Some Foundational Problems in the Scientific Study of Pain

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This paper is an attempt to spell out what makes the scientific study of pain so distinctive from a philosophical perspective. Using the IASP definition of 'pain' (1986) as our guide, we raise a number of questions about the philosophical assumptions underlying the scientific study of pain. We argue that unlike the study of ordinary perception, the study of pain focuses from the very start on the experience itself and its qualities, without making deep assumptions about whether pain experiences are perceptual. This in turn puts scientific explanation in a curious position due to pain's inherently subjective epistemic nature. The reason for this focus on the experience itself and its qualities, we argue, has to do with pain's complex phenomenology involving an affective/motivational dimension. We argue for the scientific legitimacy of first-person phenomenological studies and attempts to correlate phenomenology with neural events. We argue that this methodological procedure is inevitable and has no anti-physicalist ontological implications when properly understood. We end the paper by commenting on a discussion between two prominent pain scientists in the field, Don Price and Howard Fields, about the need to distinguish more dimensions in the phenomenology of pain and how to classify them vis-à-vis the recent scientific findings. Our interest in this discussion is not only to introduce some clarifications but also to show how "neurophenomenology" has already been shaping the scientific research and to back our claim about why this methodology is inevitable with an example.

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1. Introduction. The scientific study of pain, one of the most controversial areas in neuroscience, is rife with philosophical problems. The complex physiological nature of pain, when combined with the multi-dimensional phenomenology of pain experience as revealed in clinical studies, presents not only empirical questions but conceptual puzzles as well.

Among the foundational questions raised by scientific pain research, the following are especially relevant from a philosophical point of view: the subjective epistemic nature of the *explanandum* and the epistemological status of scientific explanations in the study of pain; the ontological nature of pain experience and its relation to underlying physiological processes; the composite nature of the experienced phenomenology of pain (especially its affective dimension); and finally, the striking contrast between pain and other modalities of perception like vision, hearing, and touch. But perhaps the most pressing question of all concerns a fundamental tension between pain as subjectively understood versus pain as objectively characterized, which constitutes the focus of our discussion below.

2. A Fundamental Epistemic Tension in the Study of Pain. The widely accepted "official definition" of pain, as presented in the journal of the International Association for the Study of Pain (IASP), *Pain,* reads as follows:

> **Pain:** An unpleasant sensory and emotional experience associated with actual or potential tissue damage, or described in terms of such damage.
>
> *Note:* Pain is always subjective. Each individual learns the application of the word through experiences related to injury in early life . . . Experiences which resemble pain, e.g., pricking, but are not unpleasant, should not be called pain. Unpleasant abnormal experiences (dysaesthesia) may also be pain but are not necessarily so because, subjectively, they may not have the usual sensory qualities of pain. Many people report pain in the absence of tissue damage or any likely pathological cause; usually this happens for psychological reasons. There is no way to distinguish their experience from that due to tissue damage if we take the subjective report. If they regard their experience as pain and if they report it in the same ways as pain caused by tissue damage, it should be accepted as pain. This definition avoids tying pain to the stimulus. Activity induced in the nociceptor and nociceptive pathways by a noxious stimulus is not pain, which is always a psychological state, even though we may well appreciate that pain most often has a proximate physical cause. (IASP 1986, 250)

Notice the contrast between the one-sentence formulation which associates pain with tissue damage, and the immediate qualification in the sub-

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sequent *Note* about the "subjectivity" of pain. This fundamental tension between what can be quantified as the "objective" measure of pain as characterized in terms of tissue damage and the "subjective" criterion of when to categorize a given experience as pain is in fact prevalent in pain research.[1] There is a sense in which the definition ultimately takes the objectively observable measures out of the diagnosis process and gives almost full authority to the subjects (even if this authority may at times be overridden in practice). When combined with the appropriate manifested behavior, the patient—if sincere and not confused—appears to have the last word, according to the definition, as to whether she is in pain or not, and what the nature and amount of her pain is. This is so even when no physical disturbance of the relevant sort can be detected in her body or central nervous system.[2]

The IASP definition also seems to have an odd consequence with respect to what counts as *causal explanation* in the scientific study of pain. One might ask: what is the target of the explanation? Is it pain as subjectively understood, or pain as objectively characterized—as a physical state of the person? The definition seems to give credence to the former conception. But unless these two conceptions are conceptions of one and the same state, the scientists seem to take themselves to be studying or explaining the objectively observable *causes* of a subjective phenomenon (the introspectively accessible pain experience), but not the pain understood as an objective physical state. Put differently, consider whether it is reasonable, on the face of it, to take the definition as committed (implicitly or otherwise) to a metaphysical claim similar to those often made for con-

1. While IASP's definition is generally regarded as the received view on how to characterize pain, in the community of pain researchers there are several dissenting voices. Donald Price, for example, questions the association of a sensory experience or emotional unpleasantness with potential or actual tissue damage, as postulated in the main body of the definition. Price asks: "[I]t is not at all clear from whose point of view such an association exists: is it based on the judgment of an outside observer or on the experience of the person in pain? Although this most likely was not the intention of its authors, the definition could be understood to imply that if an observer (e.g., a health care professional) cannot determine an association between the reported experience and actual or potential tissue damage, then the experience is not that of pain" (1999, 1). This, we take it, is a consequence that Price regards as mistaken, if not absurd. See the first chapter of Price's book, devoted to the exploration of this conceptual space and attempts at more satisfactory formulations.

