What is it like to meditate?
Methods and issues for a microphenomenological description of meditative experience[1]

Claire Petitmengin, Martijn van Beek, Michel Bitbol, Jean-Michel Nissou, Andreas Roepstorff

Journal of Consciousness Studies, Volume 24, Numbers 5-6, 2017, pp. 170-198(29)

Abstract

In our society where interest in Buddhist meditation is expanding enormously, numerous scientific studies are now conducted on the neurophysiological *effects* of meditation practices and on the neural *correlates* of meditative states. However, very few studies have been conducted on the *experience* associated with contemplative practice: what it is like to meditate – from moment to moment, at different stages of practice – remains almost invisible in contemporary contemplative science. Recently, "micro-phenomenological" interview methods have been developed to help us become aware of lived experience and describe it with rigor and precision. The present article presents the results of a pilot project aiming at applying these methods to the description of meditative experience.

The first part of the article describes these methods and their adjustment for the investigation of meditative experience. The second part provides micro-phenomenological descriptions of two processes of which meditation practice enables the practitioner to become aware: the process of losing contact with the current situation and generation of virtual ones in "mind-wandering" episodes, and the process of emergence of a thought. The third part of the article highlights the interest such descriptions may have for practitioners and for teachers of meditation, defines the status of these results, and outlines directions for further research.

Introduction

In our society, where interest especially in secularized forms of meditation such as "mindfulness" is growing exponentially, , numerous scientific studies have been conducted on the neurophysiological *effects* of meditation practice (e.g. Lazar *et al*., 2006; Farb *et al*., 2007; Slagter et al., 2007; Grossman *et al*., 2007; Grant *et al.,* 2010; Holzel *et al*., 2011; Desbordes *et al*., 2012; Jensen *et al*., 2012; Allen *et al*., 2012) and on the neural *correlates* of meditative states (e.g. Brefczynski-Lewis *et al*. 2007; Brewer *et al*., 2011; Lutz *et al*., 2008; Lutz *et al*., 2013; van Leeuwen *et al*., 2012; Mrazek *et al*., 2013; Reiner et al;, 2013; Zanesco *et al*., 2013), providing important results. For example, it has been shown that the practice of meditation may reduce stress and depression relapse rates (Teasdale *et al*., 2000; Segal *et al*., 2002; Kuyken *et al.* 2015). However, very few studies have been conducted on the lived *experience* associated with contemplative practice: what it is like to meditate – from moment to moment, at different stages of a practice – has barely been addressed in contemporary contemplative science (e.g. Khalsa *et al*., 2008; Fox *et al*., 2012; Ataria, 2014, 2015). At best, some coarse characterizations of classes of meditative experiences are given an ancillary status in neurophenomenological studies of meditation (Lutz *et al.,* 2012). A recent proposal of a matrix

[1] This "Phenopilot" project, as it is called, was supported by a grant from the Mind and Life Institute. Part of the research in Denmark was funded by grants from the Velux Foundation and the Danish Research Council for Culture and Communication.

of phenomenological categories as a heuristic tool to generate hypotheses about the neural mechanisms of meditation practices (Lutz *et al.*, 2015) derives these categories from the analysis of texts such as meditation manuals, not from phenomenological description of these practices.

This vacuum may be explained by the ccommon assumption that since meditative experience - as any experience - is produced by brain activity, the knowledge of its neural correlates is enough to understand what is at stake in meditation and to explain its effects. It may also be due to the distrust of introspection in Western science which, ever since Auguste Comte claimed that it is impossible to walk in the street while watching oneself from the balcony, has insisted on its exclusion. Moreover, in contemplative traditions, it is not common and usually discouraged to talk about one's experience, except with one's teacher. A participant in our study who had been practicing in the Dzogchen tradition of Tibetan Buddhism for 45 years told us after the second interview: "This is very unusual for me. I never had the opportunity to share my experiences so accurately with anyone, not even with my teachers, not even with my wife." (Alain)

Our study emerged from the hypothesis that the lack of knowledge about meditative experience hampers the understanding of both the effects of practice and its neural correlates: its effects, because only a fine-grained description of the experience of the subject would enable us to understand the processes mobilized during meditation that may help to explain such effects (Philippot & Segal, 2009); its correlates, because the more the neuroimaging techniques are refined, the finer the level of granularity of description of the corresponding experience needs to be to enable the cognitive neuroscientist to make sense of recorded brain activity (Lachaux, 2011). Such fine-grained description has now become possible by the development of "micro-phenomenological" methods enabling us to become aware of our lived experience and describe it with rigor and precision.

This article outlines the results of a pilot project aimed at applying these methods to the description of meditative experience. The first part of the article describes the methods and adjustments made to them to investigate meditative experience, as well as the specific objectives of the study. The second part provides micro-phenomenological descriptions of two processes of which meditation practice enables a practitioner to become aware: the process of loss of contact with the current situation and generation of virtual ones in "mind-wandering" episodes, and the process of emergence of a thought. The third part of the article highlights the interest of such descriptions for meditation practitioners and meditation teachers, defines the status of these results, and outlines directions for future research.

Part 1. Methodology and objectives

Microphenomenology

Microphenomenology is a method of descriptive phenomenology inspired by the "explicitation interview" initially developed by Pierre Vermersch (1994/2014, 2009, 2012) to help persons engaged in professional practices to become aware of the implicit part of their mental or physical actions. This interview method was then adapted to the domain of cognitive science for describing experiences associated with any cognitive process, including manifestly embodied processes such as perception or emotion (Petitmengin 2006), and complemented by a method for analyzing verbal reports and detecting regularities in the form of generic structures (Petitmengin, 1999; Petitmengin *et al.*, in preparation), as well as methods for evaluating the

reliability of the reports and validating these results (Petitmengin & Bitbol, 2009; Petitmengin *et al*., 2013; Bitbol & Petitmengin, 2013, 2016). This method enables the researcher to collect descriptions of a *high level of reliability* and a *fine degree of granularity* of the *microdynamics* of *singular* experiences, in their *pre-reflective* dimension.

A large part of our experience remains unnoticed, or "pre-reflective" in the language of phenomenology. This is because our attention is almost completely absorbed in the content, the "what" of our activity, largely or entirely excluding the activity itself, the "how". We are like blind persons exploring objects with the tip of a cane, whose attention is entirely directed toward the object, but who are not reflectively aware of the contact and variations of pressure of the stick in the palm of their hands. Like blind persons, we use this information in action, but usually it remains largely unnoticed. The purpose of a micro-phenomenological interview is to help subjects redirect their attention from the content of the experience towards the mode and dynamics of appearance of this content, and to describe it precisely. This redirection is like the gesture of phenomenological reduction as described by Edmund Husserl: withdrawing from our exclusive focusing on objects, and broadening our attentional gaze (Bitbol, 2014) so as to reveal and describe the underlying "intentional life" of consciousness (Husserl, 2002), and, even deeper, the pre-intentional layer of the "self-affection of life" (Henry, 2000).

