amples render it at least very likely that consciousness and life will be better understood on the basis of new concepts, yet to be developed, than on the basis of "our ordinary notions of physics and chemistry." If the emergence of such new concepts is what the author calls "vitalism" (p. 16), then the vitalists' point of view has a very good chance to prevail. Incidentally, the spirit of "ordinary physics and chemistry," as the author understands it, is greatly at variance with that of quantum mechanics (as interpreted by its philosophers: Bohr, Heisenberg, and Born among others) which provides, also according to this author, the "solid foundation" for the aforementioned disciplines.

Titles such as "Of Molecules and Men" always tempt this reviewer to write a book on "Satellites and Suns." The motion and behavior of artificial satellites can be adequately explained by gravitational forces, and there is good evidence that this applies to a very large extent also to the moon and the planets. (A few snide remarks could be inserted here about the effect of the moon on romantic love to parallel Crick's remarks on religion, which he regards as the sole contender for the time which should be devoted in our classrooms to backing of the theory of natural selection). The events within the sun could be sketched at least as well in terms of the concepts of ordinary mechanics and gravitational forces as the functioning of man is sketched in this volume. The fact that the sun does seem to emit some radiation, that nuclear and electromagnetic phenomena profoundly influence its behavior, could be as easily disregarded over most of the book as the fact that we are conscious beings is disregarded throughout most of *Of Molecules and Men*. Surely, a continuous transition between satellites and suns could be as easily established as between soulless bacteria and men with consciousness. The reader will be glad to know that I have so far resisted the temptation to write such a book.

The preceding expression of disagreement with the author's views on what he considers to be "vitalism" should not obscure the fact that the little volume is interesting and written with spirit. Its content is also somewhat less dogmatic than the title might imply. Crick does mention consciousness several times, even though he seems to consider it a rather unimportant and uninteresting complication. It should be admitted, finally, that the usual path of the development of new concepts starts with a somewhat uncritical application of the old ones and leads to the development of new ones only when the recognition of the inadequacy of the old ones is virtually forced on the workers in the field.

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Tissue, Psyche, and Motive

Psychological Stress and the Coping Process. RICHARD S. LAZARUS. McGraw-Hill, New York, 1966. 480 pp., illus. $12.50.

Lazarus's volume essays to integrate within a theoretical framework a vast amount of research on (or related to) stress, particularly of human beings. The major work on stress to date has been that of Hans Selye, which has focused on the physiological reaction of laboratory animals to noxious stimulation and toxins. Lazarus's work invites comparison with Selye's because he contrasts Selye's attention to physiological stressors and stress reactions with his own presumably transcending concern with psychological stress, which he terms *threat*. It will be useful to consider later how convincingly Lazarus has developed Selye's notion of stress, with its emphasis on tissue damage, into a more refined version with focus on psychic damage.

While Lazarus does not claim to be exhaustive in coverage (and is not, though the bibliography is 27 pages long), his wide-ranging review of recent empirical work is distinctly valuable. I shall concentrate, however, for obvious reasons, on the theoretical framework used to select, order, and interpret these works.

Lazarus defines *threat*, the key concept, as the appraisal of expected psychological harm. *Appraisal* is a two-staged cognition. The first stage is an assessment of the properties of the situation of threat—the circumstances of its appearance, the recourses for avoiding harm, the imminence of harm, and the ambiguity of the threat. The second stage is the appraisal of *coping*, the behavioral resources the individual mounts for dealing with threat. *Psychological harm* is defined as the thwarting of a motive. For *motive*, I am not greatly surprised to find only the brief explanation that it is "defined as the psychological representation of goals and routes to goals rather than as tissue need" (p. 57).

This definition of motive demonstrates the author's devotion to cognitive principles of explanation in contrast to those of the "associationists" (who are on the "other side"). Lazarus gets in some good licks in an opening chapter which sets the stage for a recurrent contest with the associationists—whom we soon recognize as occupying the mainstream of thought and conception in experimental-animal-learning psychology.

> In order to have a general theory of psychological stress for all animals, one tends to eliminate categories which are prime theoretical tools for understanding the person. . . .
>
> Of course, it is possible and desirable ultimately to place even these human-centered phenomena and concepts within a general theory. The argument is not against general theory, but rather against ruling out the very distinctions that are useful in one species, the human, when developing such a theory [p. 15].

And indeed, experimentalists often have been guilty of perverse logic as regards how one proceeds from observation on animals to generalization about man. Presumably, one assumes that many, though not all, behavioral potentialities observed in lower ani-

mals are present in humans. The obverse, however, does not follow; behaviors not found in lower animals may indeed occur in man! One often has the impression that concepts inapplicable at the animal level are for many learning psychologists *ipso facto* of dubious if not disreputable standing. Animal-based concepts have even been incorporated into "behavioral therapy" for disturbed humans or "teaching machines" for uninformed ones. Not that these lack value, but there is the excess meaning carried in these ventures that man's vexing and baffling complexity will yield before the simple, elemental verities made clear in the animal laboratory. Would that it were so!

