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Diversity
by Harry R. Kissileff

I received four responses to my question about the role of food intake in energy homeostasis, and they reflected an important diversity of opinion on the issue. Each was too long to print in its entirety so I shall paraphrase and quote their central points. I shall be happy to send full texts to anyone who requests them.

The first reply came from Harvey Weingarten (July 20, 1988). He suggested two possible interpretations of my proposal that food intake, as a component of energy homeostasis, should be reduced to a special case rather than a guiding principle. First, "Should analyses of food intake occupy a less central role in our attempt to understand energy homeostasis? . . . My personal belief is that a thorough exposition of the mechanisms controlling the meal is critical to our understanding of energy homeostasis." He bases this position on the beliefs that "energy intake is a powerful determinant of energy balance and that . . . long term control of body weight may be effected by modulating the mechanisms of controlling short-term food intake," as proposed by Mayer and others.

Second, "Is food intake a component of energy homeostasis?" He gives an unqualified yes. "Food intake is a critical component and always contributes to energy balance. To believe anything else would be to believe that basic laws of thermodynamics can be violated . . . A mistake we have made (and I think this is really what your proposal addresses) is to believe that food intake is always initiated in response to energy demands. . . . To say that eating is not a direct response to energy demands does not imply that the control of eating is not a major contributor to energy homeostasis."

In reply, neither of Weingarten's interpretations of my proposal was intended. Obviously, food intake contributes to energy balance. You can't have energy balance without both an input and an output. While I agree with Weingarten's suggestions regarding meal initiation, I was not addressing that issue either. Nor was I concerned with the issue of how much attention should be given to the role of food intake in the control of energy balance.

The issue I wanted to address was picked up more accurately by Neal Rowland (July 21, 1988) and Norman White (July 25, 1988). Rowland writes "Kissileff has challenged us to discuss whether the concept of homeostasis has been accorded an inflated role in theories of ingestive behavior." Rowland then proceeds to discuss the definition of homeostasis and indicates that "Cannon conceived homeostasis as allowing a broad range of values or what might translate into control system terminology as 'loose regulation' . . . However, most of us use homeostasis for tight or relatively precise regulation. Additionally, studies that are designed to test homeostatic hypotheses invariably examine reactions that follow either an experimentally-imposed and/or measurable perturbation of the milieu interieur, or what Moore-Ede [Am. J. Physiol. 250: R735-R752, 1986] has termed 'reactive homeostasis' " He goes on to suggest that nycthemeral rhythms are a manifestation what Moore-Ede calls 'predictive homeostasis' in which the animal's response precedes anticipated changes in internal or external environments. Rowland says further: "By liberating ourselves from a purely reactive definition of homeostasis, we can start to dispense with labels such as nonhomeostatic. Thus the spontaneous meal might be termed homeostatic insofar as it certainly contributes to the animal's future welfare." He concludes that homeostasis should not be reduced from its central role in the field but that the definition needs to be dramatically rebroadened for it to remain useful.

In reply I would like to point out that Cannon's own words indicate that he thought about homeostasis in the predictive rather than reactive mode. He defines homeostasis in the following way "The coordinated physiological processes which maintain most of the steady states in the organism are so complex . . . that I have suggested a special designation for these states, homeostasis . . . It means a condition—a condition which may vary but which is relatively constant." [Cannon, *The Wisdom of the Body*, 1932 Norton reprint, 1968, p. 24]. In describing the features of stabilization necessary for homeostasis Cannon later says that "A noteworthy prime assurance against extensive shifts in the status of the fluid matrix is the provision of sensitive automatic indicators or sentinels the function of which is to set corrective processes in motion at the very beginning of a disturbance. If water