2. This is especially remarkable given that, contrary to basic pain research whence the definition comes, the clinical and medical community's reaction to this kind of phenomenon, sometimes called "psychogenic pains," has traditionally tended to dismiss patients' reports as "all made-up," "psychological," and therefore, as somehow "not real." The IASP definition proposes to alter this conception by giving priority to patient's sincere subjective reports. See Valerie Gray Hardcastle's recent book, *The Myth of Pain* (1999), for a detailed account.

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scious states in general[3]—i.e., that the explanation of pain experiences cannot be reduced to a physiological explanation because pain itself is not a physiological or physical state.[4] Accepting all subjective (sincere) reports as genuinely indicating real pain, independently of whether they are accompanied by known tissue damage or pathological *cause,* seems to render *all* objective measures of neuroscience secondary to the subjective ones.

But we believe the definition doesn't in fact go this far. It is compatible, for instance, with the claim that pain experiences *are* states of *the brain* (i.e., supraspinal activity as opposed to *peripheral* stimulation or *spinal* activity of a certain sort), and that when we *know* what states these are, objective measures will carry *at least* equal epistemic authority. Nevertheless, it is remarkable that the "official" definition seems to leave the ontological issue open, even though it insists that the *epistemic* authority is subjective as things now stand.

The question of epistemic priority between subjective and objective reports rests on a feature of pain that does not seem to be shared by perception in general: namely, the near-infallibility of pain reports, in contrast to other standard perceptual modalities where we can often be mistaken about what it is that we perceive (but see below). This near-infallibility, combined with the necessities of clinical practice and experience, appears to be the main theoretical factor responsible for the tension between standard causal explanations that the basic scientific research tends to traffic with and the epistemic authority of the patients. But how does pain differ from other perceptual modalities?

3. The Relation of Pain to Perception. The tension between explanations based on objective observation and measurement versus the subjective reports of the person in pain rests, at bottom, on the nature of pain experience itself. The difference seems to stem from the fact that it is much harder to establish, if at all possible, that a person who takes herself to be in pain is in fact mistaken and not in pain, or vice versa. Contrast this with cases of misperception, easy to come by all the time: looking at a piece of bush in the garden and mistaking it for a cat, hearing the alarm clock and mistaking it for the telephone, and so on. There seems to be a big difference between pain experience and perception in general in terms of what constitutes our immediate object of interest and attention.

3. Among many examples, see Kripke 1972; Nagel 1974; Searle 1992; and Chalmers 1996.

4. Hardcastle (1999) makes just this accusation: that the conception of pain expressed by the IASP definition has an implicit commitment to a dualist ontology, and that any philosopher who is a materialist with respect to the mind-body problem ought to reject this way of characterizing pain.

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In the case of perception, such as seeing or touching, it is what we see or touch, viz. the object of our perception, that we are most interested about. For the most part, this is certainly dictated by the fact that under ordinary circumstances, the experience of seeing or touching, apart from what is seen or touched, is largely transparent to the subject, making the content of the perception (rather than the perceptual experience itself) the focus of our attention and epistemic access. In contrast, in the case of pain experience, it is most often the experience itself that we are most immediately "presented with" and concerned about. That is, our immediate epistemic and practical focus is different in ordinary perception and in pain. Notice that this is true even if we construe pain experiences in entirely representational or intentional terms, i.e., even when we take pain experiences to represent some sort of tissue damage or bodily disorder or some kind of physical distress—whatever the intentional objects of pains turn out to be. Our immediate interest remains focused on the experience itself as indicated by the fact that we name the experience itself 'pain,' and talk about *it* when we talk about our pains, rather than apply 'pain' to the objects of the pain experience—if it has one.[5]

Wade Savage construes this difference as a difficulty for scientific accounts of pain in his extended discussion of the status of psychophysical explanations:

> [C]onsider pains, which are paradigm examples of sensations. There is the strongest kind of inclination to say that psychophysical laws of pain are laws relating sensations to their physical (or physiological) causes, laws of the form, $\Psi = f(\Phi)$. It does not seem that the concept of a perceptual ability can be substituted here for the concept of a

5. This asymmetry between pain and other perceptual modalities is elaborated in detail in Aydede (2001). For representational or perceptual theories of pain, see Armstrong 1968; Pitcher 1970, 1971; Dretske 1995, 1999; and Tye 1995, 1997 among others. Some of our colleagues with representationalist leanings have taken our claim in the text to be quite tendentious—i.e., our claim that the ordinary/dominant concept of pain applies, in the first instance, to experiences, rather than to their object. To clarify our claim, suppose, contrary to our view, that John's current excruciating experience (call it, *E*) represents a *physical condition* in his leg (e.g., a tear in his tendon; call it *PC*) so that our concept of pain applies to *PC* in his leg in the first place. Then the following would have to be correct statements: (a) John would not have any pain if he had *E,* but no *PC* in his leg (as in the case of some phantom limb pains and chronic pain cases), and conversely, (b) he would have pain if he had *PC* but no *E* (as would be the case if he had taken absolutely effective pain killers). We think that these statements would be based on a mischaracterization of our ordinary/dominant concept of pain. Note that this is a factual claim, not a terminological legislation on our part. Furthermore, this fact, in and of itself, does not argue against representationalism about pain—although, as Aydede (2001) argues, it can effectively be used in an argument against a *purely* representationalist position about pain.

