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BOOK REVIEW

GEOFFREY GRIMMETT, *Percolation*. Springer, Berlin, 1989.

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The field of rigorous percolation theory has grown so fast during the past 10 years that Kesten's 1982 book on the subject is largely out of date. Even Grimmett's 1989 book, reviewed here, is not completely current, although it remains the best available source of information about percolation theory.

The book is organized in a very logical way, and so a glance at its list of contents gives a quick but useful overview of the subject. It contains an accessible and complete account of most of the important results that had been proved prior to its preparation, especially in those parts of the theory that have been largely worked out. On the other hand, somewhat more detail about scaling theory and critical exponent inequalities might have been desirable. The chapter notes serve as a useful guide to further reading since they contain references to several topics that are not discussed in the text, and notes, added in proof, about almost all the major results that appeared after the book was written. The book makes it clear that the main open problems lie in the area of critical exponents and scaling theory. It should be useful both as a textbook either for a graduate course or for independent study and as a reference work.

The percolation model was introduced in 1957 by Broadbent and Hammersley as a model for the flow of fluid through a porous medium. Many variations are possible, but the simplest case, to be described shortly, is the nearest-neighbour, translation- and rotation-invariant, independent model.

We create a random graph whose set of vertices is $\mathbb{Z}^d$ and (in the nearest-neighbour case) each of whose edges joins a pair of nearest neighbours in $\mathbb{Z}^d$ (i.e., a pair $\{x, y\}$ with $\sum_{i=1}^{d}|x_i - y_i| = 1$). We do this by randomly assigning one of the two statuses *occupied* and *vacant* to each potential edge (nearest-neighbour pair) in $\mathbb{Z}^d$, the assignment being made independently over edges, and the probability that an edge is occupied being the same for all edges. The edge set of the random graph is the random set of occupied edges. This model depends on a single parameter, usually denoted p and called the *edge-density* or simply the *density*, namely, the probability that a given nearest-neighbour edge is occupied.

In describing the model, we have made three assumptions: first, that only nearest neighbours in $\mathbb{Z}^d$ can be joined by edges; second, that the probability that an edge is present is the same for all edges; and, finally, that there is no statistical dependence among the statuses of edges. By confining his attention for the most part to this simple model, Grimmett avoids many of the technical

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