To achieve this reorientation of attention it is necessary to guide the interviewed person to describe a singular experience. If you ask her: "What is your experience when you meditate?", it is almost certain that you will obtain a rather general description, corresponding to the meditation instructions she has received, or to the representation she has of her experience. The only chance you have to obtain a better description of what she actually lives is to 1) guide her to describe a particular phase of experience, situated precisely in time and space; 2) bring her back to the singular, concrete experience she is describing each time she moves away from it towards the expression of comments, justifications, explanations and beliefs. Those would correspond not to what she is experiencing but to what she thinks or imagines or believes about her lived experience. Every time the subject uses an abstract term, the interviewer may, for example, restate it in the interrogative form by inviting him to describe the concrete action that underlies this term. For example, if the interviewed subject says: "I adopted an open mode of attention", the interviewer replies: "Take your time to go back to the moment you adopted an open mode of attention... At that moment, how do you open your attention?". The slowing down of the verbal flow, the presence of hesitations and silences, co-verbal gestures, the use of "I" and action verbs are then clues that the subject is not rehearsing received knowledge but is *discovering* pre-reflective processes.

In most cases, as it is difficult to describe an experience while it is unfolding, there is a temporal gap between the initial experience and its description. The second key to the micro-phenomenological interview is thus to help the subject to re-enact or "evoke" the experience, whether it is in the more distant past or only just over, by retrieving the precise spatio-temporal context, and then the visual, auditory, tactile and kinaesthetic, and possibly olfactory sensations associated with the very beginning of the experience to be described. The subject "evokes" this moment when she recalls it to the point that the past situation becomes more present for her than the present situation is. The intensity of the evocation can then be verified through objective clues such as the use of the present tense and the unfocusing of the eyes. The evoked experience may be "invoked" if it occurred in the past independently from the interview, or "provoked" for the purposes of the interview, usually just before the interview. In this study, we sometimes led participants to describe significant meditative experiences of the past. But given

the subtlety of meditative experience, and the difficulty to evoke a past meditative experience in its most minute details, we usually concentrated our investigation on provoked experiences, introducing two new variants:

- Interview interrupted by meditation: in the course of the interview, the practitioner is encouraged to meditate in order to search for the answer to a given question.
  - Can you try to describe more precisely what you do with your attention at that moment where you shift?
  [Break during which Helen practices]
  - I will try to explain it. Now when I sit and sense into it, I feel the activity is over here.

- Meditation interrupted by the interview: the interview starts after the meditation has been interrupted at a random point, by the sound of a gong for example.

The third key to the interview is to help the subject to relax the focus of attention on the content, the "what" of the evoked experience, in order to let the "how" appear. For example, the interviewer reorients the attention of the subject from the content of an inner image which is emerging to consciousness, to the dynamics of appearance, the genesis of this content: the rapid phases which precede its stabilization, and for each phase the subtle inner micro-gestures that are performed to elicit, recognize, evaluate, enrich, maintain or discard this image, as well as the bodily sensations and feelings that accompany this process. To collect this diachronic description, the art of the interview consists in asking questions that guide the interviewee's attention towards the various moments of the process without suggesting any content, such as "how did you start?", "what happened then?", "when you did this, what did you do?", "when you felt this, what did you feel?". This type of "content-empty" questioning enables the researcher to obtain a precise description without inserting his own presuppositions and creating "false memories".

- When I realized that I was gone, the thought vanished.
- How did it vanish? Was it instantaneous or gradual?
- It was very quick, but it nevertheless took a moment.
- And what happened during this moment?
- I loosened, I loosened my tension on that thought.
- And when you loosened your tension on that thought, what did you loosen?
- In fact I loosened a light tension in my head.
- Where exactly was this light tension in your head?
- It was at the top to the right and at the front of the head.
- And when you loosened it, how did you go about it, what did you do?
- And so on. (Lise, 20 years of practice))

Elicitation interviews have an iterative structure to help the subject repeatedly evoke the experience to be described while guiding her attention towards a progressively finer diachronic mesh until the desired level of detail is reached. The description of just a few seconds of experience on average requires an interview of about one hour. The subject's ability, facilitated by the interview, to provide a fine-grained description is an additional clue that this description does not come from an implicit theory, because no theory describes internal processes at such level of detail. The consistency of the description, in spite of the iterative structure of the interview, is a strong complementary criterion of authenticity.

Objectives and organization of the study

This micro-phenomenological method enabled us to collect very detailed descriptions of experiences supposedly inaccessible to consciousness and barely describable, such as the micro-genesis of an "intuition" (Petitmengin, 1999, 2007; Remillieux, 2014), the emergence of an epileptic seizure (Petitmengin *et al*., 2006; Petitmengin, 2010), the microgenesis of a choice (Petitmengin *et al*., 2013), or the emergence of the famous "rubber hand illusion" (Valenzuela *et al*., 2013). Encouraged by these results we conducted a pilot study of micro-phenomenological description of meditative experiences in the context of practices in the Buddhist tradition.

The Sanskrit word often translated as "meditation" is *bhāvanā*, literally meaning "cultivation". To meditate is to train oneself "to see things as they are"[2]. Buddhist meditation techniques can be broadly divided into two groups: *śamatha* and *vipaśyanā*, to use the Sanskrit terms. Although the terms can designate a wider range of practices in different Buddhist systems, usually *śamatha*, the practice of "calm abiding", aims at slowing down the flow of thoughts by focusing the mind on an inner or external object. *Vipaśyanā* or "clear seeing" consists in applying the attention which has been stabilized by *śamatha* to the whole experience: bodily sensations, emotions, thoughts, in order to "see things as they are"[3].

We interviewed 13 practitioners with 5 to 45 years of experience with such meditation practices. The participants were 4 men and 9 women aged between 28 and 62 years: 5 Italian, 3 French, 3 Danish, 1 Norwegian, 1 English, who were interviewed in their native language. Criteria for selection of excerpts were their precision and their relevance to illustrate the two meditative processes that are the focus of the present article. They were then translated into English for this article where relevant. In order to protect the anonymity of participants, the names used are pseudonyms.

In brief, the project aimed at answering these two questions: is it *possible* to consider meditative experience as an object of research without reducing it to its neuro-physiological correlates? If so, why and to whom is this *interesting*? The project aim was not to compare specific practices of different meditators but more modestly:

1. to assess whether the micro-phenomenological techniques enable us to collect accurate and reliable descriptions of contemplative experiences,
2. to explore the need for adaptations of these techniques for this domain of inquiry and to develop a research methodology for future projects;
3. to evaluate the usefulness of descriptions of meditative experience for the meditation practitioner and the meditation instructor;
4. to identify future directions for research on meditative experience.

Each practitioner participated in two or three interviews. The "experiential protocol" of the first interview was the following:

1. Pre-interview: the context and objectives of the research project are explained, and the practitioner is asked to provide details about his/her practice: tradition, usual practice, number of years or accumulated hours of practice, frequency of practice. If unfamiliar with the interview method, as was the case for most, the participant is offered to experience a small

[2] See eg. Tulku Urgyen Rinpoche, *As It Is*, vol. 1 & 2..

[3] For typologies of Buddhist contemplative practices, see, e.g., Germano and Hillis 2005; Lutz *et al*. 2007; Lutz *et al*. 2015.

micro-phenomenological interview.
2. Meditation session (20 minutes): the participant is asked to practice *śamatha*, focusing on the breath, and when she realizes that her attention has left the breathing, to come back to her breathing.
3. Micro-phenomenological interview (60 to 90 minutes): after a general description of the unfolding of the session, the interview focuses on one or two specific moments.
4. Post-interview: the participant is asked questions on her experience of the interview itself, such as: "Did the interview help you become aware of anything? Did you learn anything during the interview?"

The "experiential protocol" of the second (and possible third) interview was the following:
1. Pre-interview: after a brief reminder of the research, the participant is asked for the possible effects of the first interview on her practice between the two interviews.
2. Meditation session (20-30 minutes): the participant is asked to practice his/her own usual practice
3. Micro-phenomenological interview as in session 1.
4. Post-interview as in session 1.

Part 2. Examples of lines of investigation in meditative experience

This second part provides micro-phenomenological descriptions of two processes that meditation practice enables the practitioner to become aware of:
a) the twofold process of loss of contact with the current situation and generation of virtual ones in "mind-wandering" episodes, and the process of regaining and maintaining contact with the present situation made possible by meditation practice;
b) the premises of the emergence of a thought.

2.1 Mind wandering

The purpose of the concentrative practice of calm abiding is not to become aware of the unfolding of episodes of drift, but to stabilize the attention by regularly bringing it back to the concentration support. As micro-phenomenological interviews make it possible to explore everything that happens during a meditation session, they allowed us to explore not only the inner act of coming back to the breath and the effect of this coming back, but also what happens when attention has left the support, in other words the very common but phenomenologically almost entirely unknown process called "mind wandering".

Scientific context

Although the phenomenon had previously escaped mainstream research (except Schooler, 2005; Smallwood & Schooler, 2006), the number of publications related to mind wandering has increased considerably since a large scale study published in *Science* (Killingsworth & Gilbert, 2010) suggested that we spend more than half of our time mentally wandering off into the past or into the future, without being aware of having lost contact with the present reality. This is so even when we are engaged in highly demanding or risky tasks such as driving (Galera *et al.*, 2012; Yanko & Spalek, 2013).

The most common method for investigating the experience of mind wandering consists in providing the participant with an electronic device which emits a beep at random intervals.

When the beep occurs, the participant is asked whether her mind was wandering just before the occurrence of the beep, and to answer a questionnaire. These studies have examined the *content* of mind wandering (temporal focus, emotional valence) and its *outcomes*, searching for a possible relationship between them (Smallwood & Andrews-Hanna, 2013; Andrews-Hanna *et al*., 2013; Ruby *et al.*, 2013a). For example, they consistently noticed a correlation between mind wandering and negative mood (Smallwood *et al*., 2007; Killingsworth and Gilbert, 2010). However the methods used did not provide access to the *process* of mind-wandering, to the *unfolding* of mind wandering episodes, which would enable us to better understand these effects, which still remain virtually unexplored (Mooneyham and Schooler, 2013; Schooler *et al*., 2014).

Examples of descriptions and analyses

Micro-phenomenological interviews with meditation practitioners enabled us to gather some descriptions of this unfolding, which may take the form of:

- a twofold process of loss of contact with the current situation and generation of a virtual one, followed by
- the reverse twofold process of vanishing of the virtual situation and regaining contact with the current one.

We tried to go deeper into the description of these processes. Here is an example of a description which although trivial is not devoid of interest.

Excerpt 1: Process of generation of a virtual scene

> "A thought occurs, which involves several characters. It's like a kind of space that opens, the term "bubble" fits well. A bubble which starts from my head, at the front, top and left. The volume of this bubble is sustained by my inner speech, just as light is sustained by the engine of a dynamo and varies with changes in the engine speed. I see the characters as through my eyes, but I do not take my body in the story. That is to say that I am only eyes, my body is not in the scene. At the same time, this scene elicits many bodily sensations in me, for example in the chest, but (at that moment) I am not aware of them, I have lost contact with them. It is as if my head was cut off from my body." (Lise, 20 years of *practice*)

The interest of this description is twofold: 1) it shows that it is possible to remember an episode of mind wandering, which has been lived without awareness of being lived, in a pre-reflected or unrecognized way; 2) it enables us to begin to identify parameters of the process of generation of a virtual scene that are independent of the content of the scene:

- The ***place of emergence of the virtual scene*** in the "lived space" of the subject:

"It's like a kind of space that opens, the term "bubble" is well adapted. A bubble which starts from my head, at the front, top and left."

- The ***sensorial modalities implied in the virtual scene***, here the auditory: "inner speech", the visual: "I see the characters", and the interoceptive: "many bodily sensations in me".
- The ***degree and mode of awareness of the sensations elicited by the virtual scene***. At the time of the episode, the subject seems to be aware of her visual experiences: "I see the characters", while being in a sense unaware of them because at that time she is absorbed in the virtual scene and unaware that her mind is wandering (if she had realized this she would have brought her attention back to her breathing). We decided to call this particular mode of unawareness "MW unawareness". At the same time, the subject is unaware of her bodily sensations: "I am not aware of [my bodily sensations], I have lost contact with them. It is as if

my head was cut off from my body." She is thus in a way doubly unaware of her bodily sensations: unaware of them because she is unaware that her mind is wandering, but also unaware of having any bodily sensations at all.[4]

- The ***perceptual positions of the subject in the virtual scene***, which are the first-person (or egocentric) perceptual position in the visual modality: "I see the characters as through my eyes"; and a "no-body" perceptual position in the interoceptive modality: "I am only eyes, my body is not in the scene."
- The ***"mode of sustainment" of the virtual scene***: "The volume of this bubble is sustained by my inner speech, just as light is sustained by the engine of a dynamo and varies with changes in the engine speed."

The following excerpt from another interview highlights another mode of sustainment, and enables us to refine our inventory of the parameters of the process.

Excerpt 2: Process of generation of a virtual scene and loss of contact with the actual situation

> "I get lost in a thought consisting in imagining that I am cutting into pieces and then mashing the pumpkin that is being baked, now while I am meditating. This is a thought without inner discourse, consisting in doing internally the gestures of crushing the mash with a fork. I can feel very well (now) the gestures, the effort in my arms. Meanwhile, I lose awareness of my body here and now: its position, the contact of my legs with the ground, of my hands on my knees, my internal sensations. I am neither really aware of the sensations aroused by the imaginary scene… the sensation of effort in my arms. I become aware of them retrospectively, when I am back, while I still keep a trace of this moment." (Lise)

- *Mode of sustainment of the scene*: in this experience the virtual scene is generated and sustained through gestures which are anticipated internally: "I am cutting into pieces and then mashing the pumpkin", "doing internally the gestures of crushing the mash with a fork."

It is interesting to note that in both excerpts, the virtual scene is sustained through subtle inner micro-gestures – in the first case through the laryngeal and oral gestures of inner speech, in the second case through micro-gestures consisting in "mimicking" inwardly a movement mobilizing the upper body.

In this second excerpt, the subject differentiates two types of bodily sensations during the mind wandering episode: the sensations associated with the actual situation, and the sensations which are elicited by the virtual scene.

- *Degree and mode of awareness of the actual bodily sensations*. "I lose awareness of my body here and now: its position, the contact of my legs with the ground, of my hands on my knees, my internal sensations."

