ORGANIC SENSATION

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Boring (1) has found that stimulation of the esophagus may give rise to qualities of warmth, cold, heat, and thermal pain, which are identical psychologically with the corresponding qualities from the skin; that cutaneous pressure and pain can not be elicited from the esophagus, but that distension brings out successively the qualities of muscular pressure and muscular pain. The esophageal sensations are referred away from the middle portion of the esophagus in the direction of one end or the other.

Carlson has brought together in a book the numerous researches by himself and his collaborators on the physiology of the stomach. This book, *The Control of Hunger in Health and Disease* (4), summarizes the work in its field and includes a useful, if inaccurate, bibliography of 283 titles. Carlson demonstrates conclusively that the gastric mucosa is insensitive to tactual and painful stimuli of all sorts. He had an exceptional opportunity for experimentation upon his subject with the gastric fistula, since he could get at the mucosa directly. The sense of fullness, which comes with distension of the stomach, and the pain found by Boring and others with great distension must come from the muscular coats.

Carlson also finds the gastric mucosa to be endowed with "protopathic temperature sensibility," since hot and cold water and ice are effective stimuli. Boring inclined in his first paper (1) to the belief that the stomach was thermally insensitive, because such extreme temperatures were needed to bring out the two thermal qualities. Later (3) Boring measured the temperature within the stomach by means of a thermo-electric couple and found that extreme stimuli, as determined before their mixture with the stomachic contents, are very much nearer body-temperature when they become effective in the stomach, and that such mild temperatures as 30° and 40° C. produce in the gastric mucosa the sensations of cold and warmth respectively. Obviously Carlson's use of Head's term "protopathic" is unfortunate in this case, for here we have, in a region which is theoretically protopathic, thermal sensations with epicritic thresholds, dissociated from the epicritic *sine qua non* of pressure and the protopathic *sine qua non* of pain. Both Carlson and Boring agree that the thermal sensations of the stomach and

of the esophagus are introspectively separable with respect both to pattern and to localization.

Carlson's work appears to establish finally the correlation of sensation of hunger with the hunger contractions of the stomach; hence the conditions of the hunger contractions gain psychological significance as the conditions of hunger. Thus hunger appears to diminish with advancing age, to be decreased by smoking and, in its initial stages, by tightening the belt, and to be inhibited by stimulation of the mouth (even chewing paraffin may be effective) and of the gastric mucosa, and by dreaming (6). Physical exercise, external cold, excessive hemorrhage, and, in spite of the current belief to the contrary, starvation, all increase hunger. Qualitatively—both Carlson and Boring (2) agree—hunger is a complex of muscular pain and kinesthetic pressure.

Boring (2) finds that thirst, nausea, defecation, urination, and the calls to defecation and urination are also complexes of pain and pressure, without qualitative novelty. Thirst is referred more to the mouth than to the throat. Nausea appears in many different patterns but always with a core of pain that is similar to or identical with the hunger pain. Carlson admits the presence of tension and pain in nausea, but urges that over and above these concomitants there is a "distinct 'sickness' character" in nausea, and that a confusion of hunger and nausea is not normal.

Carlson's most positive psychological contribution is to the problem of appetite. He holds that the gastric mucosa is endowed with a "protopathic appetite sense." Far from being allied to hunger, the appetite sensation contrasts with the hunger sensation and is best perceived if weak chemicals (beer, wine, 0.5 per cent. HCl, gastric juice, cold water) are introduced into the stomach through a stomach-tube during hunger. The tube eliminates the sight, taste, smell, and imagery of the food, and the consequent salivation and movements of deglutition. The stimulus inhibits the hunger contractions and brings out the experience of appetite which contrasts with the preceding hunger. Appetite is not due to the cessation of the hunger since it can be brought out alone. The indication of a unique quality is strong, but it must be remembered that Carlson does not mean by sensation a psychologically simple quality, for he also speaks of hunger, a complex of pressure and pain, as a "sensation."

Cannon's book, *Bodily Changes in Pain, Hunger, Fear and Rage* (5), bears on the problem of organic sensation. His thesis is that

in certain sthenic emotions mentioned in his title the bodily state is the same, viz., the widespread effects that come from the excitation of the sympathetic nervous system and the secretion of adrenalin; and that these emotions are therefore not to be distinguished by their organic constituents. Cannon's description of this widespread action of the sympathetic system suggests that there must be a corresponding consciousness which forms a fixed emotive organic pattern and which, it seems to the reviewer, may ordinarily escape analysis into constituent organic sensations because of its very complexity.

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SPECIAL REVIEWS

The Fundamentals of Psychology. W. B. PILLSBURY. New York: Macmillan, 1916. Pp. ix + 562.

Professor Pillsbury's new textbook "is intended to fill a gap which exists to-day between the smaller texts and the reference hand-books," as it is intended for students without previous training who are willing to give a year to the study of psychology. The first chapter treats of the general problems of psychology and with the general materials with which the science is interested. "It (psychology) deals with the activities commonly known as mental, the processes of perceiving, of remembering, of thinking, and particularly with the acts of the individual" (p. 1). Observation and introspection are the two general methods for attacking the problems of the science; but, of these, introspection is made a