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Lectures in Statistical Physics

From the Advanced School for Statistical
Mechanics and Thermodynamics
Austin, Texas USA

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PREFACE

These lectures are taken from the Advanced School for Statistical Mechanics and Thermodynamics organized by the Center for Statistical Mechanics of the University of Texas at Austin, (Professor Ilya Prigogine director). All lectures, except for those by Professor Lebowitz, are from the first school held in Spring 1969. Those by Professor Lebowitz are from the following year.

We feel a deep sadness at the death of Professor Zevi Salsburg during the preparation of this manuscript. His lectures were assembled from tape recordings and lecture notes. We hope these notes reflect in a small way his quality as a great teacher which we are sure his students and colleagues at the first Advanced School sincerely appreciated.

The lectures in this series form a natural sequence. Professor Prigogine first discusses the new developments in the macroscopic theory of non-equilibrium thermodynamics in the non-linear domain, particularly the dissipative structures", order appearing in far from equilibrium states. The theme of order continues in Professor Salzburg's review of equilibrium properties of phase transitions with particular emphasis on the question of long range order in one, two and three dimensional space. Dynamical effects are then reviewed by Professor Resibois in his lecturers on more recent developments. Here he discusses, for example, dynamical scaling, the semi-microscopic theory of Kadanoff and Swift. He then discusses a microscopic model reviewing his work on Heisenberg spin systems using the full techniques of non-equilibrium statistical mechanics. Professor Lebowitz turns to deep and fundamental questions when he finishes the theme of order by concisely reviewing the rigorous statistical mechanical proofs of the existence of the thