Appeared in 2013 in *Constructivist Foundations* 8 (3), pp. 288-297
(penultimate version)
Original version can be accessed for free here:
http://www.univie.ac.at/constructivism/journal/8/3/288.colombetti

Some ideas for the integration of neurophenomenology and affective neuroscience

Giovanna Colombetti
Department of Sociology, Philosophy and Anthropology
University of Exeter (UK)

Some ideas for the integration of neurophenomenology and affective neuroscience

Structured abstract

Context • Affective neuroscience has not developed first-person methods for the generation of first-person data. This neglect is problematic, because emotion experience is a central dimension of affectivity.

Problem • I propose that augmenting affective neuroscience with a neurophenomenological method can help address long-standing questions in emotion theory, such as: Do different emotions come with unique, distinctive patterns of brain and bodily activity? How do emotion experience, bodily feelings, and brain and bodily activity relate to one another?

Method • This paper is theoretical. It advances ideas for integrating neurophenomenology and affective neuroscience, and explains how this integration would make progress on the above questions.

Results • An integrated "affective neuro-physio-phenomenology" may help scientists understand whether discrete emotion categories come in different *experiential varieties*, which would in turn help interpret concomitant brain and bodily activity. It may also help investigate the *bodily nature* of emotion experience, including how experience relates to actual brain and bodily activity.

Implications • If put into practice, the ideas advanced here would enrich the scientific study of emotion experience, and more generally further our understanding of the relationship of consciousness and physical activity. The paper is speculative and its ideas need to be implemented to bear fruit.

Constructivist content • This paper argues in favour of the neurophenomenological method which is an offshoot of enactivism.

Key words • neurophenomenology, affective neuroscience, emotion experience, bodily feelings

Paper type • Conceptual inquiry

Background(s) • Philosophy, cognitive science, affective science.

Perspective • Enactive cognitive science

1 Generating first-person data in the neurophenomenological approach

In Varela's original characterization (Varela 1996), neurophenomenology is a method for the integration of third-person and first-person data, where the former refer to data about brain and bodily activity,[1] and the latter to data about consciousness or lived experience. Varela, Thompson & Rosch (1991) had already emphasized the need to develop appropriate methods for the study of consciousness, including the cultivation of first-person practices for the collection of first-person data. Varela (1996) continued this project, adding that "meaningful bridges" need to be created between first- and third-person data, in particular that first- and third-person data need to "constrain" one another. More precisely, first-person data should be collected to shed meaning on, or interpret, physical activity, whereas third-person data should in turn be used to guide experiential reports, and to help subjects discover, and report on, previously unnoted aspects of their experience.

Varela's initial suggestions have been taken up by his colleagues and students, and a few explicitly neurophenomenological experiments have been conducted so far (Lutz et al. 2002; Cosmelli et al. 2004; Petitmengin, Navarro & Le Van Quyen 2007; Christoff et al. 2009. A comprehensive overview and discussion of neurophenomenology can be found in Thompson 2007; see also Thompson, Lutz & Cosmelli 2005). Relative to more mainstream cognitive-neuroscientific works, these studies make a more extensive and often more sophisticated use of first- as well as second-person methods for the exploration of lived experience and the generation of first-person data (primarily via self-reports). This is indeed what characterizes them as neuro-*phenomenological* studies

In neurophenomenology, first-person methods are often used to stabilize and observe one's own experience, in the aim of revealing its structure. Importantly, in a neurophenomenological study participants are invited to describe their experience by adopting a *passive-observational* stance—a "bare attention" or "receptive openness," as Thompson, Lutz & Cosmelli (2005) call it, rather than an inquisitive, judgmental, and actively discriminating form of attention. This stance is akin to what several Eastern meditative techniques also recommend, namely the cultivation of a mental attitude that merely "takes note" of what the subject feels, thinks, desires, and so on, without judging,

[1] I use the term "body" to refer to the organism "minus" the brain (and, relatedly, I use the term "organism" to refer to the brain and body together).

rejecting or praising (Wallace 1999; Depraz, Varela & Vermersch 2003). Western clinical practices inspired by these techniques, such as Mindfulness Based Cognitive Therapy, similarly invite subjects merely to take note of their experiences, rather than overly analyzing them and/or ruminating over them (see e.g. Segal, Williams & Teasdale 2001).[2]

A detailed description of how to cultivate such a receptive and open self-observational stance that is highly relevant for a neurophenomenological approach has been provided by Depraz, Varela & Vermersch (2003). They describe three "interrelated acts" of *suspension*, *redirection* and *letting go*. What needs to be suspended is one's naïve and immersed attention in the contents or objects of experience (the "what" of experience). Attention needs to be redirected toward the "how" of experience, i.e. the act of experiencing itself, in its various dimensions; or, to use a Husserlian terminology, attention needs to be directed from the "noematic" pole of experience (the object as it is intended) to the "noetic" one, namely to the act itself of intending an object. Thus for example when exploring one's fear of a certain situation, the focus should be redirected from the feared object, to how one experiences the fear—such as its intensity, its bodily character or its hedonic tone. Likewise when observing an instance of intense joy, one should redirect attention to the way one "lives through" the joy—perhaps as a sense of "expansion," accompanied by the desire to jump or throw one's arms up in the air. Throughout this process, the subject needs to let her experience "go," namely let it arise and unfold "as it is," without interfering by judging, analyzing, or trying to find a cause for it.

In addition to first-person methods, neurophenomenology also calls for the development of second-person methods, namely methods that involve an interaction between the self-observing subject and an interviewer, again in the aim of exploring the structure of human lived experience and generating first-person data. One task of the interviewer is to guide the self-observing process with an open and receptive attitude that encourages the subject to report her experiences on her own terms. The method known as the *explicitation interview* for example (Vermersch 1994; Petitmengin-Peugeot 1999) begins with broad, open questions that invite the subject to observe and report in her own words her current or just-lived experience, without the imposition of pre-established theoretical assumptions on the part of the experimenter. Another task of the interviewer is to help the subject "re-live" and "slow

[2] In a recent book that also calls for the integration of first- and third-person methods, Price & Barrell (2012: 51) similarly distinguish between "simply noticing" or "observing" one's own experience, and "interpreting, analizing, or ruminating."

down" the experience under investigation, in case there are aspects of it that may not have been noted the first time they were observed. A working hypothesis of this approach is that it can reveal dimensions of experience that would not be detected if subjects were constrained with more specific questions.[3] It requires however that interviewers refrain from imposing their own views, and rather adopt a stance of non-judgmental curiosity, interest and empathetic understanding. A further task of the interviewer is to help produce, at the end of the interview, a synthetic representation of the structure and dimensions of the observed experience, namely a short description capturing its most salient or characteristic features.

In both first- and second-person methods, *training* plays an important role. Neurophenomenology assumes that naïve, untrained subjects who are not used to observing and reporting their experience are unlikely to provide good first-person data. As Husserl himself already noted, our "natural attitude" (as opposed to a reflective phenomenological one) is one of immersion in the world, rather than focus on the structures of experience. Indeed as it is often pointed out in accounts of second-person approaches to experience (not just in neurophenomenology but also for example psychotherapy), naïve subjects find it difficult to switch from their everyday stance of immersion in the world to considering and observing experience itself. Often they do not know how to describe an experience (indeed they are not even sure what an experience is), are reluctant to do so, do not distinguish

[3] This openness on the part of the questioner, and the invitation to let the reports be guided by the subject as much as possible, is a fundamental tenet of qualitative approaches in psychology, like Grounded Theory, Interpretative Phenomenological Analysis, Narrative Psychology, Discourse Analysis and others (see papers in Smith 2008). These approaches differ in method, but they all invite the experimenters to let their analyses and interpretations be guided as much as possible by what subjects report. Even if one denies that it is possible to adopt a theory-free stance towards experiential reports, there is a difference between looking for specific dimensions (e.g. pleasantness, bodily sensations, loss of control) when one reads or listens to a report, and looking for dimensions that the report itself presents as particularly salient or relevant. This difference is akin to the one between the mainstream neuropsychiatric approach, which looks for specific "experiential symptoms" (hallucinations, delusions etc.) in order to classify a mental disorder, and phenomenological psychopathology, which rather aims to describe and analyse the patient's experience on the basis of what the patient says (see Colombetti, 2013, for a comparison between neurophenomenology and phenomenological psychopathology).

between observing the experience and commenting on what the experience should be, or what could have caused it, or how it fits with one's self-image; more generally they cannot bracket their presuppositions and do not observe their experience skilfully (see Gendlin 1996; Hurlburt 2009). Training subjects is important to overcome these difficulties and to provide subjects with self-observational skills that can generate better first-person data. In addition, training of the kind advocated in neurophenomenology aims to improve concentration, to enable subjects to observe specific aspects of their experience without being too distracted by interfering mental activity (including passing thoughts, sensations and evaluations), and to distinguish between aspects of the experience and comments or judgments about it. In the absence of training, self-observation is likely to generate inconsistent reports and thus unreliable data.

Training is also advocated for second-person methods, in particular the interviewer herself needs to learn to bracket her presuppositions so as to adopt an attitude of open curiosity. Useful indications about the attitude that interviewers should take when guiding others in the exploration of their experience can be found in the literature of Mindfulness Based Cognitive Therapy. Notably Crane (2009) emphasizes non-judgmental openness, kindness and patience, as well as a "beginner's mind" attitude that explores the qualities of the other's experiences with renewed interest and acceptance of whatever arises. She stresses that the interviewer should encourage participants to develop trust in their capacity to report their experiences, and to cultivate an attitude of non-striving and dwelling in the present moment.[4]

2 The place of self-observation and self-reports in affective neuroscience

None of these methods for the exploration of lived experience is typically adopted in the current neuroscientific approach to emotion (also known as "affective neuroscience"; see Davidson et al. 2003).[5] In spite of impressive technological progress in neuroimaging and

[4] A common worry here is that training subjects *distorts* their experience, and transforms it into something else. For replies to this worry see Zahavi (2005); Thompson, Lutz & Cosmelli (2005); Petitmengin & Bitbol (2009).

[5] The term "affective neuroscience" is also associated with the work of Jaak Panksepp. Panksepp in particular has defended the existence of a set of primary affective systems in the mammalian brain, which he argues are also responsible for emotional feelings (see for

psychophysiological measurements, affective neuroscience still exhibits a general lack of trust in self-reports. The affective-neuroscientific approach usually studies emotions in the form of neural, physiological and/or behavioral responses to a range of emotional stimuli (e.g. pictures, video clips, music, scenarios). Reliance on self-reports is very cautious and minimized, in various senses. First, when self-reports are collected, this is typically done *at the end* of the experimental manipulation, mainly as a form of control, and always together with other third-person measures, considered more reliable because "objective." There is no sense here in which first-person data are used from the beginning to organize and analyze third-person data. Second, first-person data are typically obtained with questionnaires that ask subjects to *rate* their emotion experiences or feelings on some numerical scale. No method is usually elaborated or at least suggested for collecting and analyzing detailed qualitative data, and for using these data to shed light onto neural and physiological activity. Experience in these studies is thus reported only in a minimal way; qualitative methods are not used to provide fine-grained descriptions of it. Third, the scales in question are usually not produced by the experimenter, but rather borrowed from previous studies and/or standard questionnaires. These scales thus reflect previous theoretical assumptions about the nature of emotion experience (such as that it varies along the two dimensions of intensity and valence, for example), and subjects are not given the possibility to describe their feelings in their own words. The Differential Emotion Scale (DES, Izard 1972), for instance, asks subjects to rate on a scale from 1 to 5 (from very slightly or not at all, to very strongly) how happy, sad, angry, scared etc. they feel. This scale assumes that emotions come in irreducible distinctive qualities and does not allow to explore constitutive dimensions of affects (it does not allow to explore *how* it feels to be angry, scared, and so on). Fourth, sometimes standard clinical scales are used that are not designed to capture dimensions of experience *while* it is lived—such as the Hamilton Anxiety Scale (Hamilton 1995), the Beck Depression Inventory (Beck & Steer 1993), and the "body perception questionnaire" (Porges 1993). These scales ask about general traits, habits, and conditions, and not about the character of presently lived feelings.

---

example Panksepp 1998, 2005). Panksepp certainly believes that neuroscientists should pay more attention to emotion experience, and not just in humans. However to the best of my knowledge his work has focused mainly on the study of animal brains, and not on the development of first- and second-person methods for the study of emotion experience in human subjects.

