

Chapter 20

The Empirical Correlation of Mental and Bodily Phenomena



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1 **Abstract** This chapter is Grace Andrus de Laguna's discussion of the relationship
2 between mind and brain.

3 Since the days when Descartes placed the soul in the pineal gland to deflect at will
4 the course of the animal spirits and his successors formulated in return the elusive
5 dogma of parallelism, mankind's conceptions of the soul and its relation to the body
6 have remained fundamentally unchanged. The modern substitute for the Cartesian
7 view is framed, it is true, in the light of a riper knowledge of the physiological
8 structure of brain and nerve; but the difference between a soul which controls the
9 mechanical action of the brain through a pineal gland and one which operates more
10 obscurely at the synapses, raising and lowering the resistance to nervous discharge, to
11 effect its purposes, is not a fundamental one. Nor, on the other hand, has the advance
12 in science essentially altered the conception of parallelism. Upon the familiar and
13 dreary round of argument and counter-argument through which the long controversy
14 between interactionism and parallelism has worn itself out, we shall not enter. The
15 issue is not decided but it is no longer a living one. A growing sense of its futility has
16 come upon us. It has survived so long because the only alternative to the conception
17 of mind as a being or activity distinct from the body which has seemed possible has
18 been the identification of the mental with the physical. In the last few years, however,
19 changed perspectives have brought into fresh relief the unsurmounted, and, I venture
20 to say, unsurmountable difficulties which oppose the belief in a transcendent soul,
21 or a conscious existence *sui generis*. The conviction has gained ground among us
22 that such a belief is a survival of older modes of thought, in other fields happily
23 outgrown. But to cherish this conviction is to face the task of finding new terms in
24 which to read the empirical facts which the older conception imperfectly embodied.

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25 The newer movements of our own day, pragmatism, neo-realism, behaviorism, have
 26 all been, in part at least, motivated by the need for such philosophic and scientific
 27 reformulation. And amid all the confusion of present-day controversy there is to be
 28 discerned, we believe, a measure of common achievement, not yet consummated,
 29 nor capable of precise definition, but the foundation for an intellectual advance as
 30 momentous possibly as that marked by the philosophy of Descartes.

31 It is the purpose of this paper to examine how psychological phenomena such
 32 as emotion and perception are empirically correlated with the functioning of the
 33 nervous system. The alternatives with which we are familiar are either that for every
 34 change in conscious experience there is to be found a corresponding change in the
 35 chemical, and physical processes taking place in the cerebrum; or else, that while
 36 many of the simpler conscious processes may be initiated by cerebral changes and
 37 in turn modify such changes, no general or complete, correlation is to be made out
 38 between conscious experience and nervous action. These alternatives are not, as I
 39 shall try to show, exhaustive, nor is either of them an adequate description of the
 40 empirical facts. What they both falsely presuppose is that, if there is any systematic
 41 correlation between conscious experience and the functioning of the nervous system,
 42 it must be between psychical processes and the physical or chemical changes taking
 43 place in the brain. Or, in other words, it is taken for granted that the nervous system
 44 is adequately describable as a physiological organ and its functioning as a complex
 45 set of physical processes.

46 We find this point of view most clearly expressed in such nineteenth-century
 47 thinkers as Huxley or Tyndall. Both scientific investigators of the first rank, they
 48 were deeply impressed by the fact that research into the processes of organic matter
 49 reveals nothing but natural forces. Even the nervous impulse is nothing but chemical
 50 reaction. We do not, says Tyndall, possess the organ, nor the vestige of an organ,
 51 which enables us to pass from the mechanics of the brain to the corresponding feeling.
 52 Thus he was led to a parallelism which could point to a possible connection between
 53 a left-hand spiral motion and the emotion of love. This undoubtedly was a bit jocose,
 54 but it fairly represents the categories to which the speculation of his generation was
 55 limited. Bound to such limitations what, indeed, is left but an *Ignorabimus* before a
 56 final mystery?

