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Introduction: Modularity and the Nature of Emotions[1]

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Are our experiences of fear, disgust, anger, joy, pride or compassion, for instance, more akin to states such as feelings or sensations, which are often thought to lack cognitive content, or are they more like perceptions or else like judgments? If emotions are informational or cognitive states, should we take emotions to be perceptions of a certain kind or else propositional states with a fully conceptual content? Are emotions passive states or are they at least to a certain extent subject to the will? Are some or all emotions basic, in the sense of being universally shared and innate or are they cultural constructions? Do some, or all, emotions threaten theoretical or practical rationality or are they, to the contrary, essential preconditions of rational thought and action? These are some of the many questions that emotion theorists have tried to answer.

Since the publication of Jerry Fodor's *The Modularity of Mind* (1983), a new set of questions, answers to which provide at least partial replies to the questions just mentioned, has emerged in the philosophy of emotions. Are emotions, or at least some of them, modular? This would mean, minimally, that emotions are cognitive capacities that can be explained in terms of mental components that are functionally dissociable from other parts of the mind. This is what is suggested by the often noticed conflicts between emotions and thought.

1 Our thanks to Frédéric Bouchard, John King, Mohan Matthen and Pierre Poirier for helpful comments.

For instance, Hume asks us to consider "the case of a man, who being hung out from a high tower in a cage of iron cannot forbear trembling, when he surveys the precipice below him, tho' he knows himself to be perfectly secure from falling, by his experience of the solidity of the iron, which supports him."[2] The emotion of fear this man experiences is characterized by recalcitrance with respect to thought. Since this is taken to be one of the hallmarks of modularity, one might be tempted to conclude that emotions, or at least some types of emotions, are modular (especially if you think that modules are natural kinds, because then the presence of one characteristic of modularity would be a reliable basis to infer the presence of the others).

Several authors have argued that emotional phenomena exhibit some of the properties Fodor attributes to modules (Charland 1995; Griffiths 1997; Öhman and Mineka 2001; Prinz 2004). Obviously, the answer to the question whether emotions are modular depends on what modularity is taken to be. The concept of modularity in which most recent discussions about the modularity of emotions have been framed is the one put forward by Fodor himself. However, different concepts of modularity, corresponding to different kinds of modular systems, have been proposed in the literature. In this introduction, we shall give a brief overview of the main concepts of modularity that have been offered in recent literature. After this, we turn to a summary of the papers collected in this volume. Our primary aim will be to explain how the modularity of emotion question relates to traditional debates in emotion theory.

1. Varieties of modularity concepts

As has been pointed out by Richard Samuels (2000), the term 'module' usually refers to functionally specific mental structures supposed to underlie particular cognitive capacities. But this general idea has been spelled out very differently, the term having been used to refer to quite different things. Though Samuels distinguishes between three kinds of modules, we think it useful instead to consider six kinds of modules.[3]

2 Hume (1739–40), Book 1, Part III, Section XIII. For a strikingly similar case, see Montaigne (1588), book II, chap. 12.

3 For a more complete list than Samuels,' see Segal (1996).

We do not hereafter propose a typology of modularity, but try instead of identify some of the ways in which the term is used. Thus, it should not come as a surprise that some uses of the term are compatible with or even encompass other uses.

(1). The first kind of modules are what could be called *boxological modules*. For instance, they are the boxes that cognitive scientists posit to explain a capacity when they proceed to a functional decomposition.[4] According to Fodor (2000), this form of modularity is a pretty diluted and non-contentious one. Almost everybody accepts the idea that cognitive capacities will have to be explained by invoking functionally individuated mechanisms (which Fodor prefers not to call "modules," 2000, 58). This form of modularity is also pretty neutral as to the properties of these mechanisms, so much of the work in cognitive science will consist in trying to discover what these are. In some cases, scientists will attribute to them properties that make them "modules" in a stronger (and more contentious) sense, sometimes not.

Given this, the emotional system itself, as well as the systems responsible for particular emotions, can be considered boxologically modular. But saying that is pretty uninformative as to what the properties of the emotion modules are. It might be considered only a heuristic step in the direction of a more thorough description of them.

(2). A more substantial form of module is one that Samuels calls *Chomskian modules* (see also Fodor 2000). They consist in domain-specific bodies of information (databases) or mental representations that account for a cognitive capacity. In order to distinguish such a body of information from a mere collection of beliefs about a particular domain, such as hockey, it is best to consider that Chomskian modules are both innate and inaccessible to consciousness. This is in any case how Chomsky himself conceived of the structures underlying our linguistic competence. According to Chomsky, our linguistic competence is based on an innate and consciously inaccessible system of mental states encoding the grammar of natural languages (1988).

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4 Functional decomposition is an explanatory strategy in cognitive science according to which to explain a general capacity like vision or language, what one has to do is to identify component tasks that need to be performed in the system in order to produce the overall capacity.

Transposed to the case of emotions, the claim would be that our emotional reactions are: a) based on a body of information, which is b) innate and consciously inaccessible. What kind of information could that be? One quite natural possibility is to claim that the information in question concerns evaluative features of the world. Fear would depend on information concerning what is dangerous, grief on information concerning what constitutes a loss.[5] One important question is whether such information is innate (or 'prepared,' as it is often put in the literature; Öhman and Mineka 2001). It is clear that even if there are some things, such as spiders or loud sounds, that we are innately predisposed to fear, we are able to learn to fear other things.

(3). In his *The Modularity of Mind*, Jerry Fodor proposed the model of the architecture of the mind that is probably the most discussed in the literature on emotions. According to him, the mind is made up of three elements: sensory transducers (whose function is to convert physical stimulation into neural signals), input and output modules (whose function is to process the information coming from the sensory transducers or to prepare it for motor effectors), and a central system (in charge of analogical thinking, reasoning, and abduction). Modules in this model are essentially "processing devices" (a sentence parser would be a good example of such a device) that take representations specifiable in syntactic terms as input and produce representations as output according to a function (also specifiable in syntactic terms).[6]

Fodorian modules are mechanisms of cognitive processing characterized by the following properties[7] (see Fodor 1983; 1990):

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5 This suggestion would seem to fit well with some versions of the so-called appraisal theory of emotions (Arnold 1960; Lazarus 1991; Scherer et al. 2001).

6 Chomskian modules and Fodorian modules are not incompatible; quite the contrary. More often than not, the innate databases are processed by an encapsulated cognitive mechanism. As Coltheart puts it: "processing modules will generally incorporate knowledge modules [a kind of Chomskian module] – the syntactic processor will have, as part of its internal structure, a body of knowledge about syntax" (1999, p. 118; see also Segal 1996, 144).

7 There is some question as to whether these characteristics are definitional or necessary conditions for the application of the term or if they are just properties that some paradigmatic cases of modules have (or tend to have as members of

1. *Domain-specificity*: A device is domain specific if its responses are restricted to a specific class of stimuli (Fodor has suggested recently that this is not enough for domain-specificity. According to him, 'domain specificity' "applies neither to information nor to processes, but rather to the way that the two of them interact"; 2000, 61). For instance, the visual system processes only visual inputs, whereas the auditory system is dedicated to auditory inputs.
2. *Mandatoriness*: The actions of the modules are automatic; they cannot be completely turned off voluntarily (you cannot directly control whether or not a module will process a given input). For instance, you cannot but process a sentence in English upon hearing it.
3. *Limited central access to the mental representations that modules compute*: As a rule, one can say that only the "final consequences of input processing are fully and freely available to the cognitive processes that eventuate in the voluntary determination of overt behavior" (Fodor 1983, 56). Therefore, the intermediate representations (for instance, in Marr's theory of visual perception, the representations forming the 2 ½ sketch) as well as the computational processes necessary to elaborate a representation of the distal cause of a proximal stimulation are in principle inaccessible to consciousness.
4. *Informational encapsulation*: Not all characteristics of modularity are of equal importance. For Fodor, informational encapsulation is the "heart of modularity" (2000, 63).[8] A module is informationally encapsulated if, in the processing of information, its access to beliefs, desires, and utilities is restricted (or, to put it differently, if it is limited to information that is in its database).[9] This character-

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a natural kind). If such were the case, it would then be an empirical question to know if a particular module had all or some of these properties; see the fourth sense of modularity below for such a view. A related question is whether the characteristics admit of degrees or not. Fodor has explicitly stated his preference for the former (1983, 37).

8 Again, the fact that encapsulation is a central property of modules is shown in Fodor's definition of modules: "A module is, inter alia, an informationally encapsulated system – an inference-making mechanism whose access to background information is constrained by general features of cognitive architecture, hence relatively rigidly and relatively permanently constrained." (Fodor 1985/1990, 201)

9 "To a first approximation, nothing affects the course of computations of an encapsulated processor except what gets inside the capsule; and the more the

istic is also known as "cognitive impenetrability" and is meant to describe the fact that the modules are insensitive to what a person presumes, expects, or desires. As Coltheart (1999) remarks, being encapsulated is not incompatible with top-down processing, as long as the background information used in the top-down processing is restricted inside the module (the example being phoneme restoration, where phoneme identification has access to the lexical inventory of a subject language).

5. *Fast processing*: Because modules do not have to consult all the information available in the system, but only a restricted class of it (so they do not fall prey to the infamous 'frame problem'; Dennett 1987), they are able to compute faster.
6. *Shallowness of output*: Because of information encapsulation, the output of the modules has to be representations of basic categories. To put it differently, the representations produced by the modules cannot include background knowledge (or they would not be produced by modules); therefore, they have to be conceptually simpler (more basic) than representations produced with background knowledge. This is sometimes taken to mean that the output is non-conceptual in the sense that the modules generate information but not thoughts or beliefs (Carruthers 2006; also see Ogien *this volume*). However, it might just mean that the concepts involved in the production of the output are restricted to what is in the proprietary database of the module (see Charland *this volume*).[10]
7. *Fixed neural architecture*: From the neural implementation point of view, modules are often associated with a fixed neural architecture. Though modules don't have to be, there is reason to think that it

processor is encapsulated, the less information that is. The extreme case is, I supposed, the reflex; it's encapsulated with respect to all information except what's in the current input" (2000, 64).

10 Or again differently: "Since input systems are, by assumption, informationally encapsulated … the categorizations such systems effect must be comprehensively determined by properties that the visual transducers can detect: shape, color, local motion, or whatever. Input systems … are confined … to categorizations which can be inferred, with reasonable accuracy, from such 'purely visual' properties of the stimulus." (Fodor 1983, 97)

might be advantageous for them to be localized in restricted brain regions.[11]

8. *Characteristic and specific breakdown patterns*: Given the fact that modules are functionally independent from each other (and that they might be localized in restricted brain regions), one should expect characteristic and specific breakdown patterns, where (after a lesion, for instance) one module would stop working while the working of others is left untouched. Cases like visual agnosia (inability to recognize familiar objects or faces) or language aphasia (difficulty in producing and comprehending language) are examples of the kind of very circumscribed breakdown that one should expect from a modular architecture.
9. *Characteristic pace and sequencing of ontogeny*: Work from developmental psychologists shows that modular competences have specific developmental patterns. For instance, children go more or less through the same stages while developing their theory of mind (for a review, see Saxe et al. 2004), stages that have nothing to do with the stages they go through while learning language or recognizing faces (*pace* Piaget). Moreover, it seems that the learning is robust, not easily perturbed by deprivation (or degradation) of environmental information. Both these characteristics suggest that development of modules is endogenously driven (i.e., they are innate) and that, therefore, environment acts at most as a trigger.

At first blush, emotions seem to have all the characteristics of modularity. If emotions are modules, then the question of the relation between emotions and beliefs or thoughts becomes clear. Recalcitrance, the fact that emotions are sometimes not affected by what we consciously believe or think about a situation, is explained by the modular nature of emotions (Griffiths 1990). And so the fact that some imaginary representations of situations trigger emotional reactions is to be expected if these representations are of the sort that usually trigger or initiate the effect or part of emotional modules, also known as the "affect program."

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11 This is sometimes called "anatomical modularity." To restate what we just said, though some people have suggested it does, cognitive modularity does not imply anatomical modularity. (For a discussion on this issue, see Bergeron and Matthen, *this volume*, as well as Bergeron 2007.)

(4). A fourth kind of module is what might be called a *Darwinian module*. It is the kind of module favoured by evolutionary psychologists, such as Cosmides and Tooby (1995) and Pinker (1997). (See also Sperber 1994; 2002). The view of evolutionary psychologists is similar to the first notion of modularity (boxological modularity) we presented, except that they see modules as products of natural selection, that is, as solutions to adaptive problems that plagued the human species for eons. Since there were many different kinds of adaptive problems that humans faced in their environment, and, according to evolutionary psychologists these problems could not be solved adequately by a general problem solver, the solution that Mother Nature had to hit upon was to produce an architecture of the mind replete with specialists (modules). Evolutionary psychologists have thus been known for advocating a "massively modular view of the mind"; that is, a view of the architecture of the mind with "hundreds and thousands" of modules, where these are not limited to the periphery of the mind (as they are for Fodor), but also comprise some central capacities of the mind, like reasoning.

For evolutionary psychologists, modularity refers first of all to "functional specializations" or "evolved specializations" of the mind (Barrett 2006; Barrett and Kurzban 2006),[12] the properties of which cannot be specified in advance. It is therefore empirical research that should decide, for each module or specialization, what properties it has (some might be innate, some might be learned[13]; some might be fast, others slow[14]; some might be like Chomskian modules, some

12 "We have also used the term modularity to mean the tendency of biological systems to evolve functional specializations and the term module to refer to an evolved specialization, regardless of the degree to which it exists in a heavily policed informational quarantine or operates on information available to other procedures in the architecture. In this usage, we did not mean to invoke Fodor's particular and narrow concept of modularity, which appears to make information encapsulation a defining feature rather than (in our view) an occasional concomitant" (Tooby et al. 2005, 309).