Although the situation is gradually changing (see Colombetti, in press, for more details), it is still fair to say that affective neuroscience has so far hardly been affected by the recent wave of renewed interest in first- and second-person methods for the study of consciousness (see for example Varela & Shear 1999; Velmans 2000; Jack & Roepstorff 2003; 2004; Petitmengin 2009; Price & Barrell 2012). At the moment, it wavers between recognition of the need to ask subjects how they feel (see the use of questionnaires mentioned above), and fear to rely "too much" on their reports. In most cases, the latter prevails and emotion experience is sidestepped as a consequence. I think it is fair to say that Davidson et al.'s (2003) chapter in the *Handbook of Affective Sciences* is still paradigmatic of this attitude. The authors initially acknowledge that it is "tempting and often important to obtain measures of subjects' conscious experience of the contents of their emotional states and traits" (p. 9), but conscious experience quickly disappears from their discussion. The chapter overviews instead how various emotional functions have been attributed to specific brain areas via observation of behavior—namely "using objective laboratory probes rather than relying exclusively [sic] upon self-report data" (*ibid*). The authors never discuss why it is "tempting and often important" to measure subject's experience; they rapidly dismiss the issue by appealing to previous failures of using self-reports.[6] Yet as Davidson et al. (2003) undoubtedly know, one need not rely *exclusively* on self-reports to study emotion experience; rather data obtained with self-reports can and should be integrated with data about behavior, expression, brain activity etc. The question is how to accomplish this integration, and how to develop methods for the collection of first-person data that can do more justice to the complexity of lived emotion experience than the current "just-take-a-look" attitude.

3 Ideas for an affective neuro-physio-phenomenology

I now want to suggest that taking experience more seriously, and developing methods for a

[6] In fact, they refer to Kahneman (1999), and *only* to this paper. This work however is not critical of self-reports altogether, but only of retrospective global judgments about one's general affective condition (one of happiness, in this case). Kahneman himself in this paper reports the results of a study in which he "beeped" subjects during the day and asked them to report on their current state of happiness. This method is precisely the one advocated by those who think that it is important to collect first-person data and revive introspection (see Hurlburt 2009).

more rigorous and systematic exploration of it, can only benefit the neuroscientific (including physiological) study of emotion, by helping make progress on some long-standing questions on the nature of emotion. In particular in this section I indicate how such an affective neurophenomenology (or rather neuro-*physio*-phenomenology, given the importance of psychophysiological measures in the study of emotion) may help address the question of whether different emotions are underpinned by unique or distinctive patterns of brain and/or bodily activity. In the next section I discuss how it may also address the question of how emotion experience, bodily feelings, and actual brain and bodily activity relate to one another.

There is currently wide disagreement regarding the first question. Whereas several neuroimaging studies have shown that at least some emotions (such as fear, disgust, anger, sadness and happiness) activate distinct brain areas, recent meta-analyses have shown that these brain areas vary from study to study (see Phan et al. 2002; Murphy, Nimmo-Smith & Lawrence 2003; Lindquist et al. 2012). Similarly for autonomic activity. Whereas several studies have shown that at least some emotions come with distinct profiles of autonomic activity, a meta-analysis by Cacioppo et al. (2000) indicates that these alleged emotion-specific profiles are in fact not the same across studies. On the basis of these results, some emotion theorists (e.g. Barrett 2006) have concluded that emotions are not "natural kinds"—in the sense that they do not come with distinctive patterns of brain and bodily activity. This conclusion however is controversial and not shared by the authors of the meta-analyses themselves. Phan et al. (2002) and Murphy, Nimmo-Smith & Lawrence (2003) interpret the results of their analyses as encouraging for the claim that different emotions have distinctive neural "signatures." These results do in fact show *some* consistency in brain activity for at least a few emotions. For example both meta-analyses showed that in a large proportion of the studies looking at fear, activation in the amygdala was significant compared to activation in other areas; similarly in a large proportion of the studies looking at disgust, activation in the basal ganglia was significant compared to activation in other areas (see also Lindquist et al. 2012). These results are also consistent with neuropsychological evidence from lesion studies (see Murphy, Nimmo-Smith & Lawrence 2003). So although the results of the meta-analyses are not particularly "clean," they do not support the radical conclusion that no specificity whatsoever can be found for different emotions. One cannot disregard the fact that *some* recurrent activation of the same area, or areas, was found in a high number of studies for more than one emotion.[7] Whereas it does not seem to be the case that emotions such as fear,

[7] See also Vytal & Hamann (2010), who used a different statistical method for their meta-

happiness, sadness, etc. correspond, in a one-to-one way, to individual brain areas, the question of whether different emotions reliably engage specific networks or patterns of neural activity remains open. Likewise for autonomic activity. A recent and comprehensive meta-analysis conducted by Kreibig (2010) concluded that there is considerable autonomic specificity for different emotions, including not just the standard "basic" ones of happiness, sadness, fear, etc. but also shame, embarrassment, jealousy, and more. Although this meta-analysis only indicates different directions of physiological factors for different emotion types, it supports the view that different emotions come in relatively reliable patterns of distinctive bodily (here: autonomic) activity.

What could neurophenomenology contribute to this debate? My suggestion here is that studies of the brain and/or bodily correlates of different emotions may have failed to find reliable activation patterns for individual emotions because of a lack of sensitivity to *variations* of the same emotion types. Mainstream affective neuroscience tends to assume that fear, anger, happiness etc. refer to distinct "entities," with no internal variation. Yet there may be important differences within the same emotion categories of fear, disgust, sadness, and so on. These variations may be manifest in experience, and identifiable with the first- and second-person methods mentioned earlier. Experiments could then be set up to verify whether thus-identified experiential variations correlate with different and distinctive brain and/or bodily patterns.

In my experience, fear for example does not come as one and the same type of feeling every time I am scared. Language already differentiates between e.g. fear, terror, horror, anxiety and worrying, all of which, I would argue, have a "family resemblance" with fear, and yet are qualitatively different. In addition, experiences that are commonly referred to as "fear" also appear to come in different experiential varieties. *Prima facie* at least, my fear of a viper spotted in the middle of the hiking trail, for example, feels different from my fear before giving a talk in front of a critical audience, and differently also from my fear for TV detective Sarah Lund as she explores a dark corridor where a dangerous criminal may be waiting. How

---

analysis, which showed significantly consistent and discriminable patterns of brain activation for happiness, sadness, fear, anger and disgust. These patterns overlapped considerably with those (partially) identified in the previous meta-analyses. Moreover Vytal & Hamann were able to further differentiate between the emotions for which previous meta-analyses could not find distinct patterns.

exactly these different forms of fear differ from one another however is not easy to say, and it is here, I want to suggest, that an experimental investigation into the nature of experience may help identify distinctive dimensions of different forms of feelings indicating that the emotion category "fear" does not correspond to one static and unchanging entity. It may be that different experiential variations come with different brain/bodily patterns, which could at least partly explain discrepant results identified so far by meta-analyses. As a more varied, context-dependent phenomenon, fear may indeed be underpinned by different patterns of brain and/or bodily activity, thus explaining why studies of fear so far have failed to find recurrent neurophysiological activations accompanying it (likewise for studies of anger, sadness, and so on). As explained above, affective neuroscience typically does not look at emotion experience in any detail. As such, it may lack the tools to identify differences in emotional responses to stimuli that come with different physical activity. Augmenting affective neuroscience with rigorous first- and second-person methods for the generation of first-person data may reveal these differences, and contribute to a better understanding of the relationship between emotion experiences and their physical bases.

