pages, in which confinement, quark, and gluon jets are emphasized. Deep inelastic scattering, scaling, and asymptotic freedom are omitted. Electroweak interactions are treated in 60 pages, and it is here that the authors' approach is most novel. A four-Fermi vertex of pairs of quarks or leptons is introduced to account for all the observed charge-changing weak processes. The observation that the fermion pairs always have charge ± 1 motivates the introduction of a $W^{\pm}$ and leads to Cabibbo mixing, quark-lepton universality, and the GIM (Glashow-Iliopoulos-Maiani) mechanism. An argument of weak isospin symmetry and state mixing leads to the Z° and γ and gives their correct coupling to fermions and the relation of the Weinberg angle to g and g'. Neutral kaons and CP violation are treated in some detail. All this is accomplished without the use of field operators, Lagrangians, second quantization, non-Abelian symmetries, and the like.

The book has been written very carefully. Statements are phrased precisely (including necessary qualifications and exceptions) so that they do not have to be modified later on. Early discussions (for example, of parity, helicity, and CPT) point out subtleties that are later crucial. Naturally such concise, focused writing demands a lot from the reader. The emphasis throughout is on quantum numbers, symmetry arguments, and selection rules. Mastery of this book will not enable one to calculate a cross section or a lifetime. It will enable one to understand much of modern particle physics.

H. A. WELDON
Department of Physics, University of Pennsylvania, Philadelphia 19104

Avogadro and His Work

Amedeo Avogadro. A Scientific Biography. MARIO MORSELLI. Reidel, Boston, 1984 (distributor, Kluwer Boston, Hingham, Mass.). xii, 375 pp., illus. $59.50. Chemists and Chemistry.

There are two books here, a biography and a history of an idea. The first takes us through the scientific career of the Piedmontese physicist who first proposed, in 1811, the hypothesis that all gases under the same conditions of temperature and pressure contain the same number of particles: Avogadro's hypothesis, or, as Morselli calls it, the "molecular hypothesis." An opening chapter on the man and his times is followed by chapters on his early electrical and electrochemical researches, on his later essays on points of chemical theory, on his ponderous *Fisica dei corpi ponderabili* (four volumes, 1837–41), and on a miscellany of papers he published in the last 25 years of his life. Apart from the opening chapter, which sketches Piedmont's odd position in Revolutionary, Napoleonic, and Restoration Europe and Avogadro's placid ability to go on thinking about science amid the turbulence, these biographical chapters present Avogadro's arguments and findings against the background of contemporary work on the various problems he addressed. They usually end, a little regretfully, stating that Avogadro's efforts either attracted no attention at all or caused Berzelius (in his *Jahresbericht über die Fortschritte der Chemie*) to sneer.

The one exception to the desuetude into which most of Avogadro's work fell makes up the second book. Here Morselli relates the history of Avogadro's hypothesis from its inception to its acceptance late in the 19th century as a fundamental law of chemistry and a strategic bridge between physical and chemical conceptions of gases. Avogadro, putting together Dalton's chemical atomism and Gay-Lussac's observations on the numerically simple way gases combine by volume, suggested "as the first hypothesis to present itself in this connection, and apparently even the only admissible one . . . that the number of integral molecules in any gases is always the same for equal volumes." (The quotation is from Avogadro's 1811 paper.) This requires, of course, that the particles of elementary gases be divisible, or molecular. Although a number of chemists restated this idea in the first half of the century, and Avogadro himself reiterated its importance in several of his publications over the years, it did not come in for serious consideration as a way of sorting out the era's profusion of atomic weight determinations until midcentury. After Stanislao Cannizzaro's formal presentation of the hypothesis at the Karlsruhe conference of 1860 scientists had to reckon with it. The interval between publication and general acceptance (or at least acknowledgement), or the "delay" in the recognition of Avogadro's insight, or the "neglect" of his work, has been the main source of active historical interest in his career. Scientists are supposed to spot and welcome true and important contributions at once; when they do not, historians prick up their ears. Also, Avogadro's case, like Ohm's and Mendel's, brings out the public defender in some historians, anxious to do justice to the obscure, the provincial, and the powerless in a world where the metropolis is plenty smart but often has pharisaical vested interests.

