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Defensive survival circuits and recent developments in the metaphysics of mind

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Conceptual confusions arise when researchers do not carefully distinguish between the conscious state of fear and the brain circuits that contribute directly or indirectly to it. Joseph LeDoux *et al.* recommend reserving the term ‘fear’ for the conscious state and referring to the brain circuits associated with unconscious environmental threat responses as ‘defensive survival circuits.’ But what exactly is the relationship between fear and the brain circuits that contribute to it? Historically, the most popular ways of answering this question have appealed to the psychophysical identity theory, functionalism, or emergentism, but recently, a new approach, hylomorphism, has emerged that offers a promising way around the problems the others face.

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Joseph LeDoux *et al.* have argued that conceptual confusions arise when researchers do not carefully distinguish between the conscious state of fear and the brain circuits that contribute directly or indirectly to it [1,2]. These confusions can be avoided by reserving the term ‘fear’ for the conscious state and referring to the brain circuits associated with unconscious threat responses as ‘defensive survival circuits.’ If the operation of defensive survival circuits is not associated with conscious states, then most philosophers would agree that their operation does not pose any real philosophical problems: the activation of defensive survival circuits is triggered by environmental stimuli and in turn triggers behavioral responses in ways that can be explained by well-known physical principles. But many of these philosophers say that conscious states like fear are different.

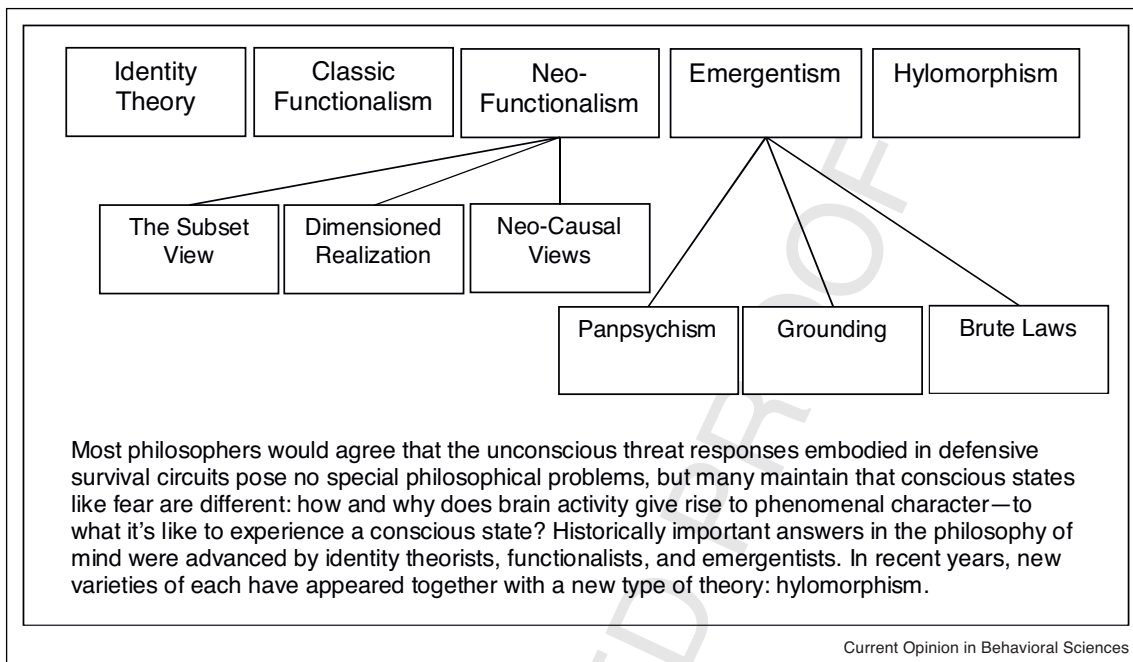
Conscious states have a phenomenal character—there is something it is like to be in them. What it is like to see red is different from what it is like to hear middle C, or to taste coffee, or to ride a roller coaster. Explaining phenomenal character poses a special philosophical challenge: the so-called hard problem of consciousness: explaining how and why the activity of various brain circuits gives rise to phenomenal character [3,4]—why those activities do not occur ‘in the dark,’ so to speak, without any accompanying experiences. Historically, the most popular approaches to the issue have appealed to the psychophysical identity theory, functionalism, or emergentism, but in recent years other approaches have emerged including hylomorphism, a theory that challenges the basic assumptions its competitors have in common (Figure 1).

