to find a rigorous measurement of mental states such as concentration. However, such measurements could potentially be developed by comparing traditional frameworks from separate cultures and experiential reports. Since such a procedure would compare independent accounts, it would be possible to eliminate errors that are due to cultural influence and bias.

Another problem is that of priming. If a teacher or text states that one should have a particular experience as a result of a practice, it could be that the effect is actually produced by that suggestion and not the meditation technique. Methods for eliminating error due to priming will have to be developed. However, it could also be the case that meditation practitioners are unable to notice a certain effect because they are not looking for it. Telling someone how to become aware of something will in some cases be essential and it can be challenging to do that without being suggestive. A contemplative science of the future will have to find ways of dealing with such problems; it has to find ways of systematically eliminating bias and priming without withholding information about how to look for the

results of practice. In other words, there need to be established procedures of challenging and defending knowledge claims.

3.5 Critical Discourse

A further way of dealing with fallibility is by having social institutions ensure that knowledge claims have passed through critical review. A central institution in contemporary science is the anonymous peer review of scientific articles. Through this process, experts are given the opportunity to approve of, suggest improvements on or reject the scientific articles of their colleagues. One might point to certain problems with this process, such as that an established scientist can reject new and controversial ideas anonymously, but it is certainly a way of validating knowledge that is more systematic than in everyday life.

Scientific journals are indeed the main channel of critical, scientific discourse in our society. Beyond publishing peer-reviewed articles, they also involve book reviews, articles on the current state of research and discussions. One should also not forget about the central role of editors in critical discourse. Editors may choose not to send articles to peer review and the choice of reviewer is not unimportant, especially if the article in question is controversial. In other words, scientific journals exist within a social network that ideally ensures that knowledge claim have been tested by peers but which can also lead to a certain form of conservatism.

Other examples of social institutions that are involved in critical discourse are research colloquiums, lectures, and conferences, which are all arenas of dissemination and discussion of scientific knowledge. Here we can also mention big science, which comprises of large-scale operations, sometimes involving thousands of scientists working together. Recent examples are the Human Brain Project and the BRAIN Initiative.

In the contemplative traditions, we also have social intuitions that have served a function similar to those in contemporary science. One is the already mentioned teacher-student structure but we can also say that the religious community, the sangha, has served the function of critical discourse. One example is that of the formal discussion between monks in Tibetan Buddhism. Furthermore, the contemplative traditions often involve the critique of the works of others. One can also find equivalents to contemporary conferences in the Buddhist tradition, such as the Samye Debate, a two-year debate (ca. 792–794 CE) on whether enlightenment is gradual or sudden (Gregory, 1987).

The amount of critical discourse within contemporary contemplative science is growing and it already takes part in the established research institutions. However, we have yet to see anything like The Human Brain project. Contemporary technology allows for a degree of interaction between researchers that is not found in the contemplative traditions but this is a potential that is, currently, mostly untapped. What we do see, however, is a greater interaction between the traditions than ever before and this is indeed a step in the right direction.

3.6 Epistemic Connectedness

Consider the following example: a company wants to know whether or not mindfulness practice makes its workers more productive. One way to go about this is to is to ask some of the employees who have done mindfulness practice if they think that it makes them more productive. Another is to have one group of employees practise mindfulness for a set amount of time and measure whether that increases productivity. Is this science? It can be hard to tell. It does mean an increase in systematicity in comparison to just asking one employee. Could the results be published in a scientific journal?

One possibility is to say that science differs from non-science through not being driven by any practical aims – the scientific pursuit of knowledge is done for the sake of knowledge itself. However, much of what we ordinarily count as science does indeed have direct practical value. This is particularly evident in the field of medicine. For instance, an increase in our understanding of cancer will often have obvious practical application, and much of the research within medicine is driven by practical concerns.

