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ME, YOU, AND THE MEASUREMENT. FOUNDING A SCIENCE OF CONSCIOUSNESS ON THE SECOND PERSON PERSPECTIVE

abstract

Modern science was born when physicists started studying phenomena by recruiting mathematical explanatory frameworks. Since this appears to be the direction followed in recent studies on consciousness, philosophers have to analyze the justification of this third-person methods of explaining a phenomenon that is supposed to be entirely subjective. In this paper I argue that this kind of justification could be found in a certain interpretation of the second-person perspective and I briefly sketch how one of the most promising contemporary theory of consciousness (IIT) could fit with such an interpretation.

keywords

second-person perspective, Integrated Information Theory, science of consciousness, embodied simulation theory

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Introduction

More than forty years have passed since David H. Hubel (1974) identified the need for a Copernicus in neurobiology. Copernicus rethought the Earth's position within the Universe and, in doing so, he forced the entire intellectual community to revise the philosophical assumptions that used to characterize the scientific inquiry of the time.
More recently, Giulio Tononi (2003) referred to Galileo Galilei in his attempt to outline a scientific theory of consciousness. In fact, Galileo was the one who fathered the modern conception of science, by employing mathematical tools in order to arrange empirical observations in a predictive and quantitative framework. Thanks to Copernicus, we attributed a new position in the Universe to human being; thanks to Galileo, we discovered how to deal with the world around us.
In this article, I will argue that, in order to justify the claim that consciousness can be investigated scientifically, it's important to get rid of out-dated assumptions about subjectivity and in particular of the idea that subjective experience is entirely evident only to the subject itself. Contrary to this view, subjective experience seems to be nothing but a form of our being living creatures in a biological and social environment, and cannot be understood apart from it. After that, I will argue that a Science of Consciousness (SOC) requires a measurement and a mathematical vocabulary: Integrated Information Theory (IIT) can be a promising starting point from which a quantitative framework, in which we are supposed to set our data, can flourish.
The main idea informing this paper is that in addition to the first-person perspective and the third-person one, another one is needed: something like a second-person perspective. In other words, before invoking Galileo, we need a Copernican revolution in consciousness studies, which would allow us to rethink the current conception of subjectivity.
In §1 I argue against the idea of a first-person SOC, in §2 and §3 I claim that there must be a "bridge" between first-person perspective (1PP) and third-person perspective (3PP), and that such a bridge can be built upon the very basis of human social interactions, namely the second-person perspective (2PP). In conclusion, in §4 I explore the possibilities that IIT opens for a SOC, by considering its future prospects and problems.

1. First Person Data and the Science of Consciousness

This section addresses the assumption that subjective experience is a private phenomenon, directly accessible only to the bearer of the experience. This line of thought has been strongly defended by David Chalmers, who maintains that the task for a SOC is to integrate two different classes of data into a scientific scheme:

> As anyone who has listened to music knows, there is also a distinctive quality of subjective experience associated with listening to music. A science of music that explained the various third-person data just listed but that did not explain the first-person data of musical experience would be a seriously incomplete science of music. A complete science of musical experience must explain both sorts of phenomena, preferably within an integrated framework (Chalmers, 2004, p. 1112).

According to Chalmers, the 1PP data are irreducible to the 3PP data. Consciousness is composed of properties of the experience that are by their own nature intrinsically qualitative and private: they are not measurable with a quantitative analysis from an external point of view. Thus, the existence of such properties, famously called *qualia*, seems to rule out, *a priori*, the possibility of a traditionally characterized SOC. However, rather than engaging in this metaphysical debate, this section seeks to demonstrate how certain metaphysical assumption can in fact damage a scientific enterprise.
In Chalmers' view, phenomenal concepts like 'pain' are not reducible to functional analysis – for every functioning that could be found at the neuronal level, it can be asked why such a functioning should be associated with a qualitative feeling. In other words, according to Chalmers, traditional science adopts a reductive form of explanation in terms of functions and dispositions, but these instruments will never be enough to explain phenomenal consciousness. Therefore, a SOC must take a non-reductive form, which considers first-person data as fundamental.
I am not claiming that Chalmers denies the feasibility of a SOC. Rather, my aim is to reformulate his proposal, with special emphasis on the idea that first-person data are *irreducible* to third-person data:

> A science of consciousness will not reduce first-person data to third-person data, but it will articulate the systematic connections between them. Where there is systematic covariation between two classes of data, we can expect systematic principles to underlie and explain the covariation. In the case of consciousness, we can expect systematic bridging principles to underlie and explain the covariation between third-person data and first-person data. A theory of consciousness will ultimately be a theory of these principles (Chalmers, 2004, p. 1113).

Chalmers' assumptions lead him to the idea that, if we want to construct a SOC, we need to *correlate* 1PP data with 3PP data, and for this reason he seems particularly interested in the so-called *Neural Correlates of Consciousness* research (Chalmers, 1996; 1998; 2000).
The first problem with this view is that it requires a non-standard concept of science. Science is typically taken to look for explanations rather than correlations. The scientific method, since Galileo, requires framing observations in a mathematically characterized explanatory model. Disregarding this (historically successful) model because of a metaphysical assumption about the nature of subjectivity could end up being a risky move.
The second problem concerns the idea of considering first-person data as fundamental. As a matter of fact, subjective experience is what we want to *be explained* by a SOC, it is not what *explains*. Introducing first-person data into a SOC would bring to the *explanans* what should

stay on the *explanandum*'s level. This remark helps clarify what should be the real *explanandum* for a SOC. As far as science deals with general phenomena, and not with individual events, we are not looking for an explanation of *my* particular subjective experience. Instead, we are concerned with the possibility that a subjective point of view can exist in the first instance. A successful SOC will provide us with general laws explaining how a subjective and intrinsic point of view arises from an organism biologically and physically constituted like us. Furthermore, it must explain how it is possible that my experiences always seem to have a quality that differs from yours. In other words, we need a SOC that explains consciousness from the intrinsic perspective of an organism. This ambitious project can be carried out only if our metaphysical presuppositions do not impede the empirical work.

In the following sections, I will explore the hypothesis that our experiential states are, by their quality, open to others' experiences. Not that you feel *my* pain, but you can mirror my pain directly in your body. You can experience it without feeling it.

Again, it seems that the notion of subjectivity, with which we attempt to construct a SOC, must be rooted in the intersubjective realm and unfolded towards the social environment a living being develops in. Rather than advocating for a scientific revolution, I will argue, here, that we need to rethink the conception that locks experience in the private realm of the subject.

2. In Need of a Bridge

The need to build a bridge between the 1PP and the 3PP is not a novel claim. The hypothesis I am proposing is, at least for the basic intuitions underpinning it, akin to the approach developed by Daniel Dennett and called *heterophenomenology* (Dennett, 2003; 2007):

> Let me begin, then, with something of a bird's-eye view of what I take hetero-phenomenology to be: a bridge – the bridge – between the subjectivity of human consciousness and the natural sciences (Dennett, 2007, p. 249).

Dennett does not deny that there is a contrast between the point of view of the subject and the point of view of the observer. Rather, he simply posits that there are no *a priori* reasons for not conveying the 1PP into the domain of natural science, as traditionally characterized. Investigating the value of heterophenomenology as a methodology for contemporary cognitive science is far beyond the scope of this paper, and I shall set aside the discussion about the different methodologies which have been explored to study subjective experience.[1] It is worth noting here, though, that such a conveyance (from 1PP to 3PP) is not ruled out *a priori*. Besides, its *possibility* is strongly suggested by an empirical hypothesis that I will outline in the next section.