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> psychological dimension. What perceptual ability would be measured? It cannot be the ability to perceive some public, physical entity, since pain is not public and not physical. To feel pain is to feel a private, psychological entity. Public entities—a pin, for example—may cause *O* to feel pain. But to feel the pin is not to feel the pain. It is not the ability to feel pins we wish to measure here, but the ability to feel pains. And this ability cannot be measured without a method for measuring pains, for measuring *sensations.* (1970, 547)

Savage's point is that unlike what is involved in perception, the object of pain experiences is not publicly observable entities or events. In fact, this way of construing pain often suggests that pain itself is the object of some form of perception. On the basis of the essential difference between things that are seen in vision, e.g., cars, cats, and football games, and "things" felt in "pain perception" (not the pain-causing stimulus but the pain experience itself), usually the following two consequences are held. First, the target of scientific explanation in pain research is a mental state that is subjectively accessible, and thus the scientific explanatory activity essentially has a prominent subjective element (to come back to the observation made previously). Second, perhaps because of this, a genuinely scientific account of pain itself is not possible, which may account for the widespread belief that pain is not a physical phenomenon (as Wade suggests above)—for if it were physical, it would be objective, not subjective, as one is tempted to argue.[6]

We concur with the first consequence, namely that scientific explanation of pain involves subjective elements—when this is understood in an ontologically neutral way—but not with the second. In fact, while we claim that "pain perception" can be construed, strictly speaking, as a form of introspection (and perhaps, to that extent, as a form of "inner perception or sense"), we don't take this to have any undesirable consequence with respect to scientific explanation and a materialist ontology.[7]

The outlined differences between pain and other modalities of perception constitute the basis of the strong epistemic foothold that subjective reports possess in the study of pain. The model of scientific explanation

6. Similar sorts of epistemic arguments have been actually given with great ingenuity and detail by Frank Jackson (1983)—although Jackson is not the first to argue this way; see, for instance, Nagel 1974.

7. See Aydede and Güzeldere (ms.). We distinguish between pains and their "perception," i.e., between pains and our knowledge of them. Our coming to know about our own pains is not to be equated with our *having* pains (i.e., our having certain kinds of sensations/experiences), however close the tie may be between them. We give a physicalist information-theoretic account of introspection that preserves the essential subjectivity and perspectival nature of our first-person access to our own experiences.

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for pain is different from the model of explanation for perception in general because of the asymmetry just mentioned. Ultimately, this difference stems from a difference between the explananda themselves.[8] However, this point—in the absence of an argument to the effect that no naturalistic explanation can be given for introspection of experiences—cannot be taken as a roadblock to a full scientific account of pain, and of experiences in general. Quite to the contrary, we argue that this particular feature of pain in fact tends to bring with it an advantage for the neuroscientist, which is normally absent in other perceptual phenomena at large: it forces the neuroscientist to pay more attention to the phenomenological information which seems to be available in introspection; it forces the neuroscientist to focus more on attempts to relate neuroscientific findings and mechanisms at the subpersonal level to what appears to be the case in pain reports at the personal level expressing subjectively accessible information.

Giving the subjectively available information almost full epistemic authority is a way of acknowledging the *reality* of what is subjectively reported, and thus practically forces the neuroscientist to assume that there have to be neural correlates (subpersonal mechanisms) of experiences.[9] It is these correlates that pain scientists try to discover by paying close attention to the subjective phenomena—after all the scientific study of *pain* is claimed to be the study of *experiences as reported and subjectively described* (as the IASP definition points out). What else is there for this scientific study to be the study of? The pressure on the pain scientist to pay close attention to the subjectively available information certainly stems from the subjective epistemic nature of pain and its clinical urgency. It seems clear that this pressure makes the pain scientist especially sensitive to integrative attempts to bridge the gulf between the subpersonal and personal levels. Thus, if the scientific endeavor is successful in this regard, the physicalist would be one step closer to actually identifying, as one and the same, the objects of the subjectively and the objectively accessible, and closing the so-called "explanatory gap" in the study of pain.[10]

4. Dimensions of Pain Experience. Recall that the addendum to the IASP definition of pain makes the following claim:

8. It may be argued that the claimed asymmetry is mistaken: in exteroception like vision and hearing, we still do have the perceptual experience with its object—it so happens that this object is normally located outside of the body. We grant that the information flow and its architecture may be the same. However, it is not obvious that the scientific explananda in, for instance, scientific vision research, are the visual experiences themselves and their introspectively accessible aspects, but rather it is how visual *recognition* occurs, which may or may not involve conscious access to experiences in the recognition process.

9. We take "neural correlates" as not excluding supervenience and identity relations.

10. On this point, see Güzeldere and Sufka 2001.

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> Experiences which resemble pain, e.g., pricking, but are not unpleasant, should not be called pain. Unpleasant abnormal experiences (dysaesthesia) may also be pain but are not necessarily so because, subjectively, they may not have the usual sensory qualities of pain. (IASP 1986, 250)

The last qualification about "sensory qualities of pain" presupposes that the subjective phenomenology of pain is not simple and homogeneous, but is complex. It has long been noted that pain experiences have at least two major dimensions: the sensory dimension and the affective one—sometimes a separate cognitive dimension is also added.[11] It is possible to exploit this bi-dimensional characteristic of pain in the service of a tighter integration of the phenomenal and physiological explanatory levels in the study of pain. To that end, we need to first sketch an outline of the relevant subpersonal mechanisms of pain.