57 It is in keeping with this mode of thought to speculate further as to the conse-
 58 quences of producing in a test tube the highly complex and unstable molecules of a
 59 brain cell and stimulating them to reactions identical to those occurring in the brain
 60 of a living being. Might there not at the same time be produced a throb of simple
 61 consciousness? If such speculations as these have not been often openly indulged in,
 62 it has been common sense and not theoretical insight which has prevented. Even so
 63 modern a writer as Münsterberg is able to postulate an ultimate conscious element,
 64 simpler than the sensation, and corresponding to the reaction of a single cerebral cell
 65 as its compound, the sensation, corresponds to the reactions of a localized group of
 66 cells.

67 This view of Münsterberg's, however, may properly be said to represent an alter-
 68 native interpretation of the correspondence theory. We may distinguish it from the
 69 *psycho-physical* parallelism of Tyndall, by the title *psycho-physiological* parallelism.

70 According to this more cautious interpretation, the correlative of a specific mental
 71 process is not a geometrical figure of the dance of brain atoms, nor even necessarily
 72 a particular chemical reaction, but the occurrence of similar physiological processes
 73 in definite physiological structures. The classic doctrine of specific energy is an
 74 example in point, and indeed a large part of what goes under the head of physi-
 75 ological psychology belongs to this view of the mind-body relation. This form of
 76 parallelism offers certain advantages over the cruder psycho-physical formulation.
 77 It is less doctrinaire. It does not commit one to the extremes of kinetic mechanism;
 78 and it has far more regard for empirical facts. Theoretically, however, such a doctrine
 79 as that of specific energy leaves us face to face with as final a mystery as that which
 80 confronted Tyndall. And as I shall try to show it is not verified, nor verifiable, by
 81 available empirical evidence.

82 In a sense the contention of parallelism is acceptable. For every change in psychical
 83 processes there doubtless is a change in the processes going on in the cortex. But
 84 it is equally true that for every change in psychical processes there is a change in
 85 atmospheric currents. To make the concomitancy of psychical and cortical change
 86 a significant *correspondence*, which is what parallelism claims, it is necessary to
 87 establish that the characteristic groupings, or *phenomena*, which the one presents are
 88 traceable in the other also, and that a repetition of a feature of the one matches a repe-
 89 tition of the corresponding feature of the other. What makes parallelism in whatever
 90 form so paradoxical a doctrine is the fact that it assumes the phenomena of nervous
 91 action to be individuated and determined by an entirely different set of principles
 92 from those by which the supposedly corresponding phenomena of conscious experi-
 93 ence are individuated and determined. That there is a correspondence of some sort
 94 between the phenomena of conscious life and the functioning of the nervous system
 95 we should all admit. The question is: Of what nature is it? In what terms are the
 96 phenomena of nervous function which correspond to the phenomena of conscious
 97 life to be described? What the mind body problem demands for its solution is the
 98 exhibition of a principle of individuation and classification common to the two. To
 99 accomplish this would in truth be not to solve the problem but to show that its very
 100 formulation depends on untenable assumptions. For to show that two supposedly
 101 disparate systems of phenomena are individuated and classified by a common set of
 102 principles is to exhibit them not as two but as one single system of phenomena.

103 The clue of which we are in search lies, I believe, close at hand. It is to be found
 104 in the simple insight that the central nervous system is not primarily a physiological
 105 organ. Its function is only secondarily to maintain the inner equilibrium of bodily
 106 processes which constitutes the living as opposed to the dead being. Its primary func-
 107 tion is the adjustment of the behavior of the individual as a whole to the outer world
 108 of goods and dangers which constitutes his environment. It is in the performance
 109 of this wider function that we must find the correlate of feeling and thought, rather
 110 than in the stimulation of neurone and ganglion. It is true that each act in the perfor-
 111 mance of this function is controlled by the stimulation of neurone and ganglion.
 112 But the uniformities of function, the characteristic *phenomena* which correspond to
 113 psychological uniformities are not describable in physiological terms.