Looking more closely at heterophenomenology, it can be said that this method aims to single out the structure of the experience by using interviews and self-reports from the subject, in order to anchor those subjective experiences in *something* that can be detected and confirmed in replicable experiments. We arrive at this *something*, according to Dennett, through the equipment of the natural sciences. In this respect, heterophenomenology counts as a third-person methodology:

> So heterophenomenology could just as well have been called – by me – first-person science of consciousness or the second-person method of gathering data. I chose instead to stress its continuity with the objective standards of the natural sciences:

1 Related to this issue, it is worth noting the role of neurophenomenology and the second-person techniques that this school of thought is carrying out. See Varela (1996), Thompson (2007), Olivares *et al.* (2015).

> "intersubjectively available contents which can be investigated as to truth and falsity" as Alva Noë puts it (Dennett, 2007, p. 252).

It is worth emphasizing that, according to the view presented in this paper, the 2PP is more than a method for gathering data. In the construction of a SOC, we do not observe that a subject *S* is in pain because she is reporting that. Rather, observers can agree upon the qualitative aspect of *S*'s experience because that experience is open to an experiential realm, which is shared by interacting subjects. As far as we are concerned with the construction of a SOC, this conception paves the way for a scientific understanding of the subjective experience. If subjectivity is spread in an intersubjective field, as a consequence, it becomes possible to study it by using intersubjective methods. Natural sciences are just one option, as it can be seen as a high-level social interaction whose contents are intersubjectively available.
I shall highlight that the approach I present is complementary to the heterophenomenological method. The view presented here, unlike Dennett's, underlines the *nature* of the data of a SOC, namely that such data are essentially disposed to be studied intersubjectively. The bridge between the 1PP and the 3PP that the heterophenomenological approach aims to build cannot be understood without stressing this aspect.
Before anchoring the subjective experience in a 3PP characterized by a mathematical framework, we need to go one step further and assess the questions as to (i) whether the idea of founding our SOC on the 2PP is scientifically justified or not and (ii) whether this 2PP will be necessary to study consciousness, once such third-person method is achieved.

3. Second Person Perspective as the Basis of Social Interactions

As Michael Pauen (2012) underlines, the 2PP is a perspective on a perspective: by observing something from a 3PP, we observe something that can be publically accessed, but this is not the case for the 2PP observation. The object I am analyzing from the 2PP has the same status of the observing subject:

> For the same reason, this perspective is not merely subjective [...] that is, it is not about the epistemic subject's own thoughts, feelings, and desires. Again, it's about other people's thoughts, feelings, and desires. This distinguishes the second from the first person perspective. Given that the second person perspective is a relation between the epistemic subject and one or more other subjects, it seems most appropriate to describe it as "intersubjective". This means that it is not primarily a scientific perspective. First and foremost it's a social perspective – even if it plays an important role in science and the humanities, too (Pauen, 2012, p. 22).

How can such an intersubjective relation be useful for the purpose of a SOC? As Pauen points out – quoting Loar (1997) and Papineau (1998) - the very possibility to employ phenomenal concepts such as 'pain' is enabled by the 2PP. According to this view, these concepts refer to an experience of the subject that can be simulated by other subjects of the linguistic community. There are two notions which are worthy of further enquiry: reference and simulation. Without delving into the wide field of the theory of reference (and meaning), I will adopt here a kind of Wittgensteinian point of view according to which the meaning of a linguistic item is given by the role, shared by a community of speakers, that that item plays in a certain linguistic game. When you use the word 'pain', I know what *you* mean because of *my* experiences of feeling pain. But this does not entail that each subject refers to her own private concept of pain. The meaning itself is a matter of intersubjective appraisal and validation. However, we still need an explanation of how a phenomenal concept can be intersubjectively shared, even though it is used by appealing to *my* own experiences, rather than *ours.* To see this, we need to address the

