# Dedication

It is now forty years since Cyril Domb set out to fill the many gaps remaining in the mathematical theory of critical phenomena after Onsager's demonstration that the Ising model in fact allows the possibility of a phase transition. He has remained at the forefront of research in the field ever since. Accordingly, it is both scientifically fitting and our personal pleasure to dedicate this volume of articles by his students, friends, and collaborators in honor of his formal, but not actual retirement from university life.

Cyril Domb was born and educated in London, showing a fascination and aptitude for numbers at an early age. After graduating in mathematics/physics (say which) from Cambridge in 1941, he spent the later war years working for the Admiralty in radar research, as did so many other distinguished scientists of the time. Following the war, Cyril returned to Cambridge to receive a Ph.D. in physics under Francis Simon in 1949. His thesis contained the seeds of ideas on critical phenomena which have engaged a full generation of researchers, and still provide a rich lode of research ideas for further development. Onsager's amazing analytical solution of the two-dimensional Ising model in zero field in 1944 was an inspiration but not a guide to further progress. Analytic methods that suffice to produce an exact result in the field-free two-dimensional case fail both in three dimensions and in the presence of a field in two dimensions. In his thesis Cyril took up the challenge of finding approximations to such solutions. His approach was based on perturbation techniques for lattice models for the calculation of parameters that characterize the critical behavior. Indeed, he was the first to recognize the significance and universality (to a considerable degree) of the critical exponents that specify, for example, the rate of divergence of the magnetic susceptibility or fluid compressibility at a critical point.

Cyril's rise in the academic ranks was swift. After spending two years as a University Lecturer in Mathematics at Cambridge he became, in 1954, Professor of Theoretical Physics at King's College at the University of London, a chair later named in honor of James Clerk Maxwell. He retired from King's in 1981 after accepting a position as Professor of Physics at

Bar-Ilan University in Israel. He was elected a Fellow of the Royal Society in 1977, received an honorary D.Sc. from Yeshiva University in 1979, and was awarded the Max Born Prize in 1981.

The list of Cyril's scientific achievements is a rich one. By developing special combinatorial and lattice graph theory techniques, he showed that a significant number of coefficients in a power series expansion of physical parameters could be calculated, thereby allowing one to deduce properties of nontrivial models of criticality. Later, he championed the use of computer enumerations of graphs on lattices, thereby extending the range of methods based on series calculations. The ratio technique devised by Domb and his student Martin F. Sykes for extrapolating such exact series expansions quickly became a standard tool in studies of critical phenomena and is still much used today. It has since also found considerable application in areas of research unrelated to statistical mechanics. The renormalization group approach of K. G. Wilson also owes a significant debt to Cyril Domb's work; indeed, while he was developing his ideas, Wilson adapted the series analysis techniques to field-theoretic models and also used them in his development of gauge field theories on lattices. Cyril's 1960 review article "On the theory of cooperative phenomena in crystals" (*Advances in Physics*, Vol. 9) was, in fact, a monograph on the subject. Almost immediately after publication it attained the status of a classic and has been used by a generation of students as a most authoritative and readable introduction to the theory of critical phenomena. Even today, nearly thirty years after publication, it remains a valuable resource. The series *Phase Transitions and Critical Phenomena* started by Domb and M. S. Green in 1972 and now edited by Domb and J. L. Lebowitz is a central and widely read collection of review articles charting the continuing development of these fields.

Cyril has enriched our understanding of polymer configurations, and has also made significant contributions to the theory of random walks, lattice dynamics, and stochastic processes. He provided a stimulus for the analytic and quantitative study of cluster-size distributions in percolation processes. In a particularly noteworthy contribution the theory of random walks Cyril Domb, together with Gillis and Wilmers, first showed that the distribution of the end-to-end distances of a self-avoiding random walk diverges strongly from the Gaussian form in two and three dimensions.

It would be impossible to characterize Cyril without citing his devotion to religion, not only specifically to Judaism, Jewish causes, and Zionism, but in a broader sense as well. His family life is marked by both warmth and rectitude, directly related to religious beliefs deeply held by him, his wife, Shirley, and their six children. Cyril's philosophy of the interrelatedness and compatibility of science and religion has led him to play a

leading role in the Association of Orthodox Jewish Scientists, and to have taken up with especial pleasure a position at the only university in Israel devoted both to the secular and religious worlds.

Cyril's devotion to his predoctoral and postdoctoral students and collaborators has been an inspiration to both; he is ever generous in his praise of the accomplishments of his former students. Few will forget the number of fruitful ideas emerging at the end of the long walks that he loves so much, as well as the intensity, integrity, and persistence with which he attacks scientific problems. University-mandated retirement will not bring Cyril's scientific activities to a halt. Rather it will free him from teaching duties and enable him to continue research in the Physics Department at Bar-Ilan as well as devote himself to the leadership of the Jerusalem Institute of Technology, where he holds the position of Academic President.

We and all of his friends hope that Cyril will enjoy many happy and healthy years in the pursuit of the many activities undertaken by him as a leader both in the fields of science and religion.

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