114 This has been strikingly, although perhaps unintentionally illustrated for us by
 115 Professor John Watson in a recently published article, “On Behavior and the Concept
 116 of Mental Disease.” A distinction is commonly made by alienists, so Professor
 117 Watson tells us, between such mental disorders as are conditioned by cortical lesions,
 118 or physiological disturbance of cortical function, and those for which no physio-
 119 logical cause can be assigned. These last are commonly called mental or “strictly
 120 mental” disease. Such a case might be, for example, an individual who ordinarily
 121 comported himself in conventional fashion, but whom religious service, instead of
 122 inspiring to appropriate devotional attitude and behavior, irresistibly impelled to the
 123 loud utterance of outrageous and ribald remarks. What Professor Watson urges is
 124 that such cases as these are not purely mental in the sense that there is no correla-
 125 tive malfunctioning of the central nervous system. Many such cases he describes as
 126 wrong “habit complexes.” Now inappropriateness of habitual behavior is evidently
 127 not to be identified with physiological disturbance, although it is as evidently due
 128 to the failure of the cortex to function properly. If Professor Watson is right, it is
 129 evident—though he himself apparently does not draw the conclusion—that normal
 130 and abnormal functioning of the cerebral cortex may be distinguished, not on the basis
 131 of any determinable physiological differences, but by the relative appropriateness of
 132 the cerebrally controlled behavior to environmental—say even social—conditions.

133 The characteristic uniformities which the functioning of the cortex exhibits to our
 134 observation, and according to which it may be intelligently analyzed, are not, then,
 135 uniformities of organic process or muscular contraction. They are uniformities of
 136 *behavior* in a larger sense.

137 In the light of this conception let us turn to the examination of some of the simpler
 138 typical mental phenomena and their bodily correlates. We shall consider first the case
 139 of emotion, using *fear* as an example.

140 Research has so far failed to localize this and other emotions in the cortex or in
 141 the lower centers. Yet fear, like other primary emotions, has markedly characteristic
 142 bodily expressions. It manifests itself, in fact, in a variety of ways: in flight, in hiding,
 143 in shrinking, sometimes in “freezing,” or a complete paralysis of all activity, even
 144 vocal utterance. Sometimes it impels the individual to seek the protection of some
 145 other individual, as the child flees to its mother’s skirts; or, again, it inspires to
 146 frantic attacks on the inciting objects. All these characteristic responses are found
 147 in man; and to these we may add the “expressive” reactions—such physiological
 148 disturbances as pallor, trembling, increased heart-beat, excitation of the ductless
 149 glands, etc. If we include the species we find even greater variety of congenital and
 150 acquired responses. Now what is the common denominator of these varied modes
 151 of behavior? There must be considerable diversity in nervous activity to issue in
 152 such diversity of response. For not only are the characteristic response different on
 153 different occasions; the stimuli which inspire fear congenitally, and as a result of
 154 simple experience, differ at least as widely. These widely differing stimuli, and the
 155 widely differing responses to which they lead, must be connected by a great diver-
 156 sity of central stimulation. Although various theories have been advanced, we can
 157 point to no cortical or sub-cortical “center” of fear, nor to any characteristic set of
 158 paths followed by the excitations set up by stimuli responded to as “fearful.” And

159 while recent researches have shown that an important part is played in emotional
 160 disturbance by the activity of the ductless glands, they have failed to discover in
 161 such physiological activity any specific correlate to a specific emotion. Yet these
 162 varied modes of response and the differing cortical action leading to them mediate
 163 a common experience—fear. What the various stimuli have in common is no set of
 164 similar physical characteristics. It is the *common relation* in which they all stand to
 165 the individual, the relation of being *dangerous*. Similarly the varied responses fall
 166 into a single group because of the common function in averting the threatened danger.
 167 The response actually elicited on any particular occasion may, it is true, fail to avert
 168 the danger, but the normal function of such behavior remains the same. The variety
 169 of fear responses exhibited by a species are undoubtedly evolutionary modifications
 170 of much simpler reactions, possibly even the primitive avoiding reaction. But the
 171 modifications of reaction which have been selected in the race, as in the individual,
 172 have been selected and preserved because of their success in performing this function,
 173 just as the stimuli which evoke it are selected because of their dangerousness.
 174 Consequently we find civilized man not only persisting in the congenital and simpler
 175 types of reaction to danger, but acting in indefinitely varied and indirect modes as
 176 well.