Morselli's thorough, detailed account of Avogadro's *oeuvre* is as complete as we are likely to get. I wish it were better. It is evident that Morselli set himself the task of presenting Avogadro whole, but inasmuch as Avogadro contributed almost nothing to 19th-century science except his famous hypothesis Morselli is left without a standard for the selection or omission of detail. As a result, Avogadro's shorter papers appear in brute summary, whereas the longer ones—and Avogadro tended to prolixity—defeat Morselli, who tries valiantly without success to connect them with the scientific mainstream. In the course of this labored and laborious exposition he even gets annoyed with Avogadro for his blurry definitions (pp. 306, 307), his "natural inclination to uphold a preconceived hypothesis rather than to accept empirical data" (p. 312), and his elaborate, obscure, "involute" prose style (pp. 17, 95, 304).

Interest in Avogadro must remain with his hypothesis, and Morselli's account picks up when he deals with it. Despite much careful scholarship on the problem of its delayed acceptance, historians do not agree on the reasons for it, or even on whether there is a delay to explain. Some scholars assert that the hypothesis was adopted precisely when it was needed, and that therefore attempts to explain its earlier neglect miss the point. This argument has swayed Morselli but has not fully won him over. His own explanation adduces three main obstacles in the way of the scientific world's immediate acceptance of Avogadro's hypothesis: from within the sphere of scientific thought, disbelief in the possibility of polyatomic elementary particles; from the "culture" (Morselli is vague about what that means), disapproval of speculation; and from Avogadro's own retiring and "bland" personality, unwillingness to press his claims or to go to Paris (as Volta did earlier) to woo the big shots.

Of these three hindrances, only the first had force, in my opinion. Other scientists as stay-at-home as Avogadro got a hearing in the capitals—Joseph Louis Proust, for example, who successfully challenged Berthollet on the principle of constant combining proportions, worked in Spain and published his papers in the same second-class journal (Lamétherie's *Journal de Physique*) that printed Avogadro's 1811 paper. Further, can it be maintained that the age was

wholeheartedly opposed to "speculative" ideas? The writings of Berzelius, Davy, Berthollet, Ampère, Dalton, Prout, and many others are full of bold guesses. This leaves the objection that Avogadro's hypothesis required what he called "constituent molecules" (our H_2 or O_2) of elementary substances, and at the time no one could figure out how two or more like atoms could stick together to form them. I for one do not see why this objection does not suffice to explain the neglect of Avogadro's hypothesis.

STUART PIERSON

Department of History,
Memorial University of Newfoundland,
St. John's A1C 5S7, Canada

Social Psychology

Social Cognition. SUSAN T. FISKE and SHELLEY E. TAYLOR. Addison-Wesley, Reading, Mass., 1984. xviii, 508 pp., illus. Paper, $16.95. Topics in Social Psychology.

The field of social psychology has historically been the cognitive vanguard of American psychology. During the decades when mainstream psychology was afflicted with a nearly terminal case of operationalism, social psychology was unabashedly receptive to such "mentalistic" constructs as attitudes, stereotypes, and schemata. How could it be otherwise, since the social environment is a *perceived* environment shaped by the expectancies and goals of the actor? For Kurt Lewin in the '30's, a person's behavior was a response to his or her psychological environment. Never mind that Lewin's solipsism was scoffed at by the behaviorists, social psychology has thrived on its varied attempts to cope with the complex processes of mental functioning. Lewin's student Leon Festinger effectively theorized about cognitions and the relations between them, giving rise to broad empirical advances in our understanding of how people deal with inconsistencies of thought. Lewin's friend Fritz Heider tried to distill the wisdom of naïve psychology with the ultimate result that an attributional approach to mental functioning became the dominant focus of social psychology in the '70's. This approach was based on the premise that people act on their causal understandings of social life and therefore it is important to determine, experimentally, how these understandings are reached.

