Of especial interest to the geometer will be the frequent recourse to fundamental domains defined by the invariant metric.

Throughout this memoir, numerous examples are calculated for special domains. Extensive bibliography and detailed indications of original papers are given.

H. BEHNKE

La théorie de la relativité restrainte. By O. Costa de Beauregard. Paris, Masson, 1949. 6+174 pp. 800 fr.

In this little volume, the author presents a textbook of the special theory of relativity, with special emphasis on those aspects of the theory to which he himself has contributed. As a result, he has shown that it is possible to this day to write a textbook on the subject that is not repetitive.

The preface contributed by Professor de Broglie is most illuminating. It appears that the author's principal contribution has been the thorough investigation of three-dimensional integrals in Minkowski space, particularly as regards their transformation properties. While the results are probably well known to differential geometers, their consistent application to physically interesting questions affords the physicist an introduction to relativistically invariant three-dimensional (space-like) integrals.

Space-like integrals are frequent in physical theories. The integral over the electric charge density must be extended over a three-dimensional space-like domain to yield the total charge; the integral over the entropy density in three dimensions gives the total entropy, and so on. The corresponding four-dimensional integrals lack physical significance. In the standard physical literature Schwinger was among the first to discover that one cannot examine the properties of such integrals conveniently if one restricts oneself to plane surfaces. The reason is that in going over from one surface to a neighboring one (connected with each other by means of an infinitesimal transformation) one finds that the variation of the integral consists of terms having the form of a (three-dimensional) volume integral and additional terms that appear in a (two-dimensional) surface integral. Now if the only domains to be considered are space-like coordinate hypersurfaces in Minkowski space, the surface integrals are to be taken at infinity, and the convergence considerations that must be carried out, though feasible, are artificial. It is much more convenient to consider at first neighboring domains that coincide everywhere except in a bounded domain. And that point of view requires the consideration of curved hypersurfaces. All this has, of course, been well known to workers in general relativity, but has been relatively unfamiliar to the community of physicists until the appearance of the Schwinger papers.

In this book the author devotes a great deal of attention to those aspects of special relativity in which the consideration of three-dimensional integrals is suggested by the subject matter, that is, the theory of the electromagnetic field, including continuous charge and current distribution, relativistic thermodynamics, and relativistic fluid dynamics, including the dynamics of viscous and "spinning" fluids. Most of this material appears to be interesting and well presented.

There are altogether five chapters. The first is devoted to historical and mathematical antecedents, the second to relativistic kinematics and (geometrical) optics, the third to relativistic electromagnetic theory, and the last two chapters to relativistic dynamics (including thermodynamics).

In its early portions, the presentation is enlivened by a discussion of all the major experiments bearing on the kinematics and the optics of moving systems. In the latter portions of the work, this reviewer was struck by the phenomenological approach to fluid dynamics and particularly to thermodynamics. In extending thermodynamics to relativity, there is a fundamental conceptual paradox: Relativistic thermodynamics may be carried out in the sense that one considers only the before-after of the two systems interacting (both are isolated before and after the "collision"), but all the results obtainable in that case have already been reported by Planck in 1908; the other approach, chosen by Costa de Beauregard among others, is to treat the thermodynamics of continuous matter, introducing temperature, entropy density, and so on, as *fields*. With the latter approach, there is no local equilibrium, hence no canonical ensemble, and the usual definition of temperature in statistical mechanics breaks down. That is why, in the reviewer's opinion, relativistic thermodynamics, if it is to have physical significance, should be built up from a new approach to statistical mechanics.

Altogether, this work appears a must for workers in any of the fields enumerated above. References to the literature are very complete. This reviewer regretted the absence of an index, but the table of contents is very detailed. Apart from the language difficulties, the differences in notation from those customary in this country and the generous use of rather difficult differential-geometrical concepts militate against its use as a principal text in a course taught in an American university.

P. G. BERGMANN