Does this mean that the study in the above example of mindfulness in business would be scientific? Hoyningen-Huene thinks we can rule that out while still saying that medical research as it is done today is still scientific. This is made possible by the introduction of the notion of *epistemic connectedness*. Scientific studies *explicitly draw on* and *contribute to* the whole field of human knowledge. In the case mentioned above, the study would become scientific if was embedded within a larger endeavour of investigating the effects of contemplative practice on human performance. Mainly this would happen through being explicit about the state of research, referring to other studies and following a methodology that was coordinated with similar research.

How do the contemplative traditions fare when considered according to this criterion? Contemplative practice is traditionally highly intertwined with practical and/or religious

concerns. This is reflected in the attitude that one should not pay notice to or theorise about specific events that occur during practice, since that draws attention away from the real aim of the practice (enlightenment, awakening, etc.). Similarly, intellectual activity is sometimes considered to be detrimental to practice (Lodrö 1998, 19), or ultimate truth is seen as non-conceptual, which means that intellectual activity, such as looking for epistemic connections for the sake of it, is at best secondary. Using the case above as an analogy, we could say that this is similar to using a systematic procedure just to increase productivity and viewing attempts at embedding this within the knowledge of the scientific community as a waste of resources.

It should be obvious, then, how a contemplative science of the future will be different from the traditions. It will be more interested in finding epistemic connections between contemplative practice and science. We are already witnessing this, particularly within the field of contemplative neuroscience. It is also conceivable that science ultimately will support contemplative practice in the same way that contemporary research in medicine is contributing to human health.

3.7 Ideal of Completeness

Science is more systematic than everyday knowledge in that it strives towards completeness. In daily life we are satisfied with bits and pieces of knowledge that fit our purposes. We may know the name of a handful of birds and how to recognise them but we do not travel the world in order to create taxonomies to cover *all* living organisms. Similarly, we usually have some rough ideas about the qualities of substances such as water, salt, and sugar but we have to look to chemistry if we want to find a complete list of the basic chemical elements that such compounds are made of. Science strives towards creating a *theory of everything*, i.e. a theory that, in as much detail as possible, is able to explain everything. Though such a theory might be impossible, it is clear that science differs from everyday knowledge in that it is striving towards completeness.

In the contemplative traditions we do find attempts at describing all relevant aspects of contemplative practice, such as in *Yoga Sutras*, the *Visuddhimagga*, but also in more recent encyclopedic projects such as *The Treasure of Knowledge* by Jamgön Kongtrul (2003-2011), which contains an account of the creation of the cosmos while being centred around the path of liberation. What we will not find within the contemplative traditions, however, is an account of nature in a way that is anything close to that of modern science (consider, for

instance, the human genome project). The contemplative traditions do not contain a concept of a gene (and they could not, since they do not contain the concepts of DNA and RNA). Insofar as genes influence contemplative practice, and there is no reason to think that they do not, contemplative science should strive towards incorporating such knowledge. If gene expression can be influenced by contemplative practice – and there is indeed some initial evidence that this is the case (Kaliman et al., 2014) – then that is also a kind of knowledge that should be incorporated.

In relation to contemplative science, the ideal of completeness can be expressed through the attempt of creating *comprehensive*, *cross-tradition maps of historical and contemporary contemplative experience*, and, furthermore, through the attempt at coordinating this project with the rest of scientific knowledge.

3.8 Generation of New Knowledge

Coming up with new scientific knowledge, such as creating hypotheses or models, can be a somewhat chaotic process. It involves creativity, playing around with ideas and even dreams (Read, 1995). At times insight seems to come out of nothing; a solution to a problem may suddenly just dawn on us. This aspect of the generation of new knowledge is not significantly different in scientific or everyday situations. However, there are other aspects of the generation of new knowledge where science goes about matters in a way that is significantly different from everyday situations.

One of the most famous examples in modern science can be found in astronomy, where the generation of knowledge was based on technological innovations such as the telescope and large-scale collection of data. We see similar examples of this in relation to the Large Hadron Collider, which gathers data about particles through having them collide at high speed. New knowledge is also generated by drawing on innovations from neighbouring disciplines, as, for example, when historians look to chemistry in order to date historical objects through carbon-dating, or when psychologists draw on neuroscience to explain mental disorders.

