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The theory of group representations, by Francis D. Murnaghan, The Johns Hopkins Press, Baltimore, 1938, 369 pp.

Books on group representations come out in waves, it seems. In short succession, three new books on the subject appeared: Murnaghan's Theory of Group Representations, Weyl's Classical Groups, and D. E. Littlewood's Theory of Group Characters. Perhaps, it is worthwhile to compare the general point of view of these new volumes with the books published during the preceding periods in the history of the theory.

First, group representations were treated as a special chapter of the theory of finite groups, furnishing a powerful method for the study of these groups. The books of Burnside, Blichfeldt, Dickson, Miller, and Speiser belong to this period. Of course, in those days no self-respecting physicist could be seen near the shelves of libraries housing works on group theory. This was the realm of mathematicians, interested in the subject because of its great mathematical importance and its inner beauty.

Suddenly, with the birth of quantum mechanics and modern nuclear physics, everything was changed. There were no self-respecting theoretical physicists anymore who would not know about representations, Schur's lemma, characters, and orthogonality relations, and so forth. The books of this period (Wigner's Gruppentheorie, Weyl's Theory of Groups and Quantum Mechanics, van der Waerden's Gruppentheoretische Methode in der Quantenmechanik) were dedicated half to group theory and half to quantum mechanics, treating the former subject as far as it was needed for the applications to physics. There is no need to describe the immense progress accomplished in this work. Very likely, the books mentioned will be counted among the classics of science.

It is not surprising that the opening of this new field was accompanied by a change of existing values. Certain special groups, the symmetric group and the rotation group suddenly came into prominence. It would not be true to say that they reenacted the story of Cinderella. Such mathematicians as Frobenius, A. Young, I. Schur, Weyl had studied them in detail, but apparently nobody thought of writing books on them, before the applications to physics were found. Of course, the mathematical work was obliterated by the spectacular success of the applications.

What we see today, seems a natural reaction. The mathematicians feel that a theory which admits such applications deserves to be put in the form of books for its own sake. Of course, the needs of physics do not exhaust the mathematical riches. There are more general cases which can be treated, connections to other mathematical theories which can be studied, new questions which can be asked. In this situation, it is hardly an accident that several mathematicans felt the need for a new book on group representations and proceeded to write it, independently of each other. The mathematical theories were treated in all detail, the physical applications were not given of course, the three books of Murnaghan, Weyl, and Littlewood differ widely, owing to the different interests of the authors, and their different points of view.

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Professor Murnaghan describes the object and scope of his book with the following words: "We have attempted to give a quite elementary and self-contained account of the theory of group representations with special reference to those groups (particularly the symmetric group and the rotation group) which have turned out to be of fundamental significance for quantum mechanics (especially nuclear physics)."

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