13 For examples of the latter, see Karmiloff-Smith 1992.

14 "For example, being fast and automatic might be properties expected of a snake detection device, but not for those responsible for mate choice, decision making under uncertainty, or making inferences about social exchanges" (Machery and Barrett 2006, 16).

like Fodorian modules, others different from them both; for a similar point, see Coltheart 1999). In a way, evolutionary psychologists adopt a bottom-up approach, starting with a very minimal definition of modularity and venturing out to discover how modularity is realized in each case.

As a consequence of the view that modularity refers to "functional specializations" of the mind shaped by natural selection, it is expected that modules will be domain-specific[15] ("boxological modularity" is not in principle committed to that). The idea is that, because modules are designed to process information in a specialized way, they will also have specific "input criteria"; they will process only certain types or formats of information. For instance, a system specialized in recognizing faces will only accept visual information with certain configurational characteristics (so, in principle, it has access to all visual information, but only processes some of it; for a distinction between *access specificity* and *process specificity*, see Barrett 2005).

Finally, a Darwinian perspective on modularity allows one to distinguish between the proper and the actual domain of a module. The proper domain of a module is the domain that the module has been selected to deal with, for instance, face recognition. The actual domain is the domain with which the module is dealing now, despite not having necessarily been selected for it. For instance, it is said that the module in charge of face recognition is also used for car recognition by car experts (Gauthier et al. 2005). Many have argued (for instance, Duchaine et al. 2006) that car recognition cannot be the "proper domain" of the module, i.e., that it has not (cannot have been) selected because it was doing that.[16]

Cosmides and Tooby (2000) have suggested that emotions are Darwinian modules; that is, they are solutions to adaptive problems encountered by our hunter-gatherer ancestors.[17] The role of emotions,

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15 Barrett and Kurzban (2006) see it as a *necessary consequence* of functional specialization (630).

16 Others have argued that car recognition depends on some more general ability that is applied to both faces and cars (see Bergeron and Matthen, *this volume*; and for a slightly different version of the same argument, Faucher et al., in press).

17 "Each functionally distinct emotion state – fear of predators, guilt, sexual jealousy, rage, grief, and so on – will correspond to an integrated mode of operation that

according to them, is to coordinate independent programs (programs governing perception, memory, learning, goal choice, etc.) to produce adaptive responses to certain classes of stimuli that are associated with reliable cues signalling their presence in the environment (bitter taste for poison or unknown faces looking straight at you for predators, for instance).

Thinking about emotions as Darwinian modules has also been instrumental in bringing to the fore what might be taken to consist in the rationality of emotions (like fear or anger) that look *prima facie* irrational or that appear to motivate irrational behaviour (Ketelaar and Au 2003; Cosmides and Tooby 2004; Haselton and Ketelaar, in press; see Jones, *this volume* and de Sousa, *this volume*).

(5). A fifth kind of module is what Segal (1996) calls a *diachronic module*. Some psychologists think that the mind has modules the function of which is to take input from the developmental environment and to build (as output) the modules we end up with as adults. Chomsky's "language acquisition mechanism" (LAM) would be such a diachronic module. In recent versions of his theory, the LAM is constituted by parameters that can be switched on or off, depending on the linguistic environment a child grows in. Diachronic modules in this model can thus produce limited variation in the 'synchronic modules,' depending of the developmental environment they are in (for instance, a French generative grammar if the child develops in a French environment).[18]

Many people have talked about emotional development, but their positions on the subject diverge. Some argue in favour of the innateness (and by this they mean the presence at birth) of the basic emotions, 'development' being characterized by the enlargement of the set of stimuli that can trigger the emotion and by the greater control

functions as a solution designed to take advantage of the particular structure of the recurrent situation or triggering condition to which that emotion corresponds" (Cosmides and Tooby 2000, 101).

18 Now, the end product of diachronic modules can be Chomskian modules or Fodorian modules or other sorts of modules evolutionary psychologists suspect might be out there. It can also be parametrized as suggested by Chomsky or by a more Fodorian computational algorithm or even by something entirely different, as long as it takes 'developmental inputs' and produces reliably adult modules as an output.

one can exercised on one's reactions (Ackerman et al. 1998). In this model, basic emotions do not develop (in this sense, there is no developmental module as such); they have to wait for the maturation of other mechanisms to get their adult form. As we mentioned earlier, some think that the 'appraisal mechanisms' can be set the same way grammars are thought to be set. If such is the case, you would get for each emotion a mechanism similar to the LAM, for instance, a Fear Acquisition Mechanism, a Disgust Acquisition Mechanism, etc. (for suggestions in this direction, see Öhman and Mineka 2001 for fear and Knapp 2003 for disgust). Finally, others see the development of emotions more as a contingent reconstruction depending on certain (physical, social and cultural) aspects of the environment as well as on more endogenous factors such as genes (see, for instance, Campos et al. 1996; for a review of the positions, see Faucher and Tappolet, in press). In this case, development would not be programmed the same way Chomsky claims language is, but it would still be modular in the sense that, if the environment is normal, the end result of development will be a particular static module. (Development would start with biases that direct development in a particular direction; see Faucher et al., in press.)