The way one gathered data in the contemplative traditions was simply through contemplative practice and subsequent oral traditions. Investigating the mind non-stop on a month-long retreat is of course not something that is undertaken in everyday life. An innovation that led to the gathering of new data could arguably be said to have happened when the Buddha recommended vipassana to be used in conjunction with śamatha. In other

words, innovations on the level of technique could be said to be similar to introducing new instruments in science.

In relation to contemplative science, we could imagine generating new knowledge by looking at data from across the contemplative traditions and also through correlating data from contemplative practice with that of brain science, something that is well underway already. Another example is to use methods from psychology to investigate claims such as the assertion that meditation accesses the subconscious (Strick et al., 2013). In such ways, contemplative science generates new knowledge through interdisciplinary means.

3.9 Representation of Knowledge

The final dimension describing the systematicity of science concerns how it represents the knowledge it generates. In the formal sciences, we find symbols and formulas that are used to succinctly represent ideas and mathematical relationships. Graphs are used as a visual means to represent connections. In chemistry, we find millions of numbered compounds and different ways of referring to them either in ordinary language, with letters and numbers, or through models that express more of the structure of the elements involved. The most famous model in chemistry is probably the double helix structure of DNA. For everyday knowledge, ordinary language is usually sufficient; the level of complexity of the knowledge is not so high as to require the invention of a new means of representation and since the amount of detail is low, there is no need to find ways of getting a view of the whole through graphs or other visual means.

The contemplative traditions have mainly relied on ordinary language to represent their knowledge. However, symbols and visualisations are also used. One particularly striking example is the ten Sefirot of the Kabbalah (Scholem, 1965), which depicts the creation of the universe, man's place within it and also the stages of the contemplative journey back to the source. Furthermore, geometric and symbolic representation is quite common in medieval alchemy (taken as a path of inner transformation). And the religious imagery of the traditions sometimes depicts stages of contemplative transformation, such as the Zen ox herding pictures (Yamada, 2004). Another way of representing knowledge in the contemplative traditions is that of the mandala, which has a function similar to the ten Sefirot and the ox herding pictures.

The strength of the forms of representation in the contemplative traditions is also their weakness. They are simple enough to be grasped without much specialised training, their

beauty may enliven the mind, but they are limited when it comes to describing complex relations in a detailed way. Maps that are very detailed can be difficult to put to practical use because they contain so much information that may or may not be relevant. The contemplative science of the future should be located somewhere in the middle or even be scalable. As I have tried to argue here, it should strive for more systematicity but should arguably also retain the ability to speak directly to the human being; presenting the potential of human transformation in a beautiful manner can itself be a way of bringing about, or at least inspiring, such transformation. However, this issue lies beyond the scope of this article.

4. Conclusion

I have attempted to account for what contemplative science is and to indicate ways for it to develop in the future. The main challenge for contemplative science is to become more systematic than the traditions in its treatment of contemplation. The way ahead is to continue to draw on modern science as this will increase systematicity in the manner that I have argued and now will summarise. Contemplative science will increase systematicity by being based on phenomenologically grounded descriptions and documented cases. Hence, as far as we take systematicity theory normatively, this is what it should do. Similarly, it should make use of modern methods of quantification and contemporary methodological innovations in general. Its account of contemplative development should ideally take into account all traditional models. In other words, it should seek a universal explanation of how the contemplative mind functions. Any predictions it makes should be built on empirical data and comprehensive theory. It should find ways of systematically eliminating error and follow contemporary standards of criticism. It should connect the knowledge it develops of the contemplative mind with other areas of human knowledge, striving towards an understanding of the human being and the world that is as complete as possible. This includes relating the views of the traditions to each other, to contemporary contemplative experience and to empirical science. Interdisciplinary endeavours such as contemplative neuroscience and biology may reveal new ways of generating hypotheses of the interrelation between the meditative mind and its material basis. Finally, it should find ways of representing contemplative knowledge that are both comprehensive and accessible to everyone seeking to understand contemplative development and apply it in their own life.