4 The question of the bodily nature of emotion experience

Another long-standing question in affective science regards, broadly speaking, the bodily nature of emotion experience. This question has various facets. One regards whether experiencing an emotion always necessarily involves experiencing some kind of bodily feeling or bodily sensation (in other words, this is a question about the bodily phenomenology of emotion experience). William James famously thought so:

> [i]f we fancy some strong emotion, and then try to abstract from our consciousness of it all the feelings of its characteristic bodily symptoms, we find we have nothing left behind, no 'mind-stuff' out of which the emotion can be constituted … What kind of emotion of fear would be left, if the feelings neither of quickened heart-beats nor of shallow breathing, neither of trembling lips nor weakened limbs, neither of goose-flesh nor of visceral stirrings, were present, is quite impossible to think. (James 1884: 193-194)

According to philosopher Peter Goldie on the other hand, "it surely seems correct to say that there are certain sorts of emotion which might have associated feelings, but which do not

have associated *bodily* feelings" (2000: 52, italics in original).[8]

First- and second-person methods could be used to explore these claims more systematically and in more detail. It may be that, in the interaction with an interviewer, some subjects can become aware of subtle bodily feelings that would otherwise remain unnoted. In fact, it seems that some subjects are just not used to paying attention to their body, but that with appropriate guidance they can become more sensitive to it (see e.g. Gendlin 1996). Perhaps then, with appropriate guidance, "[i]f the reader has never paid attention to this matter, he will be both interested and astonished to learn how many different local bodily feelings he can detect in himself as characteristic of his various emotional moods" (James 1884: 192). Yet it might also be possible to identify emotion experiences that are, reportedly, not felt as bodily, and to explore their quality in some detail.

Also, first- and second-person methods could be used to address a difficulty noted already some time ago by Nieuwenhuyse, Offenberg & Frijda (1987) regarding empirical studies of the bodily character of emotion experience. Various studies have shown that subjects report different bodily sensations for different emotions (e.g. Nieuwenhuyse, Offenberg & Frijda 1987; Scherer & Walbott 1994; Philippot & Rimé 1997). Yet it may be that participants in these kinds of studies report not what they actually feel, but what they *expect* they should feel on the basis of existing "schemes" or folk psychological assumptions of what count as typical bodily feelings for specific emotions (see also Philippot & Rimé 1997). First- and second-person methods could help here by repeatedly inviting subjects to attend to their bodily sensations. Indeed it is a frequent observation in discussions of second-person methods that subjects initially tend to answer questions about their experience by reporting what they think they should be experiencing, rather than what they actually experience (see e.g. Gendlin 1996; Petitmengin 2007). My suggestion is that second-person methods could help here by redirecting the subjects' attention, to help them stay focused on their actual experience.

It would be interesting also to compare the emotion experiences of subjects with different levels of expertise in bodily awareness, and/or different training in bodily awareness. One such study was conducted already by Sze et al. (2010). They looked at visceral awareness (measured in terms of awareness of heart rate) in meditators, dancers, and people with no training, and found that meditators (who as part of their practice pay attention to

[8] See also Heavey, Hurlburt & Lefforge (2012) for evidence that people sometimes report bodily feelings in emotion experience, and sometimes do not.

breathing and cardiac sensations) reported the highest level of visceral awareness, followed by dancers (taken, in this study, usually to rely more on somatic awareness in their practice).[9] It would be interesting to investigate further whether these subjects also differ in terms of the reported bodily character of their emotion experiences. Consider also that different dance styles cultivate different forms of bodily awareness. Whereas ballet dancers make use of mirrors when training, contemporary dancers rely mainly on proprioception; there are even dance styles, such as the Japanese Butoh, that require the performers to attend also to their interoceptive sensations (see Legrand & Ravn 2009). Do these different training styles and practices affect how subjects experience their body in emotion?

A second facet of the question of the bodily nature of emotion experience concerns its relationship to physical activity, including actual bodily activity (i.e. not just experienced bodily sensations). A neuro-physio-phenomenological method would seem to be particularly suited to addressing this question. Here, third-person methods could be used to investigate the relationship between first-person data, and actual bodily activity. How do reported bodily feelings in emotion experience relate to what goes on in the actual body—or, in other words, how does the experienced body relate to the physiological body? In some cases, it is easy to verify whether a specific bodily feeling "tracks" an actual bodily process. For example, when I feel my heart beating fast in fear, I can put a hand on my chest to verify whether what I sense interoceptively corresponds to my actual heartbeat; likewise, when I feel my breathing becoming shallower in anxiety, I can put a hand on my chest or abdomen. That bodily feelings track actual bodily activity in the case of respiration is indicated for example by a study by Philippot, Chapelle & Blairy (2002). In a first experiment, they asked subjects to self-induce feelings of sadness, anger, fear and happiness by breathing in different ways, and to report on the respiration patterns they used. The reported respiration patterns turned out to correspond to actual respiration patterns previously measured for those emotions (Boiten, Frijda & Wientjes 1994; see also Rainville et al. 2006 for a more recent study). In a second

[9] Sze et al. also measured cardiac activity in all subjects, and found that in meditators this activity correlated most clearly with reported emotion experience (as measured by a rating dial). However, rather surprisingly they did not find that reported visceral awareness in meditators correlated with cardiac activity—a result they attribute to the inadequacy of their self-report inventory for bodily awareness, which did not inquire about actual bodily feelings, but about bodily functioning more generally. More rigorous first- and second-person methods may help address this kind of shortcomings.

experiment, they were able to induce feelings of sadness, anger, fear and happiness by asking (other) subjects to breath in those specific ways (without asking them to achieve any specific emotional state). Taken together, these results provide evidence that different respiratory patterns not only influence emotion experience in specific ways, but are also felt in emotion experience, and contribute to its differentiation.