- *Degree of awareness of the sensations elicited by the virtual scene*: "I am not … really aware of the sensations aroused by the imaginary scene… the sensation of effort in my arms)."

- A new descriptive category emerges, that we call the ***persistence of the virtual scene***: "while I still keep a trace of this moment." This "trace" or persistence allows the subject to evoke and describe the virtual scene after she has realized that her mind had been wandering. The disappearance of the "MW unawareness" during the evocation enables her to report sensations she had at the time of the episode, and to become reflectively aware of sensations she was "doubly unaware" of at that time: "I become aware of them retrospectively, when I am back,

[4] See Petitmengin 2006, p. 234

while I still keep a trace of this moment."

Excerpts 3 and 4: Process of regaining contact with the current situation

> "When I come back to the nostrils, something relaxes throughout my head. Before there was a little tension, a light one, at the level of the skull, inside, that I was not aware of. And when I come back, at the first breathing in, it aerates itself. It relieves itself. This tension, which is not really a tension, which is very light, with a weight if you want, with a density and a weight, it releases itself, it dissolves." (Paul, 20 years of *practice*)

> "When I come in contact with the physical sensations aroused by this (virtual) scene, it creates a special feeling of release, of finding myself again, which is accompanied by a deep sigh." (Lise)

Excerpts 3 and 4 highlight some parameters of the reverse micro-process of regaining contact with the current situation:

- the ***effect of regaining contact with the current bodily sensations***. The reorientation of attention towards the sensation of breathing: "When I come back to the nostrils", "at the first breathing in", elicits a feeling of relief and release: "something relaxes throughout my head", "it aerates itself", "it relieves itself", "it releases itself, it dissolves."
- a subtle ***bodily sensation which was present at the time of (and perhaps elicited by) the mind wandering episode***: "Before there was a little tension, a light one, at the level of the skull, inside."
- the ***absence of awareness of this sensation at the time of the episode***: "Before there was a little tension, (…) that I was not aware of."
- the ***trigger of a reflective awareness of the sensation***: the excerpt suggests that it is the very movement of releasing the tension (itself elicited by the reorientation of attention towards the nostrils), which makes the subject aware a) of the tension that is being released, and b) of the fact that this tension was already there while attention had left the nostrils.
- the ***effect of regaining contact with the bodily sensations elicited by the virtual scene,*** which is also a feeling of release: "a special feeling of release, of finding myself again, which is accompanied by a deep sigh."

2.2 The early phases of the emergence of a thought

Four practitioners (Lise, Paul, Anna and Helen) described in detail the early phases of the emergence of a thought, before any virtual scene has emerged. Their accounts agree on the following micro-dynamic process.

1) A micro-impulse

- S***ensorial form of the emerging thought***

> "The thought emerges as a tiny tension (French '*crispation*')." (Lise)
>
> "A tiny 'impulse' (French 'élan') there (indicates the centre of the chest). It is associated with breathing, breathing in." (Paul)
>
> "Not so much an image, but a felt sense that something arises. Like a little movement… a perturbation. It's not a thought yet. It's just a kind of a stirring (French 'animation'). Something is about to happen." (Anna, 12 years of practice)

- Place of emergence

> "there (shows the middle of the chest). " (Paul)

2) A tension towards that first movement

"There is this kind of movement towards that movement, if that makes sense." (Anna)

- ***Location of the tension***: the eyes and the head

"The eyes become fixated, and there is almost like a tension in the eyes. Although I'm not looking at anything visually, but the visual sense gets engaged as if looking."(Anna)

"A tension corresponding to the intention to do something, comparable to the feeling of scrutinizing something visually, of making an effort to see better something far away, which gives a sensation of tension inside the skull." (Anna)

- ***Origin of the tension:*** holding the breath, tightening the throat

"It's kind of more… holding the breath, tightening the throat... Yeah, that sense of curiosity and pausing and going after something… a holding of the breath as well. It happens at the throat. That looking… that second movement… the tightening from here, rather than from the head." (Anna)

- ***Effect of the tension***

"Then the tightening in the head happens, and it feels like the head is cut off from the body, at the throat. The flow of the energy between the body and the head gets very disconnected and gets built up in the throat. It's uncomfortable, so it kind of brings attention to itself." (Anna)

"We're not speaking about anything major, it's really minor. A kind of, a subtle numbness, yes. It is as if life is not flowing completely freely in the body. Because attention is, it is like it is numbed down, a feeling, a kind of discomfort. Not like feeling nauseous or anything like that, but just like, a sense of that. There is less contact. Less permeation by life." (Helen, 20 years of practice)

The two excerpts above highlight:

A lack of circulation of the flow of energy in the body: "The flow of the energy between the body and the head gets very disconnected"; "It is as if life is not flowing completely freely in the body"; "Less permeation of/by life".

A feeling of disconnection of the head and the body: "It feels like the head is cut off from the body".

The point of disconnection: "The flow of the energy between the body and the head gets built up in the throat."

A subtle feeling of discomfort elicited by this disconnection: "It's uncomfortable"; "A kind of, a subtle numbness"; "a feeling, a kind of discomfort"; "Not like feeling nauseous or anything like that, but just like, a sense of that".

3) Releasing the tension

- The ***trigger of the releasing*** is for Anna the awareness of the feeling of disconnection, itself triggered by the sensation of discomfort associated with this disconnection:

"It's uncomfortable, so it kind of brings attention to itself. That's how I know the disconnection happened." (Anna)

- The releasing of the tension may be ***spontaneous, involuntary:***

"It's kind of releasing by itself… with the awareness that there is tightening. It's just... becoming aware of it is enough for it to relax." (Anna)

- But it is also described as facilitated by ***voluntary inner micro-gestures***:

Release the breath, the tightening in the head or the throat
"I release the breath; release the tightening if it's in the head or the throat. Release any freezing… just kind of letting things become unstuck again. And allow them to move in and out freely." (Anna)

Use of peripheral vision
"There is almost like a tension in the eyes as well… as if visually fixating at something. So, then, just by releasing into more panoramic visual field." (Anna)
"Normally, just becoming aware that there is a fixation of tension is enough. But, if I need to use more tools, then I would usually use the visual awareness, just allowing my peripheral vision to go to more than 180°. And that releases the fixation in the eyes and the tension in the head."(Anna)

Awareness, densification of the back and bottom of the body
"Being more aware of the back of my body, rather than just what's at the front." (Anna)
"I go down, I drag something down in the body. It becomes denser in the lower body." (Lise)

In the following excerpt, the interviewer helps Lise to describe how she manages "going down into her body".
- At that point I go down in my body.
- How do you manage to go down in your body?
- I go towards the back of my head, that is to say, I move my center of gravity from the front of my head towards the back of my head.
- Which center of gravity are you talking of?
- My attention
- The center of gravity of your attention?
- Yes, which is rather, as often, at the level of the head, of the center of my head, just behind the eyes. I move it towards the back of the skull.
- When you move it back, what do you do?
- I press a little bit on the eyes with my lids. And by doing that it's as if I were deactivating the eyes, the gaze, I demobilize this area. I feel more the back of my skull, which becomes denser. And at the same time, quickly, this density moves down the whole back of the body, along the spine.
- When this density moves down the spine, what is moving down?
- I truly feel a small current that runs down the spine, it's like a little tingling, it feels nice, this area around the spine that is mobilized, and becomes denser. And soon, I heave a great sigh ... it relieves. It's as if my shoulders, my spine, my back, became alive again, were able to feel again. And when the sigh comes, the well-being extends to the chest, which aerates, which opens. Breathing also reanimates the front of the body.
- [...] When I open my eyes again, I no longer look with my eyes, I look from the back of my head.
- What consequence does that have for your gaze, for your field of vision?
- It is a different way of looking, of perceiving, than visual. It is no longer just visual, it is something vaster than the merely visual. It is as if I was looking with the back of my body. [...]
- How do you to look with the back of your body?
- This is not the same look at all. This look is a kind of feeling, of feeling space. I'm not focused on an object with the front of the head and eyes, it's the back of my head that looks, thus it's much

vaster. The field is open to the maximum. There is less depth of field in fact. Let's say that there are no objects that stand out, this is flatter, in a sense, at least at this moment. At this point this is more in two dimensions than in three dimensions.

