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## LOW TEMPERATURE PHYSICS

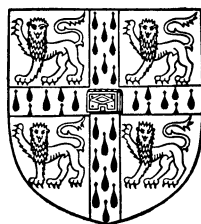
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# LOW TEMPERATURE PHYSICS

BY  
M. AND B. RUHEMANN



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## PREFACE

We have attempted in this book to discuss the principal problems that have occupied low temperature physicists since the time when low temperatures began to form a separate branch of experimental science. In our general arrangement we have followed the line of gradual penetration from such macroscopic phenomena as condensation and fusion to processes intimately connected with our concepts of elementary particles, such as give rise to magnetic moment and electrical conductivity. This arrangement, naturally enough, follows fairly closely the historical sequence of events, but is free from the monotony of chronological classification.

We have purposely neglected such fields of research as have been copiously treated in textbooks and monographs, as for instance supra-conductivity and the theory of specific heats. In these cases we have dealt merely with the latest developments. On the other hand, we have given particular attention to fields that have not to our knowledge as yet been dealt with in connected form, such as the subject of crystal structures stable at low temperatures. We believe that this principle justifies the very unequal length of the various parts and chapters. Moreover, we have omitted a number of investigations which, though valuable in themselves, are imperfectly connected with the general trend of low-temperature physics, such as Vegard's very interesting work on the emission spectra of solidified gases.

The rapid development of low-temperature engineering and the numerous unsolved problems that it offers have led us to lay considerable stress on the principles of gas liquefaction and rectification, more especially as most of the work in this domain is not to be found within the scope of general physical literature.

We have taken pains to avoid the rigidity and professionalism of a textbook, which we believe is alien to our subject. For low-temperature physics specialises neither in the objects

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## P R E F A C E

of its research nor in any particular properties of these objects, but merely in its methods of approach. It has therefore never claimed the self-sufficiency of such branches as electromagnetism and thermodynamics. On the contrary, it is intimately bound up with these and all other branches of physics and has no reason to disavow these connections. Our efforts to draw nearer to absolute zero are not merely the hectic desires of a record-hunter but are dictated by a genuine curiosity as to the properties of matter, irrespective of whether they are to be measured in amperes, angström units or calories. Half a century's experience has taught us that as long as we are in a position to attain yet lower temperatures, there will always be something of interest to study there, even if it is but those processes with the help of which the temperature has been lowered. No one seriously believes that because five-thousandths of a degree is the lowest limit hitherto reached, there is no point in attempting to go farther.

Though this book may be of some use to the specialist, we have had in mind as prospective readers rather physicists specialising in other fields and more or less passively interested in low-temperature work and students who have not yet concentrated on one particular branch of physics. On the whole we have deemed it preferable to be too elementary for the former than too "advanced" for the latter.

M. AND B. R.

KHARKOV, U.S.S.R.  
*December 1935*

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