The psychophysical identity theory claims that conscious states and brain activities are identical: just as ‘water’ and ‘H₂O’ refer to the same thing, so do ‘fear’ and ‘the activation of *B*,’ for some collection of brain circuits *B* [5,6]. The distinction between fear and the activity of *B* is thus purely conceptual—purely a function of the vocabularies we use to refer to one and the same brain state. This view was popular in the 1960s, but it was marginalized on account of multiple-realizability arguments. The latter claim that a mental state like fear can be correlated with many different kinds of physical states—the activity of brain circuits in humans, silicon circuits in robots, and so on [7–9]. If fear can be correlated with different physical states, then it cannot be identical to them: a state cannot occur without itself, yet if the argument is sound, fear could occur without brain circuits in a robot and without silicon circuits in a human.

Identity theorists have responded that scientific advancements will lead to different taxonomies of mental and physical states. We might discover, for instance, that there is no such state as fear, but a plurality of states that are merely called ‘fear,’ and that what we call ‘fear’ in humans is a brain state, whereas what we call ‘fear’ in robots is a silicon state, and so on [10,11]. Alternatively, we might discover that what we initially took to be different physical states are really just varieties of one overarching type of physical state which is identical to fear [12]. More recently, some identity theorists have tried to argue that fear can be identified with a brain state, but that this brain state can be correlated in turn with many different kinds of lower-level physical states [13**]. What remains unclear on this view is how the brain state can be correlated with multiple lower-level physical states if fear

2 Survival circuits

Figure 1



New approaches in the metaphysics of mind.

88 is not. If, after all, fear and the brain state are the very
89 same thing, then fear and the brain state cannot differ
90 from each other at all since a thing cannot differ from
91 itself.

92 The most popular response to the multiple realizability
93 argument, however, has been to abandon the identity
94 theory in favor of functionalism [7–9]. Functionalism
95 claims that fear is a functional state—a state postulated
96 by an abstract description of a system that ignores the
97 kinds of details that would be described by physics or
98 chemistry and that focuses simply on inputs to the sys-
99 tem, outputs from it, and internal states that correlate the
100 two. Psychological descriptions are thus abstract like
101 geometrical ones. When we describe a tabletop as rect-
102 angular, we ignore its physico-chemical details and focus
103 simply on its dimensions. The Euclidean rectangle which
104 the tabletop's dimensions approximate is defined inde-
105 pendent of any reference to the tabletop or any other
106 concrete physical object, so it cannot be identical to a
107 concrete physical thing; it is, rather, an abstract entity. Its
108 relationship to concrete physical things is one of
realization.

109 Classic functionalist theories understand realization as
110 isomorphic mapping: the tabletop's perimeter comprises
111 points in space which can be mapped one–one onto points
112 of the rectangle's perimeter, and the same might be true
113 of many other physical things—the air above the tabletop,

114 for instance. Similarly, psychological descriptions ignore a
115 system's physico-chemical details and focus simply on the
116 way it correlates inputs with outputs. Mental states like
117 fear are the internal correlational states posited by
118 abstract psychological descriptions onto which the states
119 of concrete physical systems, such as brains, can be
120 mapped. Fear, then, is not identical to a brain state; it
121 is an abstract entity that is merely realized by a brain state,
122 and that could in principle be realized by other kinds of
123 physical states—in principle, the states of any physical
124 system (such as a robot) with inputs, outputs, and internal
125 states that map onto the same abstract description.