It is when talking about the appraisal mechanism of emotions that people are the closest to the kind of acquisition mechanism Chomsky was proposing for language. Indeed, some think that it would be advisable to posit a "fear-" or a "disgust-acquisition mechanism"; that is, mechanisms which would constrain the class of stimuli that could elicit the emotion (for instance, no one is disgusted by rocks and, likewise, people can more easily learn to fear snakes than flowers).

(6). The last kind of module we would like to describe can be called a *biological module*[19]: Talk about modules is not confined to psychology; it also takes place in biology. In this discipline, the term refers to the fact that organisms are composed of "quasi-independent parts that

19 We are aware that the term "biological" might be a bit confusing after using the term "Darwinian module." We used the term "Darwinian module," following Richard Samuels (2000), to designate the functionally specialized computational mechanisms posited by the evolutionary psychologists. These are a subclass of the biological modules we are talking about here. Of course, Chomskian and Fodorian modules can be biological modules as well.

are tightly integrated within themselves … but develop or operate to a certain degree independently of each other" (Schlosser and Wagner 2004a, 1–2).[20] Modules are thus aspects of organisms on which natural selection can act,[21] as well as building blocks that can be used for construction of new traits (see Marcus 2006). For that reason, they are sometimes also called "evolution modules" (see Schlosser, 2004, for a review).

Biological modules can be characterized either as structures or as processes. Characterized as structures, modules are units the components of which have more intimate connections between themselves than with their surroundings (Schlosser and Wagner 2004b, 4). Cell types or organs (such as insects' segments or limb buds) are structural modules. Characterized as processes, modules are units that interact with each other in an integrated fashion, but that "behave relatively invariantely in different contexts" (Schlosser and Wagner 2004a, 4). Examples of such modules are gene regulatory networks and signalling cascades (like Hedgehog or Notch; for discussion of these and others, see chapters in Schlosser and Wagner 2004b). For instance, Notch pathway is thought to promote cell fate decisions, in early neurogenesis but also in "epidermial derivatives, various parts of the central nervous system, … lymphocytes, gut, lung, and pancreas"

20 See also Griffiths (2007): "The fundamental notion of modularity in evolutionary developmental biology is that of a region of strong interaction in an interaction matrix. A metazoan embryo is modularized to the extent that, at some specific stage in development, it consists of a number of spatial regions that are developing relatively independently of one another.… Developmental modules are typically organized hierarchically, so that modules exist on a smaller physical scale within individual, larger scale modules. The individual cell represents one prominent level of this spatial hierarchy. At a lower level than the cell are particular gene control networks." (201)

21 In a recent paper, Arthur refers to these modules as "developmental cassettes," suggesting that they are "evolution modules" (units on which natural selection acts): "The concept of an interaction pathway – and the group of genes that encode its components – as comprising a sort of developmental cassette that can be treated as a unit of evolutionary change is an attractive one. Different kinds of evolutionary process involving such units can be considered, including their divergence in separate lineages after speciation and their co-option for a new developmental purpose within a lineage, possibly coincident with the appearance of new morphological structures such as limbs" (Arthur 2002, 762).

(Schlosser 2004, 532). In most of these different domains, it fulfils a similar function; that is, it mediates cell fate decisions among adjacent cells (though the fates are different depending on the domain).

Because it only recently became fashionable to talk about biological "modules" (see, for instance, the collections of Callebaut and Rasskin-Gutman, 2005, and Schlosser and Wagner 2004b),[22] not many philosophers or psychologists have been thinking of emotions explicitly in terms of biological modules. The exception is Paul Griffiths (in press; but see also Dumouchel, *this volume*, for a different way to think about emotions along the lines of biological modules), who, in a recent paper, argues that thinking in terms of biological (developmental) modules (that is, in terms of quasi-independent parts that are tightly integrated within themselves and that can operate independently of each other) might be a step forward in the direction of a sounder evolutionary psychology. In such a psychology, much emphasis would be put on homological traits (and descent with modification) instead of on analogical traits (as is the case with evolutionary psychology at the moment).[23] According to him, homological traits have more 'causal depth' than analogical traits. To illustrate, he uses emotion as an example:

> [S]uppose that two animals have psychological traits that are homologous – the basic emotion of fear in humans and fear in chimpanzees…. We can predict that, even if the function of fear has been subtly altered by the different meaning of 'danger' for humans and for chimps, the computation methods used to process danger-related information will be very similar and the neural structures that implement them will be very similar indeed.… [S]imilarities due to homology (shared ancestry) are notoriously deep – even when function has been transformed, the deeper you dig the more similarity there is in mechanisms. Threat displays in chimps look very different from anger in humans, but the more you understand about the facial musculature, the more similar they appear. The same is almost certainly true of the neural mechanisms that control them. (Griffiths, in press)

22 This is not to say that the idea of modularity has not been around for a while; see, for instance, Simon (1966) and Gould and Lewontin (1979).

23 For a very similar argument, see Matthen (1998).

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There is a great variety of structures that have been called "modules." The six kinds of modules we have described here are not the only ones distinguished in the literature (see, for instance, Hurley 1998, as well as Sneddon, *this volume*, for a distinction between horizontal and vertical modules), but they are the main ones in the recent debate. As should now be obvious, the question whether emotions (the emotional system or else the systems responsible for particular emotional kinds) are modules thus splits into at least six sub-questions. The questions addressed by the contributions to this volume are: a) whether emotions are modules of this or that kind, and b) what this entails with respect to our understanding of emotional phenomena in general. We have thus divided the different chapters along the lines of three traditional questions in the philosophy of emotions, i.e., the rationality of emotions question, the question whether there are basic emotions, and the question whether emotions are perceptions. Finally, the last part of this volume puts together contributions that focus on the modularity of particular emotional phenomena, such as shame.

2. Emotion theory and the modularity question

The rationality of emotions. A question which is as old as emotion theory is that of the relationship between emotions and reason. Although emotions have traditionally been criticized because of what was considered their opposition to reason, the renewal of interest in the emotions in the last twenty years has come with a marked revalorization of emotion (de Sousa 1987; Lazarus 1991; Damasio 1994; Nussbaum 2001). Emotions have been claimed either different from, but necessary for, theoretical and practical reason, or else part and parcel of rational thought. This question of the rationality of emotions is taken up here by Karen Jones and Ronald de Sousa.[24] As Jones underlines, the claim that emotions are rational is far from obviously compatible with the view that emotions are modular in the Fodorian or Darwinian senses.

Karen Jones takes a critical, but sympathetic, look at what she calls the "new pro-emotion consensus." She starts with a detailed account of the different ways emotions are claimed to contribute to rationality,

24 Also see Lance and Tanesini (2004).

such as by improving our access to reason or by facilitating appropriate action. The question is how these feats are possible if emotions are encapsulated and mandatory. She claims that Tooby and Cosmides' evolutionary account of emotions fails to show how emotions contribute to practical rationality in the contemporary world and argues that, while Jesse Prinz's theory of recalibration might do so, this would be at the cost of having to abandon the claim that emotions are modular in the way vision is. She concludes that what is in fact needed to vindicate the pro-emotion consensus is more empirical work concerning the plasticity of emotions (on this, see Faucher and Tappolet, in press).

Ronald de Sousa encourages us to take what he calls "a political stance" with respect to the emotions. Though there is evidence that our emotions are modular in some ways, there might be reasons to resist this putative fact and even to seek to change it. Discussing the merit of the view that emotions are modular, de Sousa distinguishes between Fodorian modules and Darwinian modules, the latter being the kind of module that advocates of so-called basic emotions favour. He claims that, although some emotions, i.e., "basic emotions," are governed by Darwinian modules, this kind of modularity does not make them currently adaptive. But neither does it make them socially or individually useful, since such modules belong to what he calls the "first track" mind, which is largely encapsulated from reasoning. This is why de Sousa suggests that, instead of following either the biological evidence or our predictive and explanatory needs, our conception of the emotions should get its inspiration from art, something which would allow for a life of greater emotional richness.

Basic emotions. The idea that some emotions are more basic than others, the latter being constructed out of basic building-blocks, goes back at least to Descartes. Though following the work of psychologists, such as Paul Ekman (2007), and philosophers, such as Griffiths (1997), the thesis that some emotions, such as fear or disgust, are basic is often presented as a fact, it is still very controversial. This debate opposes psychologists with a biological bent (Ekman 1972; Friesen 1972; Tooby and Cosmides 1990), who claim that (at least some) emotions are pan-culturally and universally shared as well as innate, to social constructionists (Averill 1980; Armon-Jones 1986; Harré 1986), according to whom emotions are socio-cultural constructions that vary

from one socio-cultural context to another (for some proposals as to how both approach could indeed be compatible, see Faucher 1999 and Mallon and Stich 2000). The claim that emotions, or at least certain of them are basic, is often associated with the view that these states are modular. The question whether there are basic emotions is central to the essays of James Russell, Robyn Bluhm and also Paul Dumouchel. It is noteworthy that all three contributors take issue with so-called basic emotion theorists.