problem posed by the notion of simulation.
Recent neuroscientific studies (Singer *et al.*, 2004; Ryu *et al.*, 2008) have discovered that some brain areas are activated both when a subject imagines an emotion or a perception, and when she actually *feels* that emotion or *has* that perception. Pauen seems to take these findings as proofs for the fact that an actual simulation is going on when I am listening to you telling me about your pain, as though my imagination process brings about an empathic relation. Such interpretation does not seem to be fully satisfactory: imagination is quite an active and conscious process, and it seems inappropriate to describe what is going on in the comprehension of concepts like 'pain'. The notion of simulation that is needed here is more primitive and sub-personal. Thus, the simulation process does not need to be consciously recruited by the subject, but, rather, it must be something that happens to a subject embedded in a social environment.
The main point of this section is that the notion of simulation that can contribute constructing a SOC could be derived from the Embodied Simulation Theory (EST) as proposed by Vittorio Gallese (Gallese, 2005, 2016; Gallese & Sinigaglia, 2011). According to this view, the producer of representational content is not the brain *per se*, but rather the brain-body system. Thus, intersubjectivity is nothing but a form of intercorporeality. Simulation is not a "resemblance process" that reproduces or copies a mental state. Rather, it is a functional process depending on the possibility to reuse certain brain structures for different purposes:

> According to the alternative view, simulation as reuse, there is mental simulation just in case the same mental state or process that is used for one purpose is reused for another purpose (Gallese, 2016, p. 303).

Such a proposal goes beyond the role of mirror neurons[2] and deals with the possibility for a subject to simulate another subject's mental state. Such a simulation derives from the fact that the same brain structure is activated both when a subject experiences a certain state and when she sees someone else experiencing that very same state. As Gallese puts it:

> ES theory posits that the MM [Mirror Mechanism] counts as implementing mental simulation processes primarily because brain and cognitive resources typically used for one purpose are reused for another purpose. For instance, the activation of parieto-premotor cortical networks, which typically serve the purpose of representing and accomplishing a single motor outcome (such as grasping something), [...] might also serve the purpose of attributing the same motor goal or motor intention to others. The same holds for emotions and sensations. Within the anterior insula the same voxels typically underpinning the subjective experience of disgust also activate when attributing disgust to others (Gallese, 2016, p. 304).

What is crucial is that our understanding of others is represented via the bodily format: we can map the others onto ourselves in a non meta-representational, sub-personal and pre-intentional way. By collecting suggestions from Pauen's and Gallese's works, we can extend EST to phenomenal concepts and speculate that at least certain kinds of concepts are in fact embodied. For example, in Broca's area there is a wide overlap between structures activated both in speech production and in speech perception. Moreover, Mirror Mechanism is activated when certain actions are described verbally (Gallese & Glenberg, 2011). It can be suggested,

2 For an introduction, see Rizzolatti & Sinigaglia (2008).

at this point, that concepts like 'pain' can also be mapped in our body, because the same brain regions that are responsible for the quality of *my* feeling of pain are responsible for my comprehension of *someone else's* pain in several intersubjective practices.
If this hypothesis were correct (and we need further empirical evidence regarding the influence of language on the Mirror Mechanism, as well as the role of the body in language processing), it would suggest that the bodily format of concept representation is the mechanism underpinning that intersubjective consonance that, in the present proposal, makes the bridge between the 1PP and the 3PP. Of course, my experience remains in a certain sense private because it is *my* body interacting with an environment. It is *my* point of view. However, others can, in principle, map this experience onto their selves, and this mapping seems to be the enabling condition for the intersubjective formation of phenomenal concepts we use in intersubjective practices. Since science is one of such contexts, our SOC will have to deal with concepts that are both "private" from an intrinsic point of view and "public" from the point of view of a social interaction between subjects. Once again, the final goal of a SOC is to account for the possibility of a point of view to arise, given a certain physical substrate and a dynamic interaction of this substrate with a biological and social environment. What I suggest is that science must rely on the degree of public availability of experiences happening to this point of view. As further evidence, I shall consider the work of the developmental psychologist Vasudevi Reddy.[3] Importantly, Reddy (2003) shows that early infants interpret others as attending beings during reciprocal interactions, even before they develop awareness of themselves and others as psychological entities.
Reddy's suggestion shows that the mutual engagement I-Other is perceived, rather than conceived. Felt, rather than inferred:

> A second-person approach to self-and-other awareness is suggested as an embodied bridge across the alleged gap between first-person experience and third-person observation (Reddy, 2003, p. 401).