177 It is their common ancestry and the community of function in the economy of life
 178 which serves to unite the varied responses into a single phenomenon. So, too, it is the
 179 identity of the part played in this economy by the differing cortical and sub cortical
 180 processes exciting these responses that determines the identity of the correlated
 181 conscious experience. Even if research should discover a “fear center” to which all
 182 “fearful” stimuli are transmitted and whence all fear responses are indirectly excited,
 183 the case would not be essentially altered, for we should point to the stimulation of
 184 this center as the correlate of the emotion fear precisely because of its function in
 185 coordinating such responses to such stimuli.

186 We are now prepared to consider the ease of perception. This is more complicated
 187 than emotion since perception covers so wide a range of phenomena, and since
 188 meaning is so largely involved. Thus we may *perceive* a total situation, a single object,
 189 a relation, or a quality. But in none of these cases, except possibly the last, have we
 190 grounds for supposing that “sameness” of perception is conditioned by sameness
 191 of physiological process. My perceptions of my dog on different occasions, since
 192 they are perceptions of this same familiar dog, are in so far alike. But the sensory
 193 excitations from eye and ear and hand, if compared on any two occasions, would
 194 probably be found to contain no single common factor, nor is there evident reason
 195 to suppose that the perception of my dog excites any invariable motor response.
 196 Perceptual experiences are commonly classed as like or different because of identity
 197 of meaning, rather than because of likeness of sensory content, and, as is well known,
 198 physiological psychology ventures to say very little concerning the physiological
 199 basis of meaning.

200 When we come to perception of simple sense-qualities, such as color, tone, odor,
 201 etc., however, the case is very different. Such experiences seem to be classed, both
 202 by common sense and psychology, wholly on the basis of immediately felt identities
 203 and differences, without any reference to meaning. And it is these psychological

204 phenomena to which definitely localized cortical excitations correspond. Thus there
 205 is a well-defined visual center in the occipital lobe, etc. In short, perception of sense
 206 qualities is the field where the evidence for psycho-physiological, if not psycho-
 207 physical correlation is most convincing. In the phenomena of vision, in particular,
 208 research has established beyond dispute that specific physiological structures condi-
 209 tion the experiencing of the different visual qualities. Various color theories, it is
 210 true, continue to dispute the field, but all unite in the unquestioned assumption that
 211 the experience of color qualities is mediated by the functioning of correspondingly
 212 different physiological structures. Take the case of “red,” for example. Here, as in
 213 the case of other visual and auditory qualities as well, we find a definite physical
 214 correlate of the sense quality “red,” viz., specific wave-length. In order that a phys-
 215 ical stimulus of this sort should excite the corresponding sensory quality, it must
 216 initiate a specific process in retinal end-organ, which must in turn set up processes
 217 in the cortical cells of the visual center. Now, according to the traditional view, the
 218 excitement of such specific processes in the visual center is the essential and suffi-
 219 cient condition for the experiencing of the quality “red.” What we have to ask is
 220 whether this view adequately represents the relevant empirical facts, or whether it
 221 is a result of the same theoretical preconceptions which dominated the thought of
 222 Tyndall’s generation. That the excitation of specific processes in the visual center
 223 is a necessary condition of experiencing “red,” is, of course, to be admitted; but
 224 that such excitation constitutes the *essential* and *sufficient* condition is not, I submit,
 225 a conclusion warranted by empirical evidence, nor is it a conclusion which any
 226 available empirical evidence could suffice to establish. For what sort of empirical
 227 evidence is adducible? The evidence from behavior only. That an individual is or
 228 is not capable of experiencing a given sense quality can be determined only by his
 229 capacity to discriminate the quality by appropriate behavior. It is only on the basis of
 230 evidence from behavior that any conclusions as to the cerebral function can be drawn.
 231 Now the ability to discriminate a sense quality like red depends not simply upon the
 232 excitation of specific processes in the sensory center, but upon the existence of an
 233 extensive system of sensory and motor connections. For such a system of connec-
 234 tions is implied in the very act of attention itself by which the quality is perceived.
 235 Consequently, what the empirical evidence points to as the neural correlate of the
 236 sensation “red,” is not the occurrence of specific processes in the visual center, but
 237 the functioning of that center as a member of a complicated system. To suppose that
 238 excitation of the visual cells could mediate the experience of sense quality red if their
 239 functional connections with other centers were interrupted, is to make an assumption
 240 for which no possible evidence is available and which must rank accordingly as futile
 241 speculation.