Meanwhile, disenchantment with the sterility of clearly behavioral approaches, the challenge of the computer metaphor, and advances in measurement techniques were converting perceptionists and learning theorists into cognitive psychologists. It was perhaps inevitable that developments in social and "natural science" psychology should begin to influence each other as they have increasingly in the past decade. "Social cognition" is the result, an outgrowth of the attributional approach that is especially responsive to the information processing conceptions and measures of cognitive psychology. To an extent, social cognition represents an uneasy marriage between the broad contextualism of the social psychologist and the preference of the cognitivist for fine-grain analyses of attention, perception, memory, and inference. The book under review is an impressive summary of this emergent field.

Fiske and Taylor characterize their domain as the general concern with how people make sense of other people and themselves. Such a complex enterprise does not lend itself to a single theory or a limited set of methods. But what is allegedly new and distinctive about social cognition research is that its practitioners are comfortable with mentalistic explanations, committed to the analysis of thinking processes (rather than outcomes), and open to the continued cross-fertilization between cognition and social psychology. One may be skeptical of the claim for the novelty of social cognition research but still be grateful for the rich smorgasbord of ideas, insights, and data that the authors have collected and organized for us.

The book is divided somewhat arbitrarily into sections entitled Elements of Social Cognition and Processes of Social Cognition. Since the elements section includes a treatment of attributional approaches and the processes section focuses on the more recent conceptalizations of attention, memory, and inference, the division makes a certain historical sense. Nevertheless, I find it strangely misleading to treat the complexities of attributional reasoning under the general label "elements of cognition." There is a final section, entitled Beyond Cognition, that presents a discussion of affect, attitudes, and behavior. Such a discussion is essential for a comprehensive understanding of how cognitions function in the active and reactive person.

Three models of the social thinker appear to underlie contemporary research. The first is that of the social thinker as naïve scientist, interested in prediction and control through causal understanding of the surrounding environment. The second is that of the self-oriented information processor, especially attentive to self-relevant information and often processing it in self-serving or self-protective ways. The third is that of the "cognitive miser," pressing toward efficient inferential short-cuts and mindless automatic processing. This last model goes hand in hand with the concept of schema, and the authors devote considerable space to the vast empirical literature that shows how our theories and hypotheses affect the ways in which we process available information. Not to have such schematic processing aids would leave us as paralyzed victims of information overload. Perhaps ultimately we will have a clearer picture of how these three models combine to facilitate predictions of thought and behavior, but one can hardly expect the present authors to do much more than suggest that each of the different processing models is appropriate under different circumstances.

In order to evaluate the contribution of this volume it is important to understand to whom it is addressed. It is one of a series designed for undergraduates lacking any particular background in social psychology. Certain stylistic consequences of this orientation are apparent. Individual research studies are referred to and superficially summarized; they are rarely described in sufficient detail to permit critical appraisal. Strings of references validate (for those already familiar with the literature) the authors' extensive scholarship, but the professional reader may yearn for greater depth and sophistication of treatment. Instead, the presentation is interspersed with hypothetical cases, largely from undergraduate life, and with thought experiments. Most of these are intriguing and pedagogically apt, but some readers may feel patronized or vaguely manipulated by anecdotes intended to "make the point" being considered.

All in all, in spite of the deference to undergraduate interests and concerns, this is an ambitious enterprise that goes well beyond pedestrian textbook standards. It is really the first major effort to consider how cognitive and social psychologists have joined hands, and it is carried out with imagination, good sense, and good humor. The book presents the outsider with a clear picture of the dominant contemporary focus in social psychology. It also deals perceptively and engagingly with problems of social and self understanding that must be a concern of every sentient person. Finally, the book gives the professional scholar a remarkably useful bibliography and