Evidence from developmental psychology appears to confirm that the development of our subjectivity derives from intersubjective practices. The idea is that 2PP is the perspective from which we cognitively form, in a later time, a conception of the Self. In conclusion, it can be argued that the empirical findings discussed in this section strongly suggest that the metaphysical conception of subjectivity as a private realm does not seem to be adequately supported.
Before proposing a 3PP method to study consciousness, it is worth noting that 2PP needs to be transcended. Indeed, 2PP is, in the present proposal, a conceptual tool that allows us to grasp the intersubjective nature of subjectivity and to open the possibility of studying consciousness scientifically. Once one acknowledges that, the possibility to draw a complete theory of consciousness based exclusively on the 3PP is not excluded and this is in fact the result we should expect from a mature SOC.

3 I owe this suggestion to an anonymous referee, whom I sincerely thank.

4. How Can We Measure Experience?

The last step requires bringing subjective experience into a structure defined by its functional properties,[4] so that a particular aspect of an experience can be defined by its power to affect the state of the organism. Once defined in such a way, it will be easier to set phenomenal concepts in a mathematical framework that will provide us with measures and predictions. The crucial point is that this functional definition is possible because of the intersubjective nature of the phenomenal concepts discussed above: 'pain' is a concept that a community of speakers employs not because of what it *is*, but of what it *does*. We use that concept because of how the phenomenon picked up by the concept affects our *bodies.* Generally speaking, phenomenal concepts deal with bodily states, not mental states. For a SOC, this aforementioned "*does*" has to be treated mathematically. One could object and argue that a numerical-mathematical description of consciousness would provide us with a method for individuating conscious experience in a way that is independent from the observer's point of view. This would be, in itself, an objection to the idea that experience is intersubjectively constituted. A possible answer to this remark consists in clarifying that maintaining that phenomenal experience is intersubjective does not mean that there is no experience without the second-person consonance. In the case of locked-in patients, there can be subjective experience without the ability to show that that experience is actually there within an intersubjective domain. Such evidence does not show that subjective experience is essentially private, but, rather, that there is the possibility for an emergence of a subjective point of view, even in such cases where the mechanisms underlying the *expressions* of that experience are impaired. This shows once again that the 2PP is not enough for constructing a complete theory of consciousness. We need to shift to the 3PP in order to study consciousness both as a dynamic phenomenon of an organism interacting with an environment and as a brain's capacity in off-line situations.

In this section, I will suggest that IIT is a convincing method and a well-informed epistemological theory of measuring experience. IIT is chosen among several other alternatives because the practical measures that are based on IIT have shown empirical effectiveness.[5] IIT[6] poses, as I remarked several times in this paper, that consciousness exists from a subjective point of view and claims that phenomenal properties of experience can be explained by the informational properties of a system.

Anyways, information here is not defined in the classical Shannonian sense, according to which it would be the measure of the entropy of a system, but as "difference that makes a difference"[7] in a system. In IIT, information about the cause/effect repertoire of a basic mechanism is measured by recruiting the *minimum* function between cause information (CI) and effect information (EI) repertoires. Roughly speaking, a mechanism in a state specifies a set of possible previous states (CI) and a set of possible outcome states (EI). Appealing to minimum function guarantees that that current state is available from the intrinsic point of view of the system, since it works as an "information bottleneck". Whenever a system cannot be partitioned without a loss of information, it exists from an intrinsic point of view, according to the key notion of integration, the second pillar of the theory.

This analysis aims to explain the emergence of an intrinsic point of view of a system from the basic elements constituting it. Nevertheless, we still need an explanation of how to measure experience. IIT defines concepts as Maximally Irreducible Cause/Effect Repertoire (MICE),

4 For 'functional property' I mean a property defined by its function, namely the capability to affect and be affected by other properties in its own network.