References

Ataria, Ataria Y., Dor-Ziderman Y., & Berkovich-Ohana A. (2015) How does it feel to lack a sense of boundaries? A case study of a long-term mindfulness meditator, *Consciousness and Cognition* **37**, 133-147.

Bitbol M. (2012) Neurophenomenology, an Ongoing Practice of/in Consciousness, *Constructivist Foundations* **7**(3), pp. 165-173.

Bitbol, M., & Petitmengin, C. (2013) A Defense of Introspection from Within, *Constructivist Foundations* **8**(3), pp. 269-279.

Carrier, M. (2015) Systematizität: Eine systematische Charakterisierung der Wissenschaft? – Kommentar I, *Zeitschrift für philosophische Forschung*, **69**(2), pp. 230-234.

Catherine, S. (2008) *Focused and Fearless*, Sommerville: Wisdom Publications.

Chirban, J. (1986) Developmental Stages in Eastern Orthodox Christianity, in Wilber, K., Engler, J., & Brown, D. P. (eds.) *Transformations of Consciousness*. Boston: Shambala.

Brown, D. (1986), The Stages of Meditation in Cross-Cultural Perspective, in Wilber, K., Engler, J., & Brown, D. P. (eds.) *Transformations of Consciousness*. Boston: Shambala.

Eberth, J., & Sedlmeier, P. (2012). The Effects of Mindfulness Meditation: A Meta-Analysis. *Mindfulness* **3**(3), pp. 174–189.

Farb, N. A. S. (2014) Can Contemplative Science Bring Meditation to (Western) Life? in Schmidt, S., & Walach, H. (eds.) *Meditation. Neuroscientific Approaches and Philosophical Implications*. Heidelberg: Springer, pp. 243-260.

Feyerabend, P. (1975) *Against Method.* Atlantic Highlands: Humanities Press.

Full, G. E., Walach, H., & Trautwein, M. (2013) Meditation-Induced Changes in Perception: An Interview Study with Expert Meditators (Sotopannas) in Burma, *Mindfulness* **4**(1), pp. 55-63.

Goleman, D. (1979) A taxonomy of meditation-specific altered states, *Journal of Altered States of Consciousness*, **4**(2), pp. 203–213.

Gordon, S. (ed). (2013) *Neurophenomenology and its Applications to Psychology*. New York: Springer.

Gregory, P. N. (1987) *Sudden and Gradual*. Honolulu: University of Hawaii Press.

Hoyningen-Huene, P. (2013), *Systematicity*. Oxford: Oxford University Press.

James, W. (1902) *The Varieties of Religious Experience*. London & Bombay: Longmans, Green & Co.

Komjathy, L. (ed.) (2015) *Contemplative Literature*. Albany: State University of New York Press.

Kornfield, J. (1979) Intensive insight meditation: A phenomenological study, *Journal of Transpersonal Study*, **11**(1), pp. 41-58.

Kongtrul, J. (2003-2011) *The Treasury of Knowledge*. Ithaca: Snow Lion.

Kaliman P., Alvarez-López M. J., Cosín-Tomás, M., Rosenkranz M. A., Lutz A., & Davidson R. J. (2014), Rapid changes in histone deacetylases and inflammatory gene expression in expert meditators, *Psychoneuroendocrinology*, **40**, 96-107.

Latham, N. (2015) Meditation and Self–Control, *Philosophical Studies*, **10**, pp. 1-22.

Laumakis, S. J. (2011) Eastern and Western contributions to «contemplative science», *Enrahonar. Quaderns de Filosofia*, **47**, pp. 93-104.

Loyola, I. (1991) *The Spiritual Exercises and Selected Works*. New York: Paulist Press.

Luisi, P. L. (2009) *Mind and Life: Discussions with the Dalai Lama on the Nature of Reality*, New York: Columbia University Press.

Lutz, A., Dunne, J., & Davidson, R., (2007) Meditation and the Neuroscience of Consciousness: An Introduction. In: Zelazo, P. Moscovitch, & M. Thompson, E. (eds.) *The Cambridge Handbook of Consciousness*. Cambridge: Cambridge University Press.