4.1. An Outline of Subpersonal Pain Mechanisms. Pain processing starts with specific receptors and pathways, evolved to alert the brain to the presence of harmful stimuli via nociception. Nociceptive receptors and pathways vary in kind and are probably abundant in the human body. They project, like other various somatosensory pathways, from the periphery to the spinal cord, and from there to the cortical and subcortical areas in the brain.

One of the main results in pain research over the past thirty years or so is that there appear to be roughly two distinct central nociceptive pathways—the lateral and the medial. The lateral pathway ascends from the spinal cord to the lateral thalamic nuclei in the brain (the ventrobasal complex (VB), which includes the ventroposterolateral (VPL) and ventroposteromedial (VPM), as well as the ventroposterior inferior nucleus (VPI)), on its way to the primary and secondary somatosensory (S1 and S2) cortices. The medial pathway, in contrast, follows a more central route, stretching from the spinal cord to the medullary and pontine reticular formation (RF) to the medial thalamic nuclei, terminating in the in-

11. This distinction was first introduced by the late nineteenth century introspectionists such as E. B. Titchener who wrote: "The pain of a toothache is localized at a particular place, 'in the tooth'; but the unpleasantness of it suffuses the whole of present experience, is as wide as consciousness. The word 'pain' . . . often means the whole toothache experience." (The quotation is from Melzack 1961, 47, who does not specify the reference). William James also makes a similar distinction: "a distinction needs to be made between the primary consciousness of the pain's intrinsic quality, and the consciousness of its degree of intolerability, which is a secondary affair, seemingly connected with reflex organic irradiation." See also Trigg 1970 for a more modern statement, as well as Aydede 2000. This distinction later gained neurophysiological support, as we are about to see below.

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sula and the anterior cingulate cortex (ACC)—there are also connections to pariaqueductal grey (PAG) and to the amygdala (through the brainstem parabrachial nucleus—PB) and the prefrontal cortex (PF) as well as other limbic structures (see Figures 1 and 5 below). The terminating points of these pathways also reveal a functional difference between them.

The lateral pathways terminating in somatosensory cortical areas (S1, S2) seem to serve the capacity of the pain system to distinguish between different sensory properties of noxious stimuli, such as bodily location, intensity, and quality (thermal, incisive, traction, extension, etc.). In contrast, the medial pathways—due to the connections to insular and cingulate cortices and to limbic structures in general, which are known to

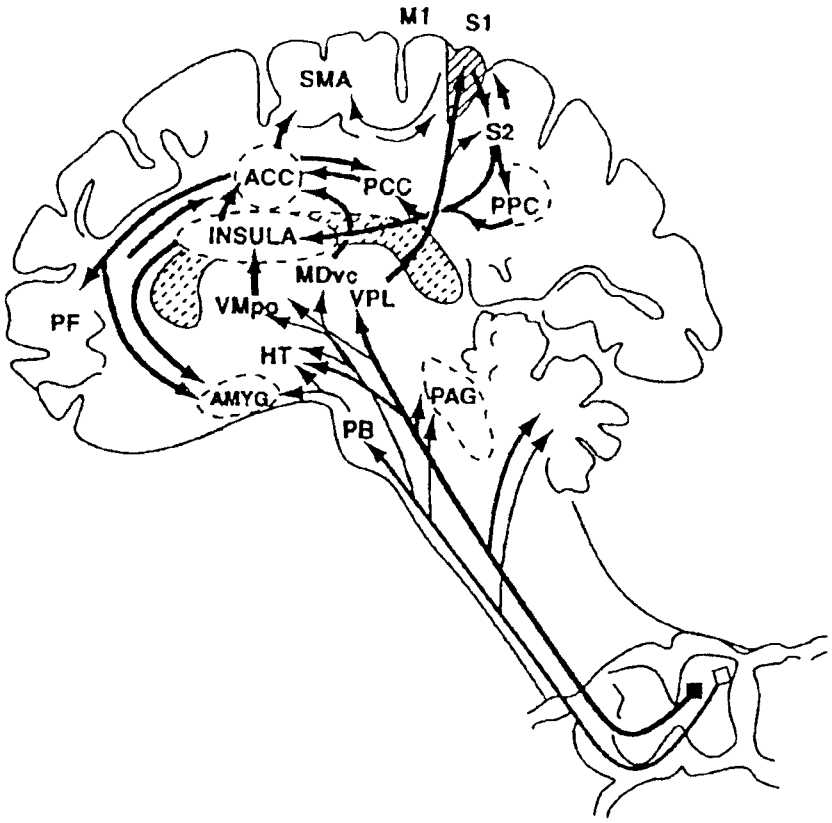


Figure 1. Schematic illustration of ascending pathways, subcortical and cortical structures involved in processing pain. VMpo, ventromedial part of the posterior nuclear complex; MDvc, ventrocaudal part of the medial dorsal nucleus; PCC, posterior cingulate cortex; HT, hypothalamus; PPC, posterior parietal cortex; SMA, supplementary motor area; AMYG, amygdala. (Adapted from Price 2000)

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play a crucial role in emotional behavior—seems to serve the capacity of the pain to generate the appropriate affect-laden responses (such as unpleasantness, urgent desire for cessation, interruption of attention) to nociception.[12]

These pathways appear to be anatomically distinct, although they heavily overlap. They are also functionally disassociable. Melzack and Casey (1968), mostly depending on case studies of such pain disassociation and modulation, provided the theoretical groundwork for much of the following scientific research that lead to the identification of some of the anatomic sites. The proposed gross functional organization of the central processing of nociceptive information underlying pain, as Melzack and Casey outlined in their highly influential 1968 paper, is still largely intact at least in so far as it insists on the distinct mechanisms for qualitatively distinct aspects of a pain experience (see Figure 2).