Other cases, however, seem trickier. What is going on in the body when people report "butterflies in the stomach," "chills" or "shivers down the spine" in emotion? Are they reporting actual bodily changes? If so, what kind of changes? And what about feelings of action readiness or urges to act? Or feeling "down" or "up"? Not all bodily feelings are feelings of parts of the body that can be obviously identified and measured with third-person methods. Vice versa, there are very many changes going on in the body when subjects experience an emotion, and not all of them appear to be tracked as such when subjects report bodily feelings—although they may influence emotion experience nevertheless (as in the case of changes in glucose and hormonal levels). Note that some studies just assume that bodily concomitants in emotion experience can be studied merely by asking subjects how they feel their body, without carrying out any actual bodily measurement. Scherer & Wallbott (1994), for example, addressed the vexed question of whether at least some emotions exhibit the same patterns of physiological activity across cultures merely by asking subjects from different countries, with various questionnaires, how they felt their body during emotion experience. Likewise, Grewe et al. (2007) studied "physiological responses" to music with questionnaires asking subjects to "report their perceived bodily reactions" (779; see also Sloboda 1991). Most philosophical discussions also assume that bodily feelings in emotion experience register what is in fact happening in the body. Yet how the lived body and the physiological body relate to one another is an empirical question, and needs to be addressed as such.

Addressing this question could also help understand whether differences between emotion experiences that are reported as bodily, and emotion experiences that are not reported as bodily (as established with first- and second-person methods), correlate with differences in actual bodily activity—or whether they depend rather on differences in bodily self-awareness, such as e.g. interoceptive awareness. There is evidence already that some subjects are better than others at perceiving their bodies, as measured (so far) in terms of perception of their own heartbeat (e.g. Craig 2002);[10] and that differences in interoceptive awareness correlate with

[10] In these experiments, subjects are asked to count their perceived heartbeats silently (without feeling for their pulse), or to evaluate whether their heartbeats are synchronous with

differences in emotion experience, such as anxiety (Critchley et al. 2004). It may turn out that whereas different emotion experiences involve specific changes in the body, subjects are not equally good at detecting these changes, and therefore some subjects experience emotion as "less bodily" than others. Relatedly, it would be interesting to find out whether subjects can be trained via biofeedback to detect their body more accurately, and whether this training influences their emotion experience in terms of "how bodily" it feels.

Additional relevant first- and third-person data could be gathered from subjects with a variety of bodily impairments, to understand whether and how these affect emotion experience and its bodily character, and how reported bodily feelings (if any) relate to the condition of the body. For example, do subjects with spinal cord injuries experience emotion and, if so, do these emotion experiences include bodily feelings? If they do include bodily feelings, what kinds of feelings are they? Are they visceral sensations? Are they rather kinesthetic feelings, such as urges to move or even act in specific ways? How and where in the body are these feelings experienced? Existing evidence about the extent to which spinal cord lesions impair emotion experience is mixed (e.g. Hohmann 1966; Chwalisz, Diener & Gallagher 1988; Montoya & Schandry 1994; Cobos et al. 2002; O'Carroll et al. 2003; Nicotra et al. 2006). Yet the other questions, to the best of my knowledge, have not been explored systematically, with the first- and second-person methods recommended by neurophenomenology. Even if people with spinal injuries retain emotion experiences, it may be that these have a different or attenuated bodily character, compared to the emotions experienced before the lesion. Further questions could then be raised about the relation between experience and condition of the body. Spinal cord lesions can impair the capacity to move various muscles, proprioception, the generation of sympathetic and parasympathetic responses as well as sensory feedback from the viscera. The type and degree of impairment can vary considerably depending on the location and nature of the injury. A neuro-physio-phenomenological approach might enable us better to understand the relationship between the nature of the lesion and the subjects' experience, and in particular whether and how different aspects of bodily arousal contribute to emotion experience.

A similar approach could be taken towards other conditions, such as pure autonomic failure (which involves a peripheral degeneration of sympathetic and parasympathetic autonomic neurons), Möbius syndrome (which entails a congenital total paralysis of facial

---

tones triggered by the heartbeats themselves, with varying delays (see for example Critchley et al. 2004).

muscles), and locked-in syndrome (which involves a paralysis of all voluntary muscles apart from those responsible for vertical movement of the eyes, and blinking). We know from autobiographies of locked-in patients (painfully dictated letter by letter through blinking) that they retain bodily sensations, as well as a variety of more or less intense emotion experiences (see Bauby 1997; Chisholm & Gillet 2005). What is the quality of the latter however?[11]

Third-person methods could focus not just on the body but on the brain as well. Which areas of the brain activate significantly when people report bodily emotion experiences? Are they different from the brain areas that activate significantly for reportedly non-bodily emotion experiences? Existing evidence indicates that the anterior insula (also known as "insular cortex") for example is significantly involved in registering bodily activity and contributing to interoceptive feelings (Craig 2002; Critchley et al. 2004). It would be interesting then to see whether emotion experiences that reportedly involve bodily feelings correlate with activity in this area more than emotion experiences that reportedly do not involve bodily feelings. Damasio et al. (2000) notably showed that self-induced experiences of happiness, sadness, fear and anger correlate with activity in brain structures involved in the regulation of the organism, in particular that receive signals from the internal milieu, viscera and musculoskeletal system (such as insula, secondary somatosensory cortex, and cingulate cortex); moreover they found that those four emotion experiences correlate with different patterns of neural activity in these areas. Yet we do not know from this study how the subjects experienced those emotions, and in particular whether they felt them as bodily. A more recent study that looked at how experience, body and brain all correlate with one another is Harrison et al. (2010). This study illustrates well the possibility of correlating first- and third-person data of various kinds in the study of emotion experience, and thus comes quite close to a neuro-physio-phenomenological methodology (although more attention still could be paid to first- and second-person methods).

[11] Of course a variety of ethical and practical considerations makes this kind of inquiry particularly difficult. See also Topulos, Lansing & Banzett (1993) for a study in which healthy, unsedated subjects (for ethical reasons, these were the experimenters themselves) willingly underwent a complete neuromuscular blockade. They reported experiencing emotions such as fear and panic, but it remains unclear from the paper whether the blockade interrupted visceral feedback and, again, whether the subjects experienced their emotions as "bodily" (and if so, in which sense).