Lutz, A., Jha, A. P., Dunne, J. D., & Saron, C. D. (2015) Investigating the phenomenological matrix of mindfulness–related practices from a neurocognitive perspective, *American Psychologist* **70**(7), pp. 632–658.

Ospina M. B., Bond K., Karkhaneh M., Tjosvold L., Vandermeer B., Liang Y., Bialy L., Hooton N., Buscemi N., Dryden D. M., & Klassen T. P. (2007) Meditation practices for health: state of the research, *Evidence Report/Technology Assessment* **155**, pp. 1-263.

Piron, H. (2001) The Meditation Dept Index (MEDI) and the Meditation Depth Questionnaire (MEDEQ), *Journal of Meditation and Meditation Research* **1**, pp. 24-38.

Ruse, M. (2014) Systematicity: The Nature of Science by Paul Hoyningen-Huene reviewed in *Philosophy of Science*, **81**(2), 284-288.

Schmidt, S. (2014) Opening up meditation for science: The development of a meditation classification system, in Schmidt, S. Harald, W. (eds.) *Meditation. Neuroscientific Approaches and Philosophical Implications*. Heidelberg: Springer, pp. 137-152.

Shankman, R. (2008) *The Experience of Samadhi*. Boston: Shambhala.

Shear, J. Shear J. (2014) Meditation as first-person methodology: Real promise – and problems, in Schmidt, S. & Walach, H. (eds.) *Meditation –Neuroscientific Approaches and Philosophical* Implications, Berlin: Springer, pp. 57-74.

Strick, M., van Noorden, T. H., Ritskes, R. R., R., de Ruiter, J. R., & Dijksterius, A. (2013) Zen meditation and access to information in the unconscious, *Consciousness and Cognition* **21**, pp. 1476-1481.

Thompson, E. (2007) *Mind in life. Biology, Phenomenology, and the Sciences of Mind*, Cambridge: Belknap Press of Harvard University Press.

Young, S. (2013) *What Is Mindfulness?* Manuscript in possession of the author.

Petitmengin, C. (2006) Describing one's subjective experience in the second person. An interview method for the science of consciousness, *Phenomenology and the Cognitive Sciences* **5**, pp. 229-269.

Petitmengin, C., Remillieux, A., Cahour, B., & Carter-Thomas, S. (2013), A gap in Nisbett and Wilson's findings? A first-person access to our cognitive process, *Consciousness and Cognition* **22**(2), pp. 654-669.

Read, J. (1995) *From Alchemy to Chemistry*. New York: Dover Publications.

Scholem, G. (1965) *On the Kabbalah and its Symbolism*, New York: Schocken Books.

Thalos, M. (2014) Systematicity: The Nature of Science by Paul Hoyningen-Huene, reviewed in *Mind*, 124(493), pp. 351-357.

Van Vugt, M., Taatgen, N., Sackur, J., & Bastian, M. (2015) Modeling mind-wandering: a tool to better understand distraction, in Taatgen, N., van Vugt, M., Borst, J. & Mehlhorn, K. (eds.) Taatgen, N., van Vugt, M., Borst, J. & Mehlhorn, K. (eds.) *Proceedings of the 13th International Conference on Cognitive Modeling* Groningen: University of Groningen, pp. 252–257.

Varela F. J. (1996) Neurophenomenology, *Journal of Consciousness Studies* **3**, pp. 330–349.

Vermersch, P. (1999) Introspection as practice, *Journal of Consciousness Studies* **6**(2-3), pp. 17-42.

Wallace, A. (2007) *Contemplative Science.* New York: Columbia University Press.

Wallace, A. (2000) The Buddhist tradition of Samatha. Methods for refining and examining consciousness, in Shear, J., & Varela, F. (eds) *The View From Within*. Thorverton: Imprint Academic 2000.

Yamada, M. (2004) *Lectures on The Ten Oxherding Pictures*. Honolulu: Hawaii University Press.

Yates, J., Immergut, M., & Graves, J. (2015) *The Mind Illuminated*. Pearce: Dharma Treasure Press.