What has initiated and motivated the scientific search for separate subpersonal mechanisms for these distinct components was mainly a set of puzzling clinical data (as well as the introspectable phenomenology of pain), which are now confirmed through several different experiments with different methodologies (anatomical and physiological considerations as well as brain imaging studies). These data typically came from patients who have undergone prefrontal lobotomy (Freeman and Watts 1942, 1946; Hardy et al. 1952; Barber 1959; Bouckoms 1994) or cingulotomy

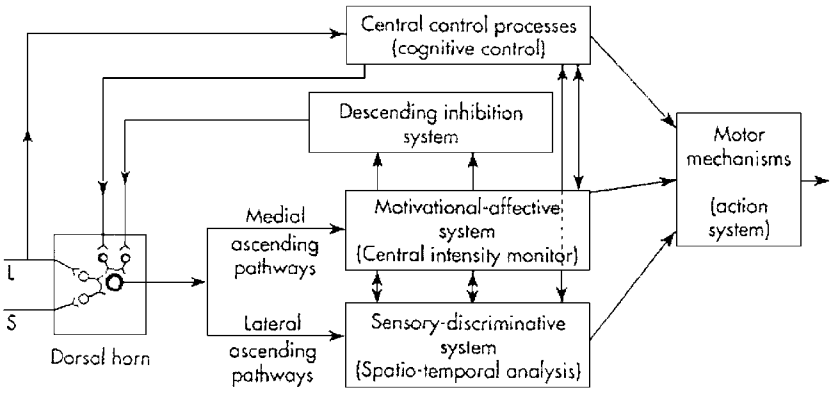


Figure 2. (Adapted from Melzack and Casey 1968).

12. Price (1988, 1999, 2000) may be in disagreement with this claim. He thinks that although affect in general is processed both in parallel and in series by these two major pathways, consciously felt affect results when the nociceptive stream coming from S1 and S2 (major sites at the end of the lateral pathway) reaches IC and ACC via PPC and PCC—see Figure 1 above.

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(Foltz and White 1962; White and Sweet 1969) as a last resort for their intractable chronic pain (as frequently involved in phantom limb pain, neuralgia, causalgia, severe psychogenic and cancer pains), from patients under the effects of hypnotic suggestion (Rainville et al. 1997, 1999), nitrous oxide (laughing gas), and some opium derivatives like morphine (Barber 1959). These patients by and large agreed that when they were in pain, they could recognize and identify it as such, but did not feel or seem bothered or distressed in ways characteristic to pain experience. There are, however, important differences among the phenomena afflicting these patients, which are manifested in patients' reports and behavior. For instance, pain asymbolia also typically produces a kind of disassociation—a rather strong kind—similar to cingulotomy patients' but interestingly different from lobotomy patients' (Rubins and Friedman 1948; Weinstein et al. 1995; Hurt and Ballantyne 1974; Devinsky et al. 1995).

Notice that the data here are obtained mostly on the basis of subjective reports of patients. No objective observations of the causes of their condition, non-verbal behavior, and/or the brain damage involved, would *all by themselves* be strong enough to force scientists to seek functionally and anatomically separate brain mechanisms.

There is strong evidence that the disassociation between these two components also goes in the other direction: in addition to cases where the intensity of sensory component can be reduced without affecting the unpleasantness of the experience (Gracely et al. 1979), there is at least one well documented and studied case where the patient experiences something very unpleasant upon receiving nociceptive stimuli without being capable of identifying his experience as pain (Ploner et al. 1999).[13]

It was (among others) the accumulation of this sort of (mostly) subjectively obtained abnormal data, indicating disassociable phenomenological

13. It is worth quoting from this study to illustrate the *prima facie* counter-intuitive results, which provided strong support for the bi-dimensional nature of pain experience: "[At higher intensities of cutaneous laser stimulation] the patient spontaneously described a 'clearly unpleasant' intensity-dependent feeling emerging from an ill-localized area 'somewhere between fingertips and shoulder' that he wanted to avoid. The fully cooperative and eloquent patient was completely unable to further describe quality, localization, and intensity of the perceived stimulus. Suggestions from a given list containing 'warm,' 'hot,' 'cold,' 'touch,' 'burning,' 'pinprick-like,' 'slight pain,' 'moderate pain,' and 'intense pain' were denied." (Ploner et al. 1999, 213). In personal communication, Price has indicated an important feature of the findings, which seem to be missed in the literature when reference is being made to this case study: the unpleasantness reported by the patient has arisen only when the laser stimulus intensity has reached 350 mJ, 150 mJ more than the normal pain threshold established for the normal right hand. As emphasized by Price, this seems to indicate that the disassociation of affect from sensation is not just a matter of being a parallel system being shot down, rather it leaves room for a serial interpretation of the interaction between affect and sensation.

