The fact that Aitken does not explicitly take the next step in his argument may relate to his selection of sources for both his history and his theory. In Aitken's view, general ideas or metaphors make these new conversions or blends possible by "serving always to organize or give meaning to information that would otherwise remain disjunct and without structure" (p. 44). In his history, the idea of syntony organized the perceptions of the three translators. Perhaps Aitken could show that intellectual influence on the translators by presenting evidence from their personal papers. But his history rests largely on information from professional journals, government records, and biographies. He uses these sources with care and intelligence. In reassigning priority of invention to Lodge (p. 123), for instance, he constructs a plausible argument based on a wide range of materials. But an attempt to explore the conditions of creativity that makes no use of primary sources, such as personal papers, cannot be wholly satisfactory or convincing.

Nor does Aitken show a broad acquaintance with current literature pertinent to his work. The writings of such historians of science as Arnold Thackray, Paul Forman, and Barry Barnes suggest that science was not as autonomous as Aitken portrays it as being. Barnes's work on the role of metaphor in science would seem particularly useful for Aitken's purposes. Aitken reveals more familiarity with current work in the history of technology but neglects Thomas Hughes's work on technological systems and on the relations between science and technology and Elting Morison's sociopsychological interpretation of creative invention. In economics, the work of the post-Schmookler "technological change" school (of, for example, Richard Nelson, W. Paul Strassmann, Edwin Mansfield, or Raymond Vernon), which explores relations between technology and economics, is ignored. In addition, Aitken misses a number of works from the Tavistock Institute (of, for example, Howard V. Perlmutter or Eric Trist) that treat economics as a system of social action. Aitken is a translator, though, and translators are never as specialized as the enterprises they bridge.

Aitken's exploration of the creative relations between science, technology, and economic activity, which is his fundamental concern, is a valuable contribution. His theory points to the importance of technological anomalies for scientific paradigms, alerts us to the creative nature of both technological and economic activity, identifies a translator role, and, most important, suggests an effective way of thinking about the full creative process of innovation. Aitken's analytical isolation of the translator role in that process and his suggestion that a translator's perception of relevant information is as important to the process as the information or knowledge itself clearly carry too many historical and current implications to explore in a review. His book is bound to spark much thought and discussion.

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Improving Plant Yield

CO_2 Metabolism and Plant Productivity. Proceedings of a symposium, Madison, Wis., June 1975. R. H. BURRIS and C. C. BLACK, Eds. University Park Press, Baltimore, 1976. xiv, 432 pp., illus. $39.50.

The fifth Steenbock symposium provided an opportunity for many of the world's leading researchers studying CO_2 metabolism in plants to assess the limitations of photosynthetic productivity in terrestrial plants and to propose researchable methods of increasing such productivity. The 26 symposium papers included in this volume address all major aspects of CO_2 metabolism in plants. The papers are authoritative and well conceived. Some are straightforward summaries of research in progress, and others describe one or two decades of effort by individual laboratories to improve crop yield by using conventional plant breeding approaches to increase the photosynthetic capacity of plants.

Wallace and colleagues have analyzed dry bean genotypes that differ in CO_2 assimilation rate and have concluded that the polygenic regulation of the process makes breeding for CO_2 assimilation rate practically ineffective. Zelitch has come to the same conclusion working with tobacco. Ogren and Moss have screened thousands of seedlings of agronomic plant species that have been treated with conventional mutagens without discovering a single mutant that was useful in a breeding program for photosynthesis.

These perplexing results have spawned other innovative research. Bjorkman has attempted to cross related plant species that have different CO_2 assimilation pathways. Zelitch has used tissue culture techniques in an attempt to generate phenotypes that have more efficient photosynthesis and altered daylight respiration. Ogren is attempting to regulate CO_2 assimilation and daylight respiration by chemical and genetic modifications of the primary enzyme in the pentose phosphate cycle.

As the efforts to discover new genetic or chemical tools to modify the rate of photosynthetic CO_2 fixation continue, several physiologists are questioning the extent to which the rate of CO_2 assimilation limits a plant's productivity in the fields. Loomis and colleagues and Wallace and colleagues correctly argue that, regardless of photosynthetic capacity, it is the utilization of the photosynthate by the crop in such processes as leaf expansion, fruit growth, nitrogen fixation, and respiration that ultimately determines yield. Moss shows how the capricious environment may prevent the realization of the genetic potential for photosynthetic CO_2 assimilation in current crop genotypes.

The volume offers a balanced presentation of the status quo and a lucid discussion of the challenges confronting researchers studying photosynthetic CO_2 metabolism. The hypotheses framed by the contributors will undoubtedly tempt new, bright minds to take up the challenge of increasing the photosynthetic productivity of crops.

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Scattering Phenomena

Optics of the Atmosphere. Scattering by Molecules and Particles. EARL J. MCCARTNEY. Wiley, New York, 1976. xviii, 408 pp., illus. $24.95.

Not long ago optics meant to most people the physical properties of visible light, radiation that we could see. During World War II the military developed infrared night vision devices, and, more recently, vidicons have been developed that can sense ultraviolet radiation and present an image of it on a television screen. So optics nowadays encompasses the entire spectrum of electromagnetic radiation, from the extreme ultraviolet to the far infrared. With the development of optical sensors, new fields of environmental research, called remote sensing or optical probing, have sprung up. Optical sensors enable us to detect and monitor pollutants in the atmo-