126 Classic functionalism faces well-rehearsed objections [10,14]. Critics claim, for instance, that if psychological descriptions are abstract, then states like fear can have no causal influence on behavior [10,11,15]. Consider by analogy the causal powers we attribute to the tabletop (its power to retain its shape under compression, say): those powers are exhausted by the physical materials composing it; they have nothing to do with its realizing a Euclidean rectangle. The same would appear to be true of humans if classic functionalism is true: their behavior can be exhaustively explained in principle by appeal to brain circuits such as defensive survival circuits; fear and other mental states could thus play no role in accounting for what humans do. Yet critics urge that conscious states like fear play crucial roles in explaining at least some of what humans do.

142 Neo-functionalists have looked to overcome the short-
 143 comings of classic functionalism. They generally claim
 144 that realization is a relation between properties, and that
 145 properties either are, or else comprise, causal powers. A
 146 diamond's hardness, for instance, comprises the power to
 147 scratch glass, the power to scratch jade, and so on. The so-
 148 called subset view of realization is most similar to classic
 149 functionalism. It claims that the properties of various
 150 brain circuits realize an experience of fear exactly if
 151 the causal powers of those brain circuits include as a
 152 subset the powers designated by the term 'fear' [16,17].
 153 Like classic functionalism, the subset view seems
 154 to imply that psychological expressions are just abstract
 155 ways of referring to powers described by more fundamen-
 156 tal disciplines. This generates a worry that the subset
 157 view faces the same problem with mental causal influence
 158 that classic functionalism does. By contrast, the so-called
 159 dimensioned view of realization claims that states like
 160 fear comprise powers distinct from any possessed by a
 161 system's parts taken collectively or in isolation [12,18,19].
 162 In this sense, the dimensioned view is like emergentism.

163 Emergentism claims that fear and brain activity are
 164 distinct kinds of states that comprise distinct causal
 165 powers, but unlike the dimensioned view, emergentism
 166 claims that the relation between them is *causation* [20–22]:
 167 fear is produced by brain activity. One influential argu-
 168 ment for emergentism appeals to the hard problem of
 169 consciousness. The identity theory and functionalism, it
 170 says, lack the resources to explain how brain states
 171 produce conscious states like fear. The reason is that it
 172 is logically possible for two systems to be exactly alike
 173 physically and functionally, and yet to differ in their
 174 conscious states [3,4,23]. There is no contradiction in
 175 conceiving of an exact physical replica of you who never-
 176 theless has conscious states whose phenomenal characters
 177 differ from yours: what it is like for you to taste coffee, say,
 178 is different from what it is like for your replica. Your
 179 replica might even lack conscious states altogether: your
 180 brain circuits and your replica's might operate in indis-
 181 tinguishable ways, and yet those operations might be
 182 accompanied by conscious experiences in you, but not
 183 in your replica. If these philosophers are right, then fear
 184 cannot be identical either to a physical state or to a
 185 functional one, for if fear were identical to either, it would
 186 be impossible for two systems that were physically and
 187 functionally the same to differ in their conscious experi-
 188 ences. If the identity theory and functionalism are ruled
 189 out, however, then it seems the only remaining candidate
 190 for a naturalistic account of consciousness is emergentism.

191 Emergentism and views similar to it (such as dimen-
 192 sioned realization) nevertheless face several serious chal-
 193 lenges [24]. Some critics argue that these views cannot
 194 explain how mental states can causally influence physi-
 195 cal ones. This has pushed some emergentists to embrace
 196 epiphenomenalism, the claim that mental states really