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components, that ultimately led to the identification of the neural substrates through brain imaging studies: the phenomenology strongly guided what to look for, and where. Melzack and Casey's speculations opened a whole new chapter in modern pain research: more elaborate models unearthed inhibitory and modulatory systems in pain processing along with cognitive control and intervention mechanisms.[14]

4.2. The Phenomenal Complexity of the Affective Dimension of Pain. There is, however, some disagreement among scientists themselves about the nature of the affective dimension and how it relates to the sensory one. We would like to examine this disagreement because of its importance to the philosophical point we have made about the role of phenomenology in scientific research. We also hope to bring some conceptual clarification to the issues at hand in hopes of facilitating agreement.

One of the first pain scientists who pointed out the complexity of what is indiscriminately bundled up under the label "affective-motivational" is Donald Price (1988). Melzack and Casey had already changed the landscape of scientific pain research with their insistence that pain is not a single homogeneous phenomenon but consists of at least two dimensions. Price was persistently stressing in the late 1980s that the conceptualization of the affective dimension also need to reflect (at least) two different phenomena. In a recent *Science* article, he writes:

> Part of the affective dimension of pain is the moment-by-moment unpleasantness of pain, made up of emotional feelings that pertain to the present or short-term future, such as distress or fear. Pain unpleasantness is often, although not always, closely linked to the intensity of the painful sensation. Another component of pain affect, "secondary pain affect," includes emotional feelings directed toward long-term implications of having pain (e.g., "suffering"). (2000, 1769)

Earlier, he had called the moment-by-moment unpleasantness, "stage 1 affect" (1988, 56–57, 226–227). Unfortunately, despite Price's warning against generating potential confusion, the scientific community, as far as we can tell, has not paid much attention to this further distinction within the affective dimension of pain—until recently. In the abstract of a tribute article for Melzack/Wall/Casey on pain research, Fields summarizes his main discussion this way:

> This essay is an attempt to clarify the construct of unpleasantness in the context of the psychophysics of pain. The first critical point is that

14. See Fields 1999 and Price 1999, 2000 for overview. Chapman and Nakamura 1999 and Melzack and Wall 1989 are also very useful.

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> one aspect of unpleasantness is tightly coupled to stimulus intensity and is therefore a sensory discrimination. Pain has this quality, but so do other somatic sensations such as itch and dysesthesias that are not recognized as painful by most people. A corollary of this is that pain must have a quality other than unpleasantness that allows it to be unequivocally identified. I use the term algosity for that quality. In addition to stimulus bound (primary) unpleasantness, there is an unpleasant experience that reflects a higher level process which has a highly variable relationship to stimulus intensity and is largely determined by memories and contextual features. I have termed this experience secondary unpleasantness. (1999, S61)[15]

Fields then claims that: "[t]he sensory-discriminative/affective motivational dichotomy has outlived its usefulness and is currently more of an impediment than a guide to neurobiological explanation of pain" (1999, S61).

If Fields' distinction between primary and secondary unpleasantness should be taken as finessing Melzack-Casey's distinction, just like Price's, his suggestion seems puzzling. Given the way the framework is set up, one would think that Fields' distinction is a distinction within the affective dimension itself—that unpleasantness is an affective affair seems true by definition. So how could he be suggesting that the original sensory-discriminative/affective motivational dichotomy no longer applies?

As far as we can tell on the basis of textual evidence and personal communication, Fields takes the original dichotomy to make a distinction between what he calls algosity and secondary unpleasantness. Secondary unpleasantness is a "high level" processing because it involves heavy cognitive mediation and modulation. It consists of emotional reactions[16] produced or heavily influenced by how the patient *conceives* of her own pain and the consequences of having it. This conception need not be very reflective or self-conscious, but nevertheless taps on the patient's memories, perception/cognition of her context in which the pain occurs, and her general background knowledge and preferences.

15. A philosopher, Roger Trigg, writes in his underappreciated essay on pain: "The concept of a 'pain-quality' becomes necessary when it is realized that pains are not defined as merely unpleasant sensations. It cannot be the case that we just group some sensations together without any basis for doing so. We must be able to explain our ability to cope with completely new types of sensations. We do not have to think of our reaction to the sensation or the context in which it occurs before saying whether they are new types of *pain* or not. There is clearly something about a sensation in itself that prompts us to declare that it is a pain, and if this element is absent, we deny that the sensation is to be classed as a pain" (Trigg 1970, 26). Evidently, Fields introduces 'algosity' for much the same reasons that Trigg proposes 'pain-quality'.

16. Or, "emotional feelings." As Price defines it, an emotional feeling is *"the felt sense of a cognitive appraisal that occurs in relation to something of personal significance, often in relation to desire and expectation"* (1988, 56, emphasis in the original).

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We are not sure as to whether Fields' concept of secondary unpleasantness is the same as Price's concept of secondary pain affect, but at a minimum, they are close (although Fields' concept seems to be broader and more inclusive than Price's).[17] If our diagnosis is correct, Fields finds the original Melzack-Casey distinction to be flawed because it does not seem to leave any room for a conception of unpleasantness as a "raw feel," distinct from algosity but almost equally stimulus-bound, which is still an affective phenomenon but is not cognitively mediated in any way in which secondary unpleasantness is cognitively mediated.