- Effects of releasing the tension

Disappearance of the emerging thought
"When I loosen the tension, the thought vanishes." (Lise)

Reconnection of the head and the body
"There is a sense of awareness opening up again. And, the flow between the head and the body being… there is more sense of appointment, more kind of connection, between the head and the body." (Anna)

Feeling of flow and warmth, awareness of the bodily sensation, connection between me and the world
"It is warmth. As if the blood is flowing freely, warmth, centeredness, physical sensations of the body. Can notice the inhalation, the exhalation, at the level of cells. Can feel how the back and the chest move, can feel the knees, feet and legs. So there is a presence in the body and, well, the surroundings… I am sitting on [knocks on the floor] equally with the bird that is walking there outside. There is such an equality in that. And life [knocks on the floor]. That I am a part of a connectedness. There is such a feeling of belonging, just because [laughs], just because this is here, yes. And when attention moves out into the thoughts, it is as if… there is this feeling of separation, like that [gesture]. I think it is like this membrane [gesture] - like I said before, it is closed and here are you and there is the world, yes. And it is simply enormously liberating that I could return to the breath and the body. And to feel that that feels more true." (Helen)
In other words, when Helen gets lost in thoughts, it is as if a membrane closes and creates a separation between her and the world, her body and the environment, whereas when she is maintaining her open awareness, there is the sense of a continuity between inside and outside, and an equality between her and living beings outside. They are all part of one continuous, shared "lived space".

Part 3. Discussion

This study enabled us to collect fine-grained descriptions of the dynamics of the mind wandering process and of the emergence of a thought, and to identify in both experiences a set of descriptive categories which are independent from the content of the experiences, in other words, a sketch of the dynamic structure of these experiences. We will now address the status of these findings, the research directions they open, and finally the interest of these descriptions for meditation practitioners and meditation instructors.

3.1 Status of these results

The analyses we presented in the previous section are far from exhausting the content of the interviews, which were only partly devoted to descriptions of mind wandering episodes and to the emergence of thoughts. And these descriptions are themselves far from exhausting these two types of experience. Hence, these descriptions and their analyses indicate lines of investigation for future research. Researchers trained in micro-phenomenology could consider the experiential categories we have identified:

- as hypotheses that may be confirmed, refined or invalidated by new interviews and analyses in the context of similar or new experiential protocols.

- as guides for future interviews. For each descriptive category identified by us, the researcher may ask: "Which experiential protocol, which questions can I use to collect the corresponding information?". For example, which questions may bring a practitioner to describe her "perceptual position in the virtual scene?" How can we get a more accurate description of the inner gestures for "coming back to the nostrils", "releasing the breath" or "dragging something down in the body"?

- as heuristics to discover new dimensions to explore. The very gaps in our analyses suggest further investigations to fill them. It would thus be possible to provide more fine-grained descriptions of the process of emergence of virtual scenes, including for example the order of apparition of the sensorial modalities, their respective degrees of awareness, the micro-gestures that sustain the scene, the transitions from one scene to another, but also the transition between the emergence of a thought as a tiny tension and the absorption of attention into an elaborate virtual scene. It would also be possible to do a fine-grained exploration of the reverse process of disappearance of the scene and of the "trace" it leaves: what is the "trace" of the virtual scene like? Does it have a sensory form? For how long does it persist and allow “refreshing” and “reactivation”?

In the descriptions we have collected, at least sometimes, as soon as the premise of a thought arises in the form of a tiny "impulse", a subtle tension may have the effect of producing a sense of disconnection between the head and the body or a feeling of discomfort ("numbness"). When in the course of mind wandering episodes the emerging thought is transformed into a virtual scene, this loss of bodily awareness may intensify up to a complete loss of consciousness of bodily feelings. Our descriptions suggest that this loss may elicit a kind of rigidification and partitioning not only between the head and the body, but between "internal" and "external" space, between the subject and the environment. Conversely, coming back to the present sensations allows life and warmth to flow again. It fosters a reunification of mind and body, self and world, creating a feeling of deep relief and liberation.

It seems to us that these descriptions offer an interesting avenue for explaining the unhappiness said to be associated with mind wandering (Killingsworth & Gilbert 2010), as well as a possible therapeutic effect of meditation (e.g., Farb *et al.* 2015*)*. We can hypothesize that the discomfort generated by attentional drift is not (only) due to the (pleasant or unpleasant) content of the virtual scene, but to the very loss of contact with the intimacy of experience, notably bodily experience. The therapeutic effect of meditation would not be explained by the attainment of a particular experiential content, but by the process of regaining contact with experience, regardless of its content. In both cases, the effect would be due not to the content of experience (in the virtual scene or thought), but to the structural features of the dynamic process of becoming (un-)aware itself.

It would be very interesting to deepen this line of description of the process of loss of contact with experience, as it could shed light on the process underlying the Buddhist notion of *avidyā,* "ignorance" or "nescience", which prevents us from "seeing things as they are". We could notably investigate the process through which *avidyā* creates and maintains the co-arising illusion of a permanent subject desiring to appropriate solid objects, which is considered in the Buddhist tradition as the very root of suffering, and the reverse process of vanishing of this illusion, leading to liberation from suffering.