In his contribution, psychologist James Russell launches an attack on basic emotion theory. He argues that this program is not well supported by empirical evidence. According to basic emotion theory, emotions are complex adaptive responses that provided solutions to problems our ancestors encountered. Given that one tenet of basic emotion theory is that emotions are modular – they are, mainly, fast, innate, mandatory, encapsulated responses – doubts pertaining to basic emotion theory also threaten the modularity thesis. Russell argues that emotions are in fact composed of separate component processes, such as what he calls "core affect," which is a neurophysiological state that is accessible through conscience and which is exemplified by the experience of feeling good or bad. The modularity question, he claims, is best asked with respect to each of these components. Core affect, in particular, is characterized by a certain amount of modularity. It is has a unique output; it is fast and innate; it is subject to an evolutionary explanation; it is produced by a dedicated neural processor; it is mandatory, i.e., automatic and involuntary; and it is largely, but not completely, encapsulated.

In her paper, Robyn Bluhm explores the idea that, contrary to what advocates of the basic emotions thesis suppose, there are discontinuities between emotions in animals and humans. These discontinuities, she claims, have important consequences for the extent to which we can consider human emotions as modules. Using work by developmental psychologists like Allan Schore as well as Stanley Greenspan and Stuart Shanker (on the role of social interaction in the development of emotional regulation) and by specialists of human brain evolution like Deacon, she argues that human emotions do not have most of the characteristics attributed to modules by Fodor – that is, they are not encapsulated, nor mandatory, nor are they subserved by a distinct neural basis, and finally, their development is not endogenous but

depends on social interactions. Such a view, going strongly against the claim of phylogenic continuity central to the basic emotion theory, might open the door to a view quite similar to Russell's, a form of psychological constructionism, or even to a form of social constructionism.

Anne Jacobson is interested in showing that, despite the fact that some instances of certain emotions (like fear) are not "informationally encapsulated," some are. After considering phenomena like *emotional contagion* and what she calls "primitive emotions" (those emotions shared with other animals), she argues that these can be explained using a type of non-propositional (and non-conceptual) representation. Though they do not have all the properties traditionally attributed by philosophers to representations (i.e., intentionality), they play an important role in the explanation of the emotional phenomena just mentioned. Indeed, because they are exclusively explained by their causal properties, they are the right kind of representations to play a role in those emotional phenomena that are modular.

As we said earlier, Paul Dumouchel is exploring a radically different way of thinking about emotions. After explaining how biologists use the notion of modularity (see our sixth sense of modularity above, more specifically the view of modules as processes), he proposes that emotions could profitably be thought of as biological modules. He is particularly drawn by the fact that biological modules are often invoked to explain population-level phenomena (coordination), bypassing the level of the individual. He claims the same is true for emotions. According to him, there are sub-personal affective modules the function of which is the coordination of individuals. Dumouchel then explores how this way of thinking about emotions helps to resolve two difficulties that more traditional views of basic emotions cannot solve: the "sincerity problem" and the "indeterminacy problem."

Emotions as perceptions. The many analogies between emotions and perceptual experiences have led some emotion theorists to the view that emotions are a kind of perception (de Sousa 1987; Goldie 2000; Tappolet 2000; Prinz 2004). A striking fact is that both perceptual experiences and emotions allow for cases of conflict with higher cognition. In cases of perceptual illusion, as in the Müller-Lyer illusion, what we perceive conflicts with what we believe or know to be the case. The

same kind of phenomena is present in emotions. As Hume noted, we often experience fear while we believe or even know that what we fear is neither dangerous nor fearsome. Thus, both perceptual experiences and emotions, or at least some of them, seem to share at least one important modularity characteristic: informational encapsulation. For the same reason, the evaluative content of emotions has been considered to be non-conceptual (Tappolet 2000; see also Tye 2006). Of the four contributions that address the question whether emotions are perceptions of a kind, three are favourable to a perceptual account of emotions, while the last one, that of Louis Charland, favours a more cognitivist model of emotions.

As he did before in his *Gut Reactions* (2004), Jesse Prinz defends a perceptual account of emotions in the tradition of James and Lange. In cognitive science, most people working on perception take it that it is to some degree modular. It is thus a small step to argue that, emotions being some kind of perception, they might also be modular. This is exactly what Prinz claims (more precisely, he suggests that emotions are perception of 'concerns' and they do so by registering the state of the body, that is, through introception). As he suggests, there is no big difference between getting mad and seeing red. But contrary to his 2004 book, Prinz changes his view on modularity and instead of adopting the Fodorian view on modularity, proposed his own, what he calls "quasi-modularity" (which drops the "informational encapsulation" characteristic of modules and replaces it by the notion of "stimulus dependency").