Fields' way of making this point, however, is a little disorienting. He first suggests that "both [primary] unpleasantness and algosity are primary somatosensory qualities that represent two distinct intensity-based sensory discrimination" (1999, S64). He then says: "The attempt to pigeonhole unpleasantness as either sensation or affect is misguided because it is both" (S64). This analysis seems to us to be misleading because if primary unpleasantness is a form of genuine sensory discrimination distinct from algosity, then there must be some property—some objective feature of the stimulus—that it must discriminate, and this feature must be distinct from what algosity discriminates. But it is hard to see what this property of the stimulus might possibly be.[18]

According to our interpretation, what Fields is after is to isolate an affective component of pain phenomenology (an episodic raw feel) which is distinct from algosity but is nevertheless *primarily stimulus-bound* (almost as much as algosity is) in that it is largely (but not entirely) impervious to cognitive modulation and penetration. One might characterize this as a "raw hurtfulness" intrinsic to every normal pain experience as an essential component of it, no matter how much the secondary unpleasantness can be modified and mediated by various cognitive factors.

If we are right in this reading, it is also not surprising to find Fields arguing (apparently against Price 1988, 1999, 2000 and Rainville 1999, among others) that primary unpleasantness is processed in parallel with algosity. In other words, Fields insists that although it is reasonable to view secondary unpleasantness as a cognitively mediated *reaction* to al-

17. We are assured by Price that they are not the same (personal communication).

18. In personal communication, Fields has indicated that he means the primary unpleasantness to track the stimulus intensity, which is also tracked by algosity, when the intensity reaches a certain level . In other words, he said that his claim was precisely that it is one and the same natural property of the stimulus (i.e., its intensity) that they both track. We certainly think that primary unpleasantness is highly correlated with stimulus intensity, but we don't think that this is enough to make primary unpleasantness a sensory-discriminative response. We think that there are other difficulties with this claim that we plan to discuss elsewhere. The lack of space here unfortunately limits the extent and detail of the discussion that Fields' view much deserves.

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gosity, and therefore as causally dependent on it (i.e., in series with it), it is not reasonable to view the primary unpleasantness as a *reaction* to algosity (see Figure 3). He seems to think that primary unpleasantness is as much a raw feel as algosity is in reaction to stimulus intensity; so it is therefore (largely) in parallel with it. Indeed, he cites the above-mentioned case study by Ploner et al. in support of this view.

It is natural to think that Fields' distinction between primary and secondary unpleasantness is influenced by and at least roughly corresponds to Price's (chronologically earlier) distinction between stage 1 affect (or, immediate pain unpleasantness) and secondary pain affect. But the disagreement between Price and Fields about whether the affective-motivational aspect of pain is in parallel or in series with the sensory-discriminatory aspect seems to go deeper. We believe that it can be traced to a more fundamental disagreement as to whether there is an affective quality of pain which is a "raw" phenomenological element intrinsic to normal pain experiences, i.e., not *normally* cognitively mediated and modulated. It so turns out that Price thinks that even immediate "moment-by-moment" unpleasantness of pain depends on *cognitive appraisals*—even though they may be quite rudimentary and "automatic." Price's conception of his distinctions is captured nicely by a diagram he has been using over the years in slightly different forms (see Figure 4). Notice that here immediate pain unpleasantness as a qualitative component of pain phenomenology depends directly on "perceived intrusion or threat." Indeed, Price (1988) labels the latter stage on which the immediate unpleasantness depends "meanings" (58) and (first order) "cognitive appraisals" (227). This stage in turn causally depends on what Price calls "nociceptive sensations"—what Fields would call "algosity."

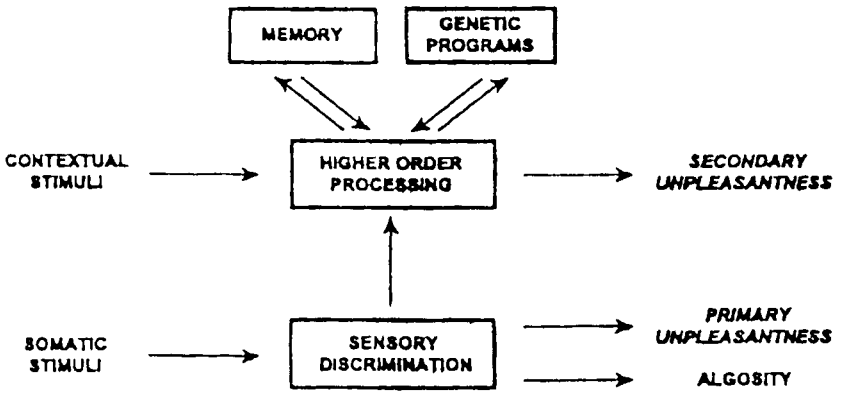


Figure 3. Fields' conception of the relations between algosity and two different kinds of unpleasantness (Figure from Fields 1999).

