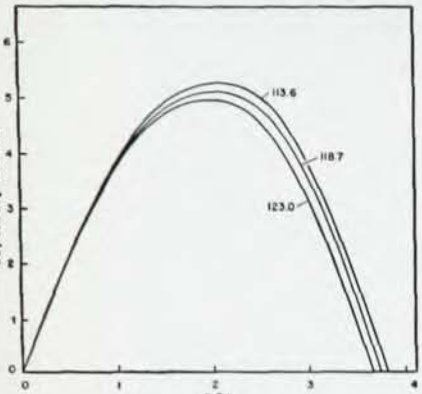

Fig. 6. Entropy difference between normal and superconducting states for tin samples of different mean atomic mass. These curves are geometrically similar figures.

namic equilibrium. As the temperature is lowered more and more of the normal fraction "condenses" to form part of the superconducting fraction. The model is set up so that x varies from zero to unity as the temperature goes from the absolute zero to the transition temperature T_c. Quite naturally therefore x is a function of the reduced temperature T/T_c.

The total electronic entropy, according to the two-fluid model, is taken to be γT, the ordinary linear term for an electron gas, multiplied by a function of x, the normal fraction. An expression of this sort will automatically exhibit the similitude feature if the function contains no hidden mass dependent parameters. In the original formulation of the two-fluid model the electronic entropy was taken to be

$$S_{s(\mathrm{el})} = \gamma T x^{\alpha}, \tag{4}$$

a form chosen because it was consistent with early exprimental data. α is an adjustment parameter, characteristic of each superconductor and empirically found to be of the order of one-half. Inasmuch as α is essentially an electronic parameter it is plausible to assume that it would be independent of isotopic mass as is γ. With this assumption Eq. (4), therefore, clearly exhibits the similitude property experimentally observed. This is a direct result of the fact that the internal parameter x depends on the *reduced* temperature, T/T_c, and is an intrinsic feature of the two-fluid model. The equation for the critical field curve which follows from (4) can be derived in a straightforward way. As would be expected, the reduced field, h, is a function of the reduced temperature, t, and the parameter, α, and consequently also exhibits the similitude feature.

In concluding this brief survey we note that the phenomenology of the isotope effect gives us an interesting insight into both the microscopic and macroscopic pictures of superconductivity. From the microscopic point of view it suggests an intimate connection between the dynamical properties of the crystal lattice and superconductivity, and the general trend of agreement with the "half-power law" of the lattice vibration theories reinforces this notion. On the macroscopic side it exhibits the similitude property inherent in the two-fluid model of a superconductor.

Books

Les Atmosphères Stellaires (in French). By Daniel Barbier. 238 pp. Flammarion, Editeur, Paris, France, 1952. 625 francs.

This excellent book is really somewhat more than the title suggests, and in fact covers quite a broad part of the domain of astrophysics. It deals in some detail with classifications of stars and spectral types, radiative equilibrium and hydrostatic effects, the absorption coefficient and the continuous spectrum, and the contours of the absorption lines in stellar spectra. It also discusses such incidental topics as molecular spectra, bright (emission) line spectra, and gaseous nebulae, and presents a good summary of students' work done in this field.

The book, well illustrated with figures and diagrams, is written on the graduate student level, or for physicists desiring to familiarize themselves with recent developments in this neighboring field. It assumes the familiar forms of mathematics and atomic physics; however, since it is not intended as a treatise to instruct the experts, the references are given by name and occasional date only. It will make excellent supplementary reading, not only in astrophysics, but also as an example of the applications of the principles of atomic physics.

The style is clear and lucid and the book is strongly recommended to all interested in this subject. As usual with French editions, the volume is uncut and has paper covers.

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Electrons and Holes in Semiconductors. With Applications to Transistor Electronics. By William Shockley. 592 pp. D. Van Nostrand Company, Inc., New York, 1950. $9.75.

"I have said it thrice: What I tell you three times is true," said the Bellman. Following this sound pedagogical precept, Shockley has organized his excellent text into three parts of increasing mathematical complexity or increasing level of abstraction: Part I, Introduction to Transistor Electronics; Part II, Descriptive Theory of Semiconductors; Part III, Quantum-Mechanical Foundations. The structure is discussed in the preface:

"In Part I, only the simplest theoretical concepts are introduced and the main emphasis is laid upon interpretation in terms of experimental results. This material is intended to be accessible to electrical engineers or undergraduate physicists with no knowledge of quan-