Andrew Sneddon's aim in his chapter is to compare two ways of thinking of emotional perceptions. The central difference between these models, which are grounded in fundamentally different views of the mind, concerns the notion of modularity. One model uses classic, Fodorian, modules, which are characterized by Susan Hurley as "vertical" and are contrasted with so-called "horizontal" modules (Hurley 1998). The other model uses these "horizontal" modules, which are modular in virtue of being content- and task-specific, but which are such that processing closer to the outputs of the systems can have feedback effects on processes closer to the inputs. Suggesting that these models can be applied to emotions, Sneddon discusses some empirical tests that might adjudicate between these two models of emotional perception.

In "Assembling the Emotions," Vincent Bergeron and Mohan Matthen argue that there is an important analogy between visual experience and the emotions. The first part of their paper consists in a general discussion on the best way to characterize modularity. After distinguishing between cognitive and anatomical modules, they argue that the identification of the functional contribution of anatomical modules to cognitive performance ought to be finer grained. This is because, they argue, the cognitive performances identified by psychologists as the product of cognitive modules are often carried out by multiple anatomical components cooperating to produce outputs. For instance, as they suggest, our visual experience consists of two different kinds of components, a representational component *plus* a "feeling of presence" that marks the experience as relating to a real object. In the same way, emotions would consist of a purely cognitive evaluative component *plus* what they call "a state of moral deixis," which locates the agent in his own world of values and makes an evaluation motivationally relevant. In support of this conception, they discuss evidence from frontal lobe lesions and their impact on emotional response and social cognition. They claim that the dissociations of emotional response and social cognition fail to show that emotion is separate from cognition and argue instead that the manner of entertaining value-content is separate from cognition itself and is located in a separate area of the brain.

In his piece, Louis Charland takes issue with the usual association of the modularity thesis and the perceptual conception of emotions. According to him, there are good reasons to consider the possibility that there may also be cognitive modular factors operating in emotion, especially in emotional pathologies like depression. Charland argues that what is lacking in contemporary discussions is an appreciation of the symbol-processing computational character of Fodorian modularity and a proper understanding of the import of the distinction between modularity and transduction. On the basis of Aaron Beck's cognitive theory of depression (Beck 1976), Charland argues that depression is a cognitive module.

Types of emotions. Consider the disgust you feel at the sight of a putrefied corpse, the fear you feel when watching a horror movie, the pride you experience after having made it to the end of a difficult hike or the

love you feel for a close friend. Obviously, emotions are a varied lot.[25] This is why the modularity question (or more exactly the modularity questions, given that plurality of modularity concepts) should in fact be asked of each emotion type. It might well turn out that some emotions, such as fear and disgust, are modular in one sense of the word, while others, such as pride or love, are not. Two of our contributions focus of particular emotional phenomena.

Ruwen Ogien concentrates on an emotion that is more cognitively loaded, i.e., shame. To be ashamed of your big ears, for instance, you need to believe that you have big ears. According to many, you also need to believe that the size of your ears somehow speaks against you – maybe you consider that they violate some aesthetic canon, for instance. The question Ogien considers is whether the fact that shame necessarily involves such beliefs, as well as the fact that shame behaviour does not automatically result in typical behaviour, means that shame lacks modularity. He argues on the basis of a discussion of the cheater-detection module postulated by Cosmides and Tooby, that shame, as well as other cognitively loaded emotions such as pride or guilt, are so-called "conceptual modules." Such mechanisms lack strict encapsulation since they take complex social information as input. Ogien argues however that the modularity claim of emotions such as shame can be upheld even in the absence of automatic and predictable behavioural output. The reason for this is that the explanation of actions that such emotions provide are what Elster (1999) calls "explanations by mechanism"; that is, causal explanations which do not allow for predictions. Thus, we are not forced to give up the causal model that is essential to modularity.

In his contribution, Timothy Schroeder focuses on pleasure. In his view, pleasure and surprise are closely related, in the sense that pleasure (and displeasure) depends on a modular system the outputs of which are expectations. He argues that there is a modular system that forms what he calls "gut-level" expectations, which he distinguishes from beliefs about what is likely. This modular system would be responsible for an interesting portion of cases in which it seems to us

25 Things get even more complicated if moods, such as elation or depression, are added to the picture. See de Sousa's contribution for the modularity of moods.

that our feelings of pleasure and displeasure are not appropriate to our circumstances, and this in turn would provide the explanation for some of the phenomena that have led people to call the emotions "modular."

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