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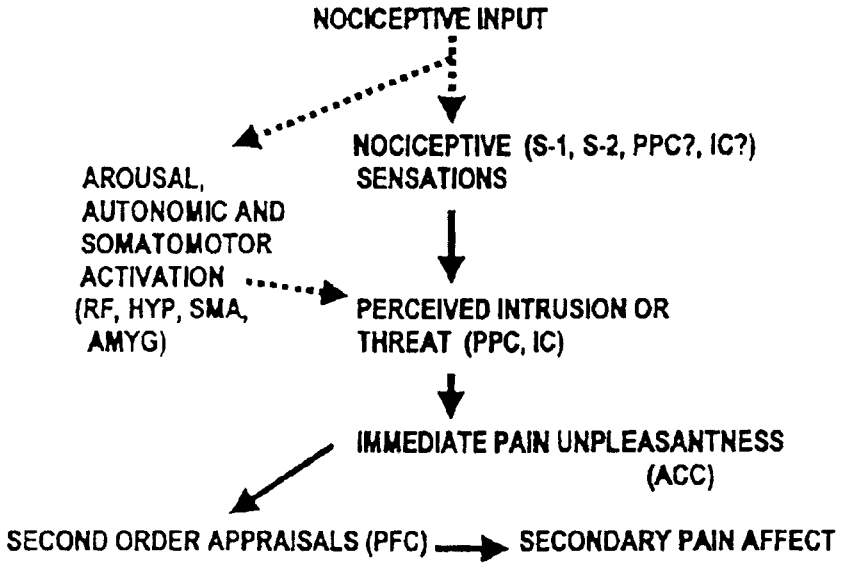


Figure 4. A schematic used to illustrate interactions between pain sensation, pain unpleasantness, and secondary pain affect (solid arrows). Neural structures likely to have a role in these dimensions are shown by abbreviations in adjacent parentheses, and their full names are given in the legend of Fig. [1]. Dashed arrows indicate nociceptive or endogenous physiological factors that influence pain sensation and unpleasantness. (Figure and caption from Price 2000)

Who is right, and how can this disagreement be adjudicated?

5. Conclusion. Trying to answer these questions goes beyond the scope of this paper. However, we would at least like to underscore the conceptual nature of the disagreement and the debate. Like many other scientists in the field, Price and Fields are talking about the *qualities* of pain experience (i.e., elements of pain phenomenology that are subjectively/introspectively accessible, and conceived as such) in an attempt to correlate them with different brain structures and mechanisms (what is objectively accessible). For instance, right after illustrating his views in Figure 3, Fields speculates on the underlying brain mechanisms corresponding to the relevant phenomenological distinctions (see Figure 5). This is a straightforward attempt to do what is sometimes called "neurophenomenology."[19] Indeed, the interest in the integration of these two levels is so strong and natural in the study of pain that sometimes it is not even clear which level drives

19. The recent interest in "neurophenomenology" owes much to the work of Francisco Varela and his colleagues. For a recent collection on this topic, see Petitot et al. 1999.

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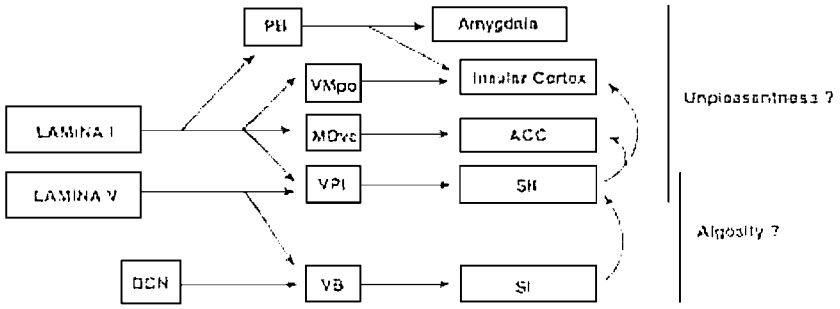


Figure 5. Nociceptive inputs to Dorsal horn laminae I and V have overlapping but distinct supraspinal projection targets; these include the brainstem parabrachial (PB) and possibly the dorsal column (DCN) nuclei, and, in the thalamus, the ventromedial part of the posterior nucleus (VMpo), the ventrocaudal Mediodorsal nucleus (MDcv), the ventroposterior inferior nucleus (VPI) and the ventrobasal complex (VB). These nuclei, in turn project to somatosensory and limbic forebrain structures as shown. (Figure and caption from Fields 1999, S66).

the investigation at the other level, and which conceptions and commitments at any given level influence the search for elements in the other level.

Fields, for instance, voices the following hope in the abstract of his 1999 paper:

> In order to increase our understanding of pain we need psychophysical tools designed specifically to differentiate primary unpleasantness from both algosity and secondary unpleasantness. These tools can then be used to determine the neural mechanisms of pain. (1999, S61)

This goes in one direction. But it is very clear that discoveries and theoretical speculations or models built to accommodate the data sometimes force the scientists (as well as philosophers—e.g., Dennett 1978) to have a new critical look at the distinctions drawn at the personal level. We think that this is as it should be. Studies and investigations at different levels do not compete against each other. On the contrary, the understanding of each feeds and enriches the understanding of the other. The *metaphysical* outcome in this process, when combined with the philosophical solutions to conceptual impediments, is to see that we are not dealing with two *ontologically* distinct levels, but the diversity is due to the different natures of the epistemic access involved—access to one and the same phenomenon.[20]

20. We are grateful to Howard Fields and Donald Price for reading an earlier version of our paper and giving us extensive feedback. They have made us appreciate how much the philosophical study of pain can benefit from interdisciplinary exchange with pain scientists (and, we hope, vice versa). While we could not accommodate all of their suggestions and criticisms due to lack of space, we intend to address these issues in more depth in a longer forthcoming essay.

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