5 The most important method is the so-called perturbational approach developed by Massimini *et al.* (2009).

6 See Tononi (2003; 2008; 2012), Tononi, Oizumi, & Albantakis (2014), Tononi & Massimini (2013).

7 The expression, used in Tononi (2008) and Tononi & Massimini (2013), derives from Bateson (1972).

namely the cause-effect repertoire that generates a maximum of integrated information among different subsystems. This C/E repertoire is maximally integrated inasmuch as, if it is segregated, it will bring the maximum loss of information within the system. As Tononi puts it:

> an element (or set of elements) implementing the concept "table", when ON, specifies 'backward' the maximally irreducible set of inputs that could have caused its turning ON (e.g. seeing, touching, imagining a table); 'forward', it specifies the set of outputs that would be the effects of its turning ON (e.g. thinking of sitting at, writing over, pounding on a table) (Tononi, 2012, p. 302).

A particular concept, according to IIT, can be set in a structure that defines a temporal fragment of our experience, forming a Maximally Irreducible Conceptual Structure (MICS), the *locus* which specifies the maximum of *conceptual* integrated information. The MICS, in IIT, is a *quale*, the minimum building block of our phenomenal consciousness.
With this theoretical apparatus, IIT claims to be able to measure φ, namely the *quantity* of an experience, how much such an experience is present to the subject, while the shape of the concept constellation in the "qualia space" would specify the quality of the experience. The problem, here, is to understand how this qualia space is characterized. It is defined as a multidimensional space whose axes are constituted by each possible state of the system. Along each axis, the probability of each state is distributed, constituting a point in the space. As a consequence, vectors connecting different points in the space realize the informational relationship between possible states. The geometrical shape of these connected points in the multidimensional space constitutes a complex *quale,* a particular quality of experience.
I am not concerned, here, with the consistency of this particular proposal, nor with its ontological claim about the fundamentality of consciousness – which is, nevertheless, controversial, since we are dealing with an emergent property of a physical substratum.[8]
The most significant point is that IIT provides the possibility of a geometrical treatment of conscious experience, a necessary step for whoever aims to construct a scientific theory of consciousness.

Conclusion

Several problems arise from IIT, and we cannot expect to explain consciousness entirely by adopting this theory. Firstly, there is a computational problem: in order to calculate φ, one is supposed to partition a system in all possible ways, and this seems an unfeasible procedure in a complex system like the human brain. Second, IIT does not explain how mental agency works. In other words, it does not explain how informational patterns, which give rise to experience, are also able to guide behavior and self-report (this problem could evoke the ancient problem of access/phenomenal consciousness).[9]
My aim here has not been to defend or to interpret IIT. Rather, it has been to acknowledge that the epistemological status of a SOC has eventually to account for a measure and a mathematical analysis of the phenomenon at stake. In doing this, IIT seems to be one of the most promising theories in the field,[10] and a future SOC will likely develop from its outlook.

8 To see how IIT can bring about panpsychist implications, see Tononi & Koch (2015).
9 See Block (1995).
10 For a critical review, see Seth *et al.* (2006).

Future directions in consciousness studies should be concerned with:

i) the evolutionary (both in ontogenesis and in phylogenesis) development of a subjective point of view from a physical body which is embedded in an environment involving interactions with other living creatures;
ii) the gradation of consciousness in the sleep-wakefulness cycle;
iii) the relation between on-line consciousness (active when the organism is engaged in direct interactions with the world) and off-line consciousness (e.g. during NREM sleep, locked-in patients, paralysis, etc.);
iv) the feasibility of a measure of consciousness, in terms of both content and level of consciousness, that allows for empirically testable predictions.

It can be argued that when these empirical findings are organised in a theoretical framework, which considers conscious experience as intersubjectively constituted, the time will be ripe for the construction of a mature and mathematically informed science of consciousness.

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