do not influence behavior [25]—that the behavior asso-
 ciated with fear, for instance, can be exhaustively
 explained by appeal to defensive survival circuits. Other
 critics argue that emergentists cannot explain how phys-
 ical states manage to produce mental ones. This criticism
 has pushed some emergentists to endorse panpsychism,
 the view that all physical things—including subatomic
 particles—have mental states. Just as your mass is built
 up out of the much smaller masses of the particles
 composing you, so too, say panpsychists, your conscious
 states are built up out of the phenomenally simpler
 mental states of those same particles [26**]. Panpsychists
 nevertheless have difficulty explaining how this building
 up process is supposed to work—the so-called combina-
 tion problem [27,28]. Others have embraced grounding,
 which is supposed to be a type of non-causal determina-
 tion relation which, like parthood, is irreflexive, asym-
 metric, and transitive, yet which, unlike parthood, can-
 not obtain (or only obtain) between concrete things [29*,30,31].
 According to grounding views, facts about fear are grounded
 in facts about its underlying brain circuitry [32]. Critics
 nevertheless claim that the notion of ground is hopelessly
 esoteric, theoretically useless, or insufficiently informed
 by empirical research [33,34**,35,36**]; in particular,
 some critics say, it doesn't explain the success of composi-
 tional explanations in fields like neuroscience—explana-
 tions that account for the characteristics of whole systems
 by appeal to their parts [37,38]. The so-called new mechan-
 ists have done yeoman's service describing how composi-
 tional explanations work [39–41,42**,43], and any ade-
 quate account of conscious experience must explain the role
 those explanations play. Criticisms like these have pushed
 some emergentists to claim that emergence is ultimately a
 mystery: it cannot be explained but must simply be
 accepted as a brute fact.

A notable alternative to all the views discussed so far is
 hylomorphism, a theory dating back to Aristotle which has
 recently been rediscovered [44,45,46**,47,48]. Its appli-
 cation to problems in the philosophy of mind marks one of
 the field's newest developments [10,46**,49]. Hylomorph-
 ists claim that some things are composed of physical
 materials with a specific configuration or structure. A human
 being is not composed of physical materials configured in
 any way whatsoever, but physical materials configured in
 a very specific way. In some cases, a thing's configuration
 (its form or structure) is something static, like the spatial
 arrangements of atoms in a crystal, but in other cases—by
 far the more interesting ones—the configuration comprises
 dynamic interactions among an individual's components.
 The configurations of matter and energy that make humans
 and other complex organisms what they are cannot be
 characterized apart from the dynamic interactions among
 their component organs, tissues, cells, and the molecules,
 atoms, and fundamental physical materials ultimately
 composing them.

4 Survival circuits

253 What is true of living things is also true of their activities:
 254 walking, talking, running, and various other activities are
 255 not random physiological occurrences; each is instead an
 256 event composed of physiological occurrences with a cer-
 257 tain coordination or structure. These structured activities
 258 include thinking, feeling, perceiving, and other paradig-
 259 matically conscious experiences. Fear, for instance, is an
 260 activity composed of the operation of physiological sys-
 261 tems (those identified by compositional explanations)
 262 with a specific coordination or structure. The unconscious
 263 threat responses embodied in defensive survival circuits
 264 (responses sometimes inappropriately labeled ‘fear’ in the
 265 neuroscientific literature) are structured activities of a
 266 different sort: they involve different, but possibly over-
 267 lapping, neural subsystems and a different kind of coordi-
 268 nation. Seen in this way, conscious experiences pose no
 269 special philosophical problems: they fit into the natural
 270 world just as unproblematically as any structured events.
 271 Philosophical problems arise only for theories that fail to
 272 recognize the nature and importance of structure—the
 273 common error of the previously mentioned theories, say
 274 hylomorphists. Those theories tend to assimilate struc-
 275 ture to something like spatial arrangement, and because
 276 they have an impoverished conception of structure, they
 277 have difficulty understanding how structured phenomena
 278 like consciousness fit into the natural world. If hylomor-
 279 **Q1**phists are right, their view offers a way around the
 280 impasse other approaches to consciousness have
 281 encountered.

282 **Conflict of interest statement**

283 Nothing declared.

284 **References and recommended reading**

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