The problem with Lazarus's book is that he carries this correction, so usefully begun, too far. In the end his position amounts not to a correction really, but to a rather extensive refutation and divorcement. The mainstream psychologists have conceived motivation as an ultimate function of homeostasis. There are problems here —animals and humans often act as if they were seeking imbalance rather than equilibrium. But the concept still has power. Moreover, Lazarus's definition, in which "tissue needs" are divorced from motivation, leaves us asking just why certain "goals" and "routes to goals" become represented in cognition and, subsequently, take on such compelling power to prompt action. If the answer is that these goals, or some number of them, serve to restore homeostasis, then the question of tissue need manifestly is relevant.

The mainstream has, since the work of N. E. Miller, O. H. Mowrer, and R. W. Leeper, viewed emotion as a functional, organizing factor rather than a nonfunctional, disintegrative one. Lazarus considers this issue—of emotions as disorganizing (p. 358)—without openly taking a stand. However, it becomes clear that whether emotions are one or the other is in actuality academic for Lazarus, since he views emotion as a kind of artifact:

> From the present viewpoint, affective processes signify the manner in which the animal or person appraises a situation (because they are consequences of this appraisal). They are not the causes of behavior, but rather the consequences of certain cognitive activity. . . . We say that cognitive activity evaluating the significance of the stimulus-object for the animal's psychological welfare "orients" him toward or against the stimulus object, and the particular orientation is reflected in the affective state elicited by that object [p. 70].

Now perhaps this is what psychologists who speak of emotions systematically as hypothetical constructs are really saying, and we are merely restating it in a slightly different way. *A hypothetical construct, such as anxiety, must not be thought of in systematic usage as causing anything at all* . . . [p. 252].

Thus, Lazarus not only divorces motives from homeostatic processes, he proceeds to divorce emotions from motives! For the mainstream, motivation as a function of homeostasis has provided a broad tie between psychology and biology. Emotion has been conceived as that conditionable component of a physiological (primary) motive state which might become through learning responsive to formerly inadequate cues or signs. Fear, the generic term designating such arousal emotions, thus provides an explanatory base for anticipatory, planful, "looking-ahead" behavior—that form of behavior which in its elaborate, human forms we call cognitive and purposeful. It seems to me that in striking at these two principles (motives as homeostatic and emotions as motives) Lazarus threatens to undo the conceptual avenues that allow us to relate psychic processes to physiological ones and human behavior to that of animals. One can sympathize with the assertion that not enough attention has been given to human cognitive processes without finding it necessary to insist that *all* things psychological are cognitive. Lazarus presses this theme about as far as he can when he says,

> It is altogether possible that the extensive findings of stress biochemists that physiologically noxious agents produce changes in the hormonal secretions of the adrenal cortex are the result of their psychological impact. Few seem to take this idea very seriously; but it cannot be totally disregarded, because even in the animal research in this field, the animal is not prevented from "knowing" what is happening to him [p. 398].

Perhaps for these reasons Lazarus's theoretical treatment often leaves one uncomfortably adrift and in search of firmer footing. There is, for example, more than a hint of circularity in his treatment of appraisal of degree of threat and appraisal of coping. Lazarus advances the rule that as degree of threat increases, coping is impoverished. But it is also true that effectiveness in coping (as evidenced in ego strength, intelligence, and so forth) moderates the appraised degree of threat. The concept of primary appraisal of threat suggests that a man precariously clinging high on a mountainside would suffer an intense degree of threat. But what if he were an experienced mountain climber? Is he constantly moderating the primary appraised threat with secondary appraised coping potential? Or is he just significantly free of threat altogether?

It troubles Lazarus that behavioral scientists heed too little the uniquely complex and subtle in human behavior. The resolution, however, does not necessarily lie in allowing to flower an equally perplexing host of subtle, complex concepts with which to deal with this behavior, or in rejecting apparently simpler concepts formulated on and for simpler (animal) behavior. Elegance and simplicity of theory yet remain virtues so long as they are not preserved by the Procrustean stratagem of chopping off vexing irregularities. Selye managed to overcome just such a profusion of complex puzzles and unveil with considerable directness and clarity a valuable order in the reaction of animals to stress. Does Lazarus build on Selye's start and bring the beginning of clarity and understanding to psychological stress? I wish the answer were not so firmly negative. This is a scholarly, useful book which, in spite of a prefatory delimitation of goals, was aiming very, very high.

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Experience of Visual Distortion

The Nature of Perceptual Adaptation. IRVIN ROCK. Basic Books, New York, 1966. 303 pp., illus. $8.50.

During the last few years there has been a remarkable growth of interest in the behavioral consequences of distorting the visual array. Since the 1890's, when Stratton did his classical experiments, the question has been asked whether a person wearing inverting spectacles ever comes to experience the world as upright. This question has never had a clear answer, and it is now generally realized that the question is ambiguous. The ambiguity becomes apparent when one considers the effects of visual distortions on behavior rather than on the appearance of things. These behavioral consequences include (i) the disturbance of visual-motor coordination (visual-motor discordance), (ii) the