3.2 Usefulness of the interviews for meditation practitioners and teachers

According to the "post-interviews" conducted with the practitioners, micro-phenomenological interviews were interesting and useful for them, because they helped them to refine their awareness of what happened and what they actually do during their practice. It is like "going on a journey of discovery" (Helen). Some of them also expressed a concern about the ability of words to express experience accurately: words do not fit exactly with experience, or may break the flow of experience. All nevertheless agreed that the interview "unpacks" experience:

> "I have the feeling to be able to open the experience, like a crumpled sheet that you can unfold through this inquiry." (Elisa)
>
> "Before the interview, I had the feeling that my meditation of this morning was not a great one … I thought this was not interesting, there was nothing in it. But during the inquiry I realized there was enough stuff in it to fill an entire life … Thank you!" (Linda)

This "unfolding" is due to the fact that practitioners become aware of previously unnoticed elements of their experience:

> "The work of elicitation has drawn my attention to those little moments I would perhaps overlooked. This refines my awareness of the process" (Joëlle)
>
> "It gives greater wakefulness. It does. A greater awareness of the transitions. Of what happens. More subtlety. [. . .] It takes apart the different constituent parts. And that gives a richness that actually is there all the time, but makes it more accessible, yes." (Helen)

These unnoticed elements may be subtle feelings or the location of these feelings:

> "I became aware that the emergence of the thought is associated with a little 'impulse' at the level of the chest. This is interesting for me because I had not noticed it." (Lise)
>
> "This sense of wanting to get somewhere different from where I was… I was surprised and sort of intrigued by that sense of… "oh, it's coming from the top of my head! Very much on the right and not in the centre." (Anna)
>
> "I was not so aware that the tightening was around the throat. That's something I became aware during our interview. Because I naturally would have thought it's another tightening in the head. But it's not. It's from the throat." (Anna)

Most of the practitioners we interviewed indicated that they became more aware not only of feelings, but also of subtle micro-gestures, in other words, of what they actually do when they practice, for example:

- micro-gestures involved in the process of emergence and sustainment of thoughts: from the tiny tension towards the first impulse of an emerging thought, to the micro-gestures which generate and sustain a virtual scene in which the practitioner becomes absorbed;
- micro-gestures involved in the process of vanishing of thoughts, such as the releasing of the tension on an emerging thought and the gesture of "going down into one's body".

In the following excerpt, the interview enables the practitioner to refine his awareness of what he actually does when he "brings back his attention towards the nostrils".

> "I am realizing that in fact, when I bring back my attention to the nostrils, I do not shift (my attention). There is no shift from a point to another one, at least in my experience there. It is not: there is no awareness of the nose, and then all of a sudden there is awareness of the nose. In fact, the awareness of the nose, of the air, is already there, but what I do is to strengthen it, to intensify it. It's like a movement, but I cannot find a starting point for this movement. The end point is the intensification. But for now I have not found a starting point. So, when I move my attention, there is a strengthening, an intensification of density. And there is an action to do so. (...) Thanks to the interview, I realized that this is not a shift of attention. It's almost a discovery for me. This is not a

discovery that surprises me, because in fact this is my experience. But at first I would have said that I moved my attention. But this is not true." (Paul)

What enables subjects to distinguish these sensations and gestures in their experience are the specific devices used by the interviewer:

1) the precision of the questions that draw the practitioner's attention towards specific moments or dimensions of the experience

"- And what makes you aware of that?

- That you ask me. That you ask me to find out what happens just before. That you keep returning to that. What happens just before? That you point at a split second and ask me: what happens there? And then attention has to go in and investigate it and sense, what happens there? What happens there? What happens there? And what do I do, what do I do? What kind of response does that give in the body? What happens with attention there? What does it look like, how does it feel? That you ask, that you point at a specific point, that is sufficient. Perhaps I simply would have overlooked it." (Helen)

2) the power of the evocation process:

"It was in connection with that zooming effect that I felt that it actually worked. It was in connection with some places where sensing into that again actually re-established the state so precisely that I could recall something more about it than I would have been able to just moments earlier. So that was really interesting." (Martin)

3) and the very effort to try to find words:

"I think it is interesting to notice to what a great extent practice can be there and be sharpened at the same time as words are put on it, almost as a consequence of putting it into words." (Marcus)

"One thing I find with elicitation is that it sharpens your awareness, the clarity about what is actually going on. And the sharpening lies in the work that goes into finding words. Finding words and then discovering, at least sometimes, that that wasn't quite precise enough and then seeking to refine that further." (Helga)

These testimonies show that what is important in the micro-phenomenological interview is less the description as a result than *describing* as a *process*, that is to say the inner gestures of discrimination that the participant performs, as "perlocutionary effects" (Austin, 1962) of the questions and prompts of the interviewer.

From this perspective, verbal descriptions are but "handles" that enable the practitioner to discriminate subtle aspects of experience that might have vanished without their help. They do not necessarily express experience, nor reflect or display it, but rather point to it[5].

In spite of their inadequacy, words also have the power to trigger an act of recognition in the listener or reader. In the following excerpt, an interviewer observes that the word used by a practitioner interviewed previously allowed her to recognize in her own meditative experience an element that she had not noticed earlier:

"The interview yesterday with Paul when he described this "impulse" allowed me to become aware of it, even though it was already familiar. The word 'impulse' suits me well. I think I recognize the experience that it points to." (Lise)

The recognition of the experience which is pointed to by the word, and the adoption of this word by the researcher, mark the beginning of a possible intersubjective agreement on that word to designate this particular subtle movement. In other words, the indicial function of

[5] As Heidegger wrote, "phenomenological concepts cannot communicate their full content, but only indicate it" (Zahavi 2003, p. 173).

words does not prevent the creation of a shared, specialized vocabulary to communicate about meditative experience.

> "Among people who have lived experiences, words... this is a little like poets. Poets use words, but words of poets point to something which is far beyond words. There is a resonance of speech, which points to something else. So to make someone understand that to which we want to point, we use words, knowing that words are only directions we give" (Alain)

Also advanced meditators recognized that the interviews helped them to become aware of unnoticed elements. This answers one of the questions we had at the start of the project: meditation already aims at "seeing things as they are", at developing awareness of one's experience, presence to one's experience, so how useful can micro-phenomenological methods, which also aim at developing awareness of one's experience, be for meditation practitioners? Our study shows that even skilled meditators, who have developed a very fine attention to their experience, are not necessarily fully aware of every dimension of this experience and of all the micro-gestures they perform to be present to it. Being encouraged and supported in describing these gestures very precisely allows them to acquire a finer awareness of them, and then, perhaps, to perform them more accurately. In other words micro-phenomenological methods might support the process of discrimination intended by, e.g., *vipaśyanā*.

Another concern of the practitioners we interviewed is that the interview may increase effort in their practice. Meditating with the knowledge that there will be an interview may cause greater tension to observe and remember. However, as one of the interviewees noted, it is possible that this kind of tension is in fact always already there in the practice, and that the interview situation only helps one to become more aware of it.

Moreover, once an interview has allowed the practitioner to recognize previously unnoticed elements of her experience and practice, awareness of these elements appears to persist in future meditation sessions. So it is not necessary to maintain the discriminating effort in every meditation session. For example, if an interview has led the practitioner to become aware of a little "impulse" at the level of the chest before the emergence of a thought, she will be able to recognize it in future meditation sessions without needing to mobilize a concerted effort to identify it. The interview has a learning effect: the increased awareness provided by the interview brings more clarity and precision in subsequent meditations and even outside of meditation sessions.

> "It is true that it has impacted my meditation. It provoked in me something that makes me more focused during my meditation. Since the last time, it is clear that I am more able to discriminate what happens, I am more accurate." (Michel)
>
> "It sharpens the clarity aspect in consciousness. It was as if, it was clear that – the image may be a silly one, but it was clear that the mirror had been polished." (Marcus)
>
> "In fact, I like it a lot ... because even this week (between the two interviews), it makes me more aware of what is going on in me." (Alain, 45 years of practice)

Meditation instructors who have been trained in the micro-phenomenological interview testify that it is also useful for them in the context of their teaching. On the one hand, a more refined awareness of their own practice helps them to refine their meditation instructions. On the other hand, doing interviews with their students helps them to obtain a better sense of how students actually practice, allowing them to identify better the difficulties they meet, and therefore to improve their teaching. They can develop a richer palette of instructions tailored more precisely to particular individuals.