242 Let us turn to the consideration of the psychological correlates. It is often urged
 243 that the analysis and description of mental phenomena must be carried out in the last
 244 resort on the basis of introspection. “Fear” is something I first became acquainted with
 245 in my own experience, and afterwards learn to associate with its external manifesta-
 246 tions. Red is a felt quality, knowable only in its immediacy. So all our feelings and
 247 sensations, if not our thoughts and beliefs, are something immediately and directly
 248 experienced, something whose intrinsic qualities are the private possession of each

249 of us. I may, indeed, on the strength of the dubious argument from analogy, attribute
 250 to my fellow beings the enjoyment of inner experiences like to mine. But all that is
 251 open to my observation is his like behavior. It *may* be true, since the argument from
 252 analogy falls so far short of proof, that your feeling of fear is more like my sadness,
 253 or my anger, than it is like the fear I feel, or it may be something altogether akin
 254 to my experience. This hidden feeling of yours, unknowable by me, is like mine,
 255 indeed, in that it leads you to actions such as mine excites in me, but this likeness
 256 is merely one of external relationships. Or, again, although we both agree in calling
 257 blood red, and finding it in this respect like strawberries or the alternate stripes on
 258 the American flag, and although we both place it similarly on the color pyramid, and
 259 agree in calling it warm and the color of passion, etc., it may be that what you enjoy
 260 as “red” I enjoy as “blue,” and that only in their relations are our two reds identical.
 261 Indeed, we may go further and suppose that the whole course of your experience
 262 as immediately enjoyed by you is utterly different in felt quality from mine. Such a
 263 supposition can not be refuted—nor can it be established—for the simple reason that
 264 it is beyond the reach of any argument whatsoever. It is an essentially unintelligible
 265 supposition concerning wholly unknowable things-in-themselves.

266 Mental phenomena, like any other phenomena, can be subjects of intelligent
 267 discourse only in so far as they are identified and described in significant terms.
 268 In what terms then can mental phenomena be significantly and intelligibly described
 269 and analyzed? If the examples which we have chosen from the fields of emotion and
 270 perception are typical, it is only by reference, direct or indirect, to their function in
 271 securing the adjustment of the individual to his environment, physical and social.
 272 The fear which the psychologist studies is not a hidden feeling cherished within his
 273 breast; it is precisely *that* feeling which is inspired by determinate objective condi-
 274 tions, and which impels him to characteristic expressions and acts. He can identify
 275 a given experience to himself as “fear” only in so far as it sends cold shivers down
 276 his back or gives him a sinking in the pit of his stomach or makes his knees shake
 277 beneath him. But even these private earmarks are phrases whose significance is set
 278 by common usage.

279 If the foregoing contentions are just, the conclusion we have to draw is that the
 280 mental and bodily phenomena whose empirical correlation sets us our problem are
 281 not phenomena belonging to two distinct orders of nature, but phenomena which
 282 actually are, and only can be individuated and classified by common principles.
 283 Both the bodily correlates of mental processes, and the mental processes themselves,
 284 are individuated as phenomena only on the basis of their function in adjusting the
 285 individual to his environment.