Harrison et al. looked at two forms of disgust—"core ingestive disgust," induced by watching movies of people vomiting when smelling and eating visually repulsive food, and "body-boundary-violation disgust," induced by watching movies of surgical operations. After the presentation of each movie, subjects had to indicate respectively, on analog scales, how disgusted, light-headed/faint, and nauseated they felt. Harrison et al. found that subjects reported feeling more nauseated in the "core disgust" condition (intensity of disgust and light-headedness were not significantly different). In addition, they found different physiological patterns (as measured in terms of cardiac and gastric activity) for the two forms of disgust, and interestingly found that core disgust was accompanied by greater tachygastric responses (that is, rapid disregulated gastric responses). They also found that the two forms of disgust correlated with differential patterns of insula activation. Thus compared to Damasio et al.'s (2000), this study shows that different patterns of activity in insular cortex accompany not just different emotion experiences, but also different bodily feelings experienced as part of them; in addition, it shows how these bodily feelings correlate with actual bodily activity.

Finally, neuro-physio-phenomenology could be used to understand the extent to which (if at all) neural activity can "bypass" bodily activity and induce bodily feelings "as if" the body were undergoing specific changes. In a footnote, James (1884) already mentioned the possibility of "morbid fear in which objectively the heart is not much perturbed" (199), and pointed out that these cases needed to be better documented and studied:

> it is of course possible that the cortical centres normally percipient of dread as a complex of cardiac and other organic sensations due to real bodily change, should become *primarily* excited in brain-disease, and give rise to an hallucination of the changes being there,—an hallucination of dread, consequently, coexistent with a comparatively calm pulse, &c. I say it is possible, for I am ignorant of observations which might test the fact. (199-200, emphasis in original)

Damasio (1994: 155-160) also discusses this possibility to some extent, calling the brain areas allegedly bypassing the body "*as-if" body loops*.

Not only however there is no direct evidence that as-if body loops exist (including how long an as-if body experience could last without registering inputs from the actual body, or how it would feel), but the more we understand the complexity of how brain and body are

related, the more suspect the notion becomes.[12] Brain and body continuously influence one another in innumerable ways (Pert 1997; Cosmelli & Thompson 2010; Thompson & Cosmelli, in press). There are in particular very many channels through which the body "informs" the brain about its status, and there is no evidence that they can all be "bypassed" and "simulated" by neural activity. Somatic information is conveyed via the spinal nerves and the trigeminal nerve; visceral information is conveyed via the spinal nerves, but also the vagus nerve and the glossopharingeal nerve (two cranial nerves). There are also very many brain regions that register bodily activity: somatic information is registered in brainstem nuclei, thalamus and primary and secondary somatic sensory cortex (SI and SII) and parietal areas (Purves et al. 2008, chapter 9). As for visceral information, key areas are the nucleus of the solitary tract, the brainstem reticular formation and the hypothalamus. The brainstem also contains areas that register circulating humoral signals; these are known as "sensory circumventricular organs" and are situated at the blood-brain interface, such as the area postrema, the organum vasculosum of the lamina terminalis, and the subfornical organ (see Price, Hoyda, & Ferguson 2008; for an overview of the visceral system, see Purves et al. 2008, chapter 21; see Parvizi & Damasio 2001 for a discussion of the many nuclei of the brainstem).

It seems highly unlikely that the brain could bypass and simulate all this activity. As Damasio (1994: 158) himself originally emphasized,

> the brain is not likely to predict how all the commands—neural and chemical, but especially the latter—will play out in the body, because the play-out and the resulting

[12] In his more recent book Damasio (2010: 102) admits that the notion of as-if body loop as he originally proposed it had only "circumstantial evidence." He claims however that such evidence has now been found, in particular he refers to evidence for the existence of motor mirror neurons, which fire when one observes someone else perform a goal-oriented action "as if" the observer were herself performing that action: "[s]o-called mirror neurons are, in effect, the ultimate as-if body device" (*op. cit.*, 103). Yet note that evidence for the existence of mirror neurons is not evidence for the existence of brain systems that "bypass" one's own body and that, as they do so, simulate an experience. There is no evidence of what human subjects experience when they see another's action or expression, and their mirror system activates. Arguably when I see another person perform a goal-oriented action, I do not feel "as if" I was the one performing the action.

> states depend on local biochemical contexts and on numerous variables within the body itself which are not fully represented neurally. What is played out in the body is constructed anew, moment by moment, and is not an exact replica of anything that happened before.

In addition Damasio himself does not believe either that the experience underpinned by alleged as-if body loops would feel like one that involves actual bodily loops (see Damasio 1994: 156; 2010: 121).

In sum then, it looks like there are many ways in which a neuro-physio-phenomenological approach could be used specifically to investigate the relationship between emotion experience and the body. First- and second-person methods could be used to investigate the phenomenological or lived bodily character of emotion experience; third-person methods could be added to explore the relationship between reported lived experience, and bodily and brain activity, which could help us to understand how reported bodily feelings, as well as reportedly non-bodily emotion experiences, relate to actual brain and/or bodily processes. This method would enable affective scientists to address the question of the bodily nature of emotion experience at various levels, and in a more sophisticated way than current approaches.

Conclusion

I have argued that the current affective neuroscientific approach would benefit from being augmented with the methodology recommended by neurophenomenology. At the moment, affective neuroscience tends to minimize its reliance on first-person data. However, I have proposed, developing adequate first- and second-person methods for the generation of first-person data, in the way neurophenomenology suggests, could help answer long-standing questions about the nature of emotion. For example, it could help answer the question of whether different emotions reliably come with unique, distinctive patterns of brain and/or bodily activity. Evidence so far is inconclusive, but I have argued that a problem with the studies conducted so far is that they did not consider the possibility that emotions such as fear, anger, sadness, and so on, come in variations, each of which has its own pattern of physical activity. These variations may be manifest in experience, and revealed with careful first- and second-person investigations. A neurophenomenological (or better neuro-physio-phenomenological) method could also enable a sophisticated approach to the question of the

bodily nature of emotion experience. First- and second-person methods could be used to explore the extent to which subject report bodily feelings when they experience emotions, and these reports could then be compared with third-person data about brain and/or bodily activity, to help understand whether and how lived experience relates to the living organism.

Importantly, augmenting affective neuroscience in the ways suggested here would not only enrich current scientific methods for the study of emotion, but also benefit the neurophenomenological project itself, by extending it to the domain of emotion. This would have the additional benefit of making neurophenomenology more clearly an enterprise aimed at understanding the relationship between experience and the *whole organism*, rather than the brain only. Neurophenomenological studies so far have focused on the relationship between experience and brain activity. Affective neuroscience on its part in the last few years has developed several sophisticated and increasingly less intrusive methods for the measurement of bodily activity. Extending neurophenomenology to the study of emotion would thus extend it to the rest of the organism, more in line with the "enactive" approach that Varela himself favoured, and of which neurophenomenology is an offshoot.

References

Barrett L. F. (2006) Are emotions natural kinds? Perspectives on Psychological Science 1(1): 28-58.

Bauby J.-D. (1997) The diving bell and the butterfly. Vintage: New York.

Beck A. T. & Steer R. A. (1993) Manual for the beck depression inventory. The Psychological Corporation: San Antonio, TX.

Blood A. J. & Zatorre R. J. (2001) Intensely pleasurable responses to music correlate with activity in brain regions implicated in reward and emotion. Proceedings of the National Academy of Sciences of the United States of America 98(20): 11818-11823.

Boiten F. A., Frijda N. H. & Wientjes C. J. E. (1994) Emotions and respiratory patterns - review and critical analysis. International Journal of Psychophysiology 17(2): 103-128.

Cacioppo J. T., Berntson G. G., Larsen J. T., Poehlmann K. M. & Ito T. A. (2000) The psychophysiology of emotion. In: Lewis M. & Haviland-Jones J. M. (eds.) Handbook of emotions. Second edition. Guilford Press, New York: 173-191.

Chisholm N. & Gillett G. (2005) The patient's journey: Living with locked-in syndrome. British Medical Journal 331: 94-97.

Christoff K., Gordon A. M., Smallwood J., Smith R. & Schooler J. W. (2009) Experience sampling during fMRI reveals default network and executive system contributions to mind wandering. PNAS 106(21): 8719-8724.

Chwalisz K., Diener E. & Gallagher D. (1988) Autonomic arousal feedback and emotional experience - evidence from the spinal-cord injured. Journal of Personality and Social Psychology 54(5): 820-828.

Cobos P., Sanchez M., Garcia C., Vera M. N. & Vila J. (2002) Revisiting the James versus Cannon debate on emotion: Startle and autonomic modulation in patients with spinal cord injuries. Biological Psychology 61(3): 251-269.

Colombetti G. (2013) Psychopathology and the enactive mind. In: Fulford K. W. M., Davies M., Graham G., et al. (eds.) The Oxford handbook of philosophy and psychiatry. Oxford University Press, Oxford: 1083-1102.

Colombetti G. (in press) The feeling body: Affective science meets the enactive mind. MIT Press: Cambridge, MA.

Cosmelli D., David O., Lachaux J.-P., Martinerie J., Garnero L., Renault B. & Varela F. J. (2004) Waves of consciousness: Ongoing cortical patterns during binocular rivalry. NeuroImage 23: 128-140.

Cosmelli D. & Thompson E. (2010) Embodiment or envatment? Reflections on the bodily basis of consciousness. In: Stewart J., Gapenne O. & Di Paolo E. D. (eds.) Enaction: Toward a new paradigm for cognitive science. MIT Press, Cambridge, MA.

Craig A. D. (2002) How do you feel? Interoception: The sense of the physiological condition of the body. Nature Reviews Neuroscience 3(8): 655-666.

Crane R. (2009) Mindfulness-based cognitive therapy. Routledge: Hove, West Sussex.

Critchley H. D., Wiens S., Rotshtein P., Ohman A. & Dolan R. J. (2004) Neural systems supporting interoceptive awareness. Nature Neuroscience 7(2): 189-195.

Damasio A. R. (1994) Descartes' error: Emotion, reason and the human brain. Putnam: New York.

Damasio A. R. (2010) Self comes to mind: Constructing the conscious brain. Heinemann: London.

Damasio A. R., Grabowski T. J., Bechara A., Damasio H., Ponto L. L., Parvizi J. & Hichwa R. D. (2000) Subcortical and cortical brain activity during the feeling of self-generated emotions. Nature Neuroscience 3(10): 1049-1056.

Davidson R. J., Pizzagalli D., Nitschke J. B. & Kalin N. H. (2003) Parsing the subcomponents of emotion and disorders of emotion: Perspectives from affective neuroscience. In: Davidson R. J., Scherer K. R. & Goldsmith H. H. (eds.) Handbook of affective sciences. Oxford University Press, New York.

Depraz N., Varela F. J. & Vermersch P. (2003) On becoming aware: A pragmatics of experiencing. John Benjamins: Amsterdam.

Gendlin E. T. (1996) Focusing-oriented psychotherapy: A manual of the experiential method. Guildford Press: New York.

Goldie P. (2000) The emotions: A philosophical exploration. Oxford University Press: Oxford.

Grewe O., Nagel F., Kopiez R. & Altenmüller E. (2007) Emotions over time: Synchronicity and development of subjective, physiological, and facial affective reactions to music. Emotion 7(4): 774-788.

Harrison N. A., Gray M. A., Gianaros P. J. & Critchley H. D. (2010) The embodiment of emotional feelings in the brain. Journal of Neuroscience 30(38): 12878-12884.

Heavey C. L., Hurlburt R. T. & Lefforge N. L. (2012) Toward a phenomenology of feelings. Emotion 12(4): 763-777.

Hohmann G. W. (1966) Some effects of spinal cord lesions on experienced emotional feelings. Psychophysiology 3(2): 143-156.

Hurlburt R. T. (2009) Iteratively apprehending pristine experience. Journal of Consciousness Studies 16: 156-188.

Izard C. E. (1972) Patterns of emotions: A new analysis of anxiety and depression. . Academic Press: New York.

Jack A. & Roepstorff A. (eds.) (2003) Trusting the subject? Vol. 1. Imprint Academic: Thorverton, UK.

Jack A. & Roepstorff A. (eds.) (2004) Trusting the subject? Vol. 2. Imprint Academic: Thorverton, UK.

James W. (1884) What is an emotion? Mind 9: 188-205.

Kahnemann D. (1999) Objective happiness. In: Kahneman D., Diener E. & Schwarz N. (eds.) Well-being: The foundations of hedonic psychology. Russell Sage, New York.

Kreibig S. D. (2010) Autonomic nervous system activity in emotion: A review. Biological Psychology 84(3): 394-421.

Legrand D. & Ravn S. (2009) Perceiving subjectivity in bodily movement: The case of dancers. Phenomenology and the Cognitive Sciences 8(3): 389-408.

Lindquist K. A., Wager T. D., Kober H., Bliss-Moreau E. & Barrett L. F. (2012) The brain basis of emotion: A meta-analytic review. Behavioral and Brain Sciences 35(3): 121-143.

Lutz A., Lachaux J.-P., Martinerie J. & Varela F. J. (2002) Guiding the study of brain dynamics by using first-person data: Synchrony patterns correlate with ongoing conscious states during a simple visual task. PNAS USA 99: 1586-1591.

Montoya P. & Schandry R. (1994) Emotional experience and heartbeat perception in patients with spinal-cord injury and control subjects. Journal of Psychophysiology 8(4): 289-296.

Murphy F. C., Nimmo-Smith I. & Lawrence A. D. (2003) Functional neuroanatomy of emotion: A meta-analysis. Cognitive, Affective, and Behavioral Neuroscience 3: 207-233.

Nicotra A., Critchley H. D., Mathias C. J. & Dolan R. J. (2006) Emotional and autonomic consequences of spinal cord injury explored using functional brain imaging. Brain 129: 718-728.

O'Carroll R. E., Ayling R., O'Reilly S. M. & North N. T. (2003) Alexithymia and sense of coherence in patients with total spinal cord transection. Psychosomatic Medicine 65(1): 151-155.

Panksepp J. (1998) Affective neuroscience: The foundations of human and animal emotions. Oxford University Press: New York.

Panksepp J. (2005) On the embodied neural nature of core emotional affects. Journal of Consciousness Studies 12(8-10): 158-184.

Parvizi J. & Damasio A. (2001) Consciousness and the brainstem. Cognition 79(1-2): 135-160.

Pert C. B. (1997) Molecules of emotions. Simon and Schuster: London.

Petitmengin-Peugeot C. (1999) The intuitive experience. Journal of Consciousness Studies 6: 43-77.

Petitmengin C. (2007) Towards the source of thoughts: The gestural and transmodal dimension of lived experience. Journal of Consciousness Studies 14: 54-82.

Petitmengin C. (ed.) (2009) Ten years of viewing from within: The legacy of f. J. Varela. Imprint Academic: Thorverton, UK.

Petitmengin C. & Bitbol M. (2009) The validity of first-person descriptions as authenticity and coherence. Journal of Consciousness Studies 16(10-12): 363-404.

Petitmengin C., Navarro V. & Le Van Quyen M. (2007) Anticipating seizure: Pre-reflective experience at the center of neuro-phenomenology. Consciousness and Cognition 16: 746-764.

Phan K. L., Wager T., Taylor S. F. & Liberzon I. (2002) Functional neuroanatomy of emotion: A meta-analysis of emotion activation studies in pet and fmri. Neuroimage 16(2): 331-348.

Philippot P., Chapelle G. & Blairy S. (2002) Respiratory feedback in the generation of emotion. Cognition & Emotion 16(5): 605-627.

Philippot P. & Rimé B. (1997) The perception of bodily sensations during emotion: A cross-cultural perspective. Polish Psychological Bulletin 28: 175-188.

Porges S. (1993) Body perception questionnaire. Laboratory of Developmental Assessment: University of Maryland.

Price C. J., Hoyda T. D. & Ferguson A. V. (2008) The area postrema: A brain monitor and integrator of systemic autonomic state. Neuroscientist 14(2): 182-194.

Price D. D. & Barrell J. J. (2012) Inner experience and neuroscience: Merging both perspectives. MIT Press: Cambridge, MA.

Purves D., Augustine G. J., Fitzpatrick D., Hall W. C., LaMantia A.-S., McNamara J. O. & White L. E. (eds.) (2008) Neuroscience (fourth edition). Sinauer Associates: Sunderland, MA.

Rainville P., Bechara A., Naqvi N. & Damasio A. R. (2006) Basic emotions are associated with distinct patterns of cardiorespiratory activity. International Journal of Psychophysiology 61(1): 5-18.

Scherer K. R. & Wallbott H. G. (1994) Evidence for universality and cultural variation of differential emotion response patterning. Journal of Personality and Social Psychology 66(2): 310-328.

Segal Z. V., Williams J. M. G. & Teasdale J. D. (2002) Mindfulness-based cognitive therapy for depression: A new approach to preventing relapse. The Guildford Press: New York.

Smith J. A. (ed.) (2008) Qualitative psychology: A practical guide to research methods. Sage: London.

Sze J. A., Gyurak A., Yuan J. W. & Levenson R. W. (2010) Coherence between emotional experience and physiology: Does body awareness training have an impact? Emotion 10(6): 803-814.

Thompson E. (2007) Mind in life: Biology, phenomenology, and the sciences of mind. Harvard University Press: Cambridge, MA.

Thompson E. & Cosmelli D. (in press) Brain in vat or body in a world? Brainbound versus enactive views of experience. Philosophical Topics.

Thompson E., Lutz A. & Cosmelli D. (2005) Neurophenomenology: An introduction for neurophilosophy. In: Brook A. & Akins K. (eds.) Cognition and the brain: The philosophy and neuroscience movement. Cambridge University Press, New York: 47-90.

Topulos G. P., Lansing R. W. & Banzett R. B. (1993) The experience of complete neuromuscular blockade in awake humans. Journal of Clinial Anaesthesia 5: 369-374.

Varela F. J. (1996) Neurophenomenology: A methodological remedy for the hard problem. Journal of Consciousness Studies 3: 330-350.

Varela F. J. & Depraz N. (2005) At the source of time - valence and the constitutional dynamics of affect. Journal of Consciousness Studies 12(8-10): 61-81.

Varela F. J. & Shear J. (eds.) (1999) The view from within: First-person approaches to the study of consciousness. Imprint Academic: Thorverton, UK.

Varela F. J., Thompson E. & Rosch E. (1991) The embodied mind: Cognitive science and human experience. MIT Press: Cambridge, MA.

Velmans M. (ed.) (2000) Investigating phenomenal consciousness: New methodologies and maps. John Benjamins: Amsterdam.

Vermersch P. (1994) L'entretien d'explicitation. Editions ESF Paris.

Vytal K. & Hamann S. (2010) Neuroimaging support for discrete neural correlates of basic emotions: A voxel-based meta-analysis. Journal of Cognitive Neuroscience 22(12): 2864-2885.

Wallace A. (1999) The buddhist tradition of samatha: Methods for refining and examining consciousness. Journal of Consciousness Studies 6: 175-187.

Zahavi D. (2005) Subjectivity and selfhood: Investigating the first-person perspective. MIT Press: Cambridge, MA.