Conclusion

This pilot study allowed us to collect fine-grained descriptions of meditative experiences, and to begin to identify their parameters and highlight their structure. Hypotheses that emerge from this work can be assessed by creating appropriate experiential protocols for further research.

Our study shows that meditative experience is a research object in its own right that is of great value to 1) understand the processes that are involved in meditation; 2) understand their effects, including their therapeutic effects; 3) refine the teaching of meditation; 4) refine our understanding of the concrete processes that underlie some concepts of Buddhist epistemology. Moreover, as meditation is not aimed at cultivating extra-ordinary experiences, but a way of training the mind in order to become aware of phenomena as they are, its micro-phenomenological investigation could shed light on thorny issues in contemporary consciousness studies, such as the existence of a "minimal" or "core" self. Fine-grained descriptions of the micro-processes that create the illusion of a permanent self facing a solid world, and the dualistic scission between a seeing subject and a seen object, might also shed light on the "hard problem" of consciousness.

This micro-phenomenological investigation is not a mere heuristic detour intended to provide keys for interpreting brain activity, interesting though this may be for understanding meditative processes. However, better knowledge of the experiential structure of meditative processes is a prerequisite for researching and interpreting its possible neuro-physiological correlates. Since experience is primary (Bitbol, 2014), its disciplined micro-phenomenological investigation provides an irreplaceable and irreducible understanding of its unfolding.

Bibliography

Allen, M., Dietz, M. Blair, K., van Beek, M., Rees, G., Vestergaard-Poulsen, P., Lutz, A. Roepstorff, A. (2012). Cognitive-affective neural plasticity following active-controlled mindfulness intervention. *Journal of Neuroscience* 32 (44): 15601-15610.

Andrews-Hanna JR, Kaiser RH, Turner AE, Reineberg AE, Godinez D, et al. (2013). A penny for your thoughts: dimensions of self-generated thought content and relationships with individual differences in emotional wellbeing. *Front. Psychol.* 4:900.

Ataria Y. (2014). Where Do We End and where does the World Begin? The Case of Insight Meditation. *Philosophical Psychology*, 1–19, doi: 10.1080/09515089.2014.969801.

Ataria Y. (2015). *Consciousness and Cognition*

Austin, J. L. (1962), *How to Do Things with Words*, Oxford: Oxford University Press

Bitbol M. (2014). *La conscience a-t-elle une origine*. Paris : Flammarion.

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

Bitbol M., Petitmengin C. (2016). Neurophenomenology and the elicitation interview. in: M. Velmans (ed.). *The Blackwell Companion to Consciousness (2nd edition).* Wiley & Sons.

Brefczynski-Lewis, J. A., Lutz, A., Schaefer, H. S., Levinson, D. B., & Davidson, R. J. (2007). Neural correlates of attentional expertise in long-term meditation practitioners. *Proceedings of the National Academy of Sciences, 104,* 11483.11488.

Brewer, J. A., Worhunsky, P. D., Gray, J. R., Tang, Y. Y., Weber, J., & Kober, H. (2011). Meditation experience is associated with differences in default mode network activity and

connectivity. *Proceedings of the National Academy of Sciences of the United States of America, 108,* 20254–20259.

Desbordes, G., Negi, L. T., Pace, T. W. W., Wallace, B. A., Raison, C. L., & Schwartz, E. L. (2012). Effects of mindful-attention and compassion meditation training on amygdala response to emotional stimuli in an ordinary, non-meditative state. *Frontiers in Human Neuroscience, 6,* 292. http://dx.doi.org/10.3389/fnhum.2012.00292

Farb, N. A., Segal, Z. V., Mayberg, H., Bean, J., McKeon, D., Fatima, Z.,& Anderson, A. K. (2007). Attending to the present: Mindfulness meditation reveals distinct neural modes of self-reference. *Social Cognitive and Affective Neuroscience, 2,* 313–322.

Farb, N., Daubenmier, J., Price, C.J., Gard, T., Kerr, C., Dunn, B.D., Klein, A.C., Paulus, M.P. & Mehling, W.E. (2015) Interoception, contemplative practice, and health. *Frontiers in Psychology*, 6:763. Doi: 10.3389/fpsyg.2015.00763

Fox, K.C.R., Zakarauska, P., Dixon, M., Ellamil, M., Thompson, E. & Christoff, K. (2012). Meditation Experience Predicts Introspective Accuracy. *PLoS ONE* 7(9):e45370.

Galera C, Orriols L, M'Bailara K, Laborey M, Contrand B, et al. (2012). Mind wandering and driving: responsibility case-control study. *BMJ* 345:e8105.

Germano, D. and Hillis, G. A. (2005). Tibetan Buddhist Meditation. *Encyclopedia of Religion, (2nd edition)*. Chicago: Macmillan**.** 1284-1290.

Grant, J. A., Courtemanche, J., Duerden, E. G., Duncan, G., & Rainville, P. (2010). Cortical thickness and pain sensitivity in Zen meditators. *Emotion, 10,* 43–53.

Grossman, P., Tiefenthaler-Gilmer, U., Raysz, A., & Kesper, U. (2007). Mindfulness training as an intervention for fibromyalgia: Evidence of postintervention and 3-year follow-up benefits in well-being. *Psychotherapy and Psychosomatics, 76,* 226–233. http://dx.doi.org/10.1159/000101501

Henry, M. (2000). *Incarnation. Une philosophie de la chair.* Paris: Editions du Seuil

Husserl, E. (2002). *Zur phänomenologischen Reduktion. Texte aus dem Nachlass* (1926-1935). Sebastian Luft (ed.). Dordrecht: Kluwer

Holzel, B.K., Carmody, J., Vangel, M., Congleton, C., Yerramsetti, S.M., Gard, T., Lazar, S.W., (2011). Mindfulness practice leads to increases in regional brain gray matter density. *Psychiatry Res*. 191 (1), 36–43.

Jensen, C. G., Vangkilde, S., Frokjaer, V., & Hasselbalch, S. G. (2012). Mindfulness training affects attention—Or is it attentional effort? *Journal of Experimental Psychology: General, 141,* 106–123. http://dx.doi.org/10.1037/a0024931

Khalsa, S.S., Rudrauf, D., Damasio, A.R., Davidson, R.J., Lutz, A., & Tranel, D. (2008). Interoceptive awareness in experienced meditators. *Psychophysiology, 45*, 671–677.

Killingsworth M. & Gilbert D. (2010). A wandering mind is an unhappy mind. *Science* 33 (6006).

Kuyken, W., Hayes R., Barrett B., Byng R., Dalgleish T., Kessler D., Lewis G., Watkins E., Brejcha C., Cardy J., Causley A., Cowderoy S., Evans A., Gradinger F., Kaur S., Lanham P., Morant N., Richards J., Shah P., Sutton H., Vicary R., Weaver A., Wilks J., Williams M., Taylor RS., Byford S. (2015) Effectiveness and cost-effectiveness of mindfulness-based cognitive therapy compared with maintenance antidepressant treatment in the prevention of depressive relapse or recurrence (PREVENT): a randomised controlled trial. *Lancet*, 386, 63-73.

Lachaux J.-P. (2011), "If no control, then what ? Making sense of 'neural noise' in human brain mapping experiments using first-person reports", *Journal of Consciousness Studies,* 18, 162-166.

Lazar, S. W., Kerr, C., Wasserman, R., et al. (2005). Meditation experience is associated with increased cortical thickness. *Neuroreport, 16*, 1893–1897.

van Leeuwen, S., Singer, W., & Melloni, L. (2012). Meditation increases the depth of information processing and improves the allocation of attention in space. *Frontiers in Human Neuroscience, 6,* 133. http://dx.doi.org/10.3389/fnhum.2012.00133

Lutz, A., Dunne, J., & Davidson, R.J. (2007). Meditation and the Neuroscience of Consciousness: An introduction. In: P. Zelazo, M. Moscovitch and E. Thompson. *Cambridge Handbook of Consciousness*. Cambridge: Cambridge University Press, 499-552.

Lutz, A., Brefczynski-Lewis, J. A., Johnstone, T., & Davidson, R. J. (2008). Voluntary regulation of the neural circuitry of emotion by compassion meditation: Effects of expertise. *PLoS One*, 3(3), e1897.

Lutz, A., McFarlin D.R., Perlman D.M., Salomons T.V., Davidson R.J. (2013). Altered anterior insula activation during anticipation and experience of painful stimuli in expert meditators. *Neuroimage* (64C), 538-46.

Lutz, A., Jha, A.P., Dunne, J.D., Saron, C.D. (2015). "Investigating the Phenomenological Matrix of Mindfulness-related Practices from a Neurocognitive Perspective." *American Psychologist* 70 (7): 632-658.

Mooneyham, B.W. & Schooler, J.W. (2013). The costs and benefits of mind-wandering: A review. *Canadian Journal of Experimental Psychology*, 67(1), 11-18.

Mrazek, M. D., Franklin, M. S., Phillips, D. T., Baird, B., & Schooler, J. W. (2013). Mindfulness training improves working memory capacity and GRE performance while reducing mind wandering. *Psychological Science, 24,* 776–781. http://dx.doi.org/10.1177/0956797612459659

Petitmengin, C. (1999). The Intuitive Experience. In: F.Varela and J. Shear, *The View from Within. First-person approaches to the study of consciousness.* Exeter: Imprint Academic, 43-77.

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

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. (2010). A neuro-phenomenological study of epileptic seizure anticipation. In Daniel Schmicking and Shaun Gallagher (eds.), *Handbook of Phenomenology and Cognitive Sciences*, Berlin, Heidelberg, New York: Springer, 471-499.

Petitmengin C., Baulac M., & Navarro V. 2006. "Seizure anticipation: are neurophenomenological approaches able to detect preictal symptoms?" *Epilepsy and Behavior*, 9: 298-306.

Petitmengin C., Remillieux A., Cahour C., and Carter-Thomas S. 2013. "A gap in Nisbett and Wilson's findings? A first-person access to our cognitive processes". *Consciousness and Cognition,* 22: 654–669. doi:10.1016/j.concog. 2013.02.004

Petitmengin C. & Bitbol M. (2009). The Validity of First-Person Descriptions as Authenticity and Coherence. *Journal of Consciousness Studies,* 16, 363-404.

Petitmengin C, Remillieux A., Valenzuela C., Analyzing first-person descriptions An analysis method for the science of consciousness. Submitted.

Philippot P., Segal Z. (2009). Mindfulness Based Psychological Interventions. Developing Emotional Awareness for Better Being. In: C. Petitmengin (Ed.). *Ten Years of Viewing from Within. The Legacy of Francisco Varela.* Exeter: Imprint Academic, 285-306.

Reiner, K., Tibi, L., & Lipsitz, J. D. (2013). Do mindfulness-based interventions reduce pain intensity? A critical review of the literature. *Pain Medicine, 14,* 230–242. http://dx.doi.org/10.1111/pme.12006

Remillieux A. (2014). Les coulisses d'une invention. Une description expérientielle du processus d'invention technique. *Intellectica* 61: 273-310.

Ruby FJM, Smallwood J, Sackur J, Singer T. 2013. Is self-generated thought a means of social problem solving? *Front. Psychol.* 4:962.

Schooler, J. W., Reichle, E. D., & Halpern, D. V. (2005). Zoning-out during reading: Evidence for dissociations between experience and meta-consciousness. In D. T. Levin (Ed.), *Thinking and seeing: Visual metacognition in adults and children* (pp. 203–226). Cambridge, MA: MIT Press.

Schooler JW, Mrazek MD, Franklin MS, Baird B, Mooneyham BW, et al. 2014. The middle way: finding the balance between mindfulness and mind-wandering. In *The Psychology of Learning and Motivation*, Vol. 60, ed. BH Ross, pp. 1–33. Burlington, MA: Academic

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

Smallwood, J., & Schooler, J. W. (2006). The restless mind. *Psychological Bulletin*, **132**, 946–958.

Smallwood J, O'Connor RC, Sudbery MV, Obonsawin M. 2007. Mind-wandering and dysphoria. *Cogn.Emot.* 21:816–42

Smallwood J, Andrews-Hanna J. 2013. Not all minds that wander are lost: the importance of a balanced perspective on the mind-wandering state. *Front. Psychol.* 4:441

Slagter, H. A., Lutz, A., Greischar, L. L., Francis, A. D., Nieuwenhuis, S., Davis, J. M., et al. (2007). Mental training affects distribution of limited brain resources. *PLoS Biology*, *5*(6), e138.

Teasdale JD, Segal ZV, Williams JMG, Ridgeway VA, Soulsby JM, Lau MA (2000). Prevention of relapse/recurrence in major depression by mindfulness-based cognitive therapy. J Consult Clin Psychol 68: 615–23.

Tulku Urgyen Rinpoche. (1999, 2000) *As It Is*. Hongkong and Esby: Rangjung Yeshe Publications

Valenzuela Moguillansky, C., O'Regan, JK. and Petitmengin, C. (2013) Exploring the subjective experience of the "rubber hand" illusion. *Frontiers in Human Neurosciences* 7:659

Vermersch, P. (1994/2010). *L'entretien d'explicitation.* Paris: ESF.

Vermersch, P. (2009). Describing the Practice of Introspection. In: C. Petitmengin (Ed.). *Ten Years of Viewing from Within. The Legacy of Francisco Varela.* Exeter: Imprint Academic, 20-57.

Vermersch, P. (2012*). Explicitation et phénoménologie.* PUF*: Paris.*

Yanko MR, Spalek TM. 2013. Driving with the wandering mind: the effect that mind-wandering has on driving performance. *Hum. Factors* 56:260–69

Zahavi, D. (2003). How to investigate subjectivity: Natorp and Heidegger on Reflection. *Continental Philosophy Review*, 36 (2):155–76.

Zanesco, A. P., King, B. G., Maclean, K. A., & Saron, C. D. (2013). Executive control and felt concentrative engagement following intensive meditation training. *Frontiers in Human Neuroscience*, *7*, 566. http://dx.doi.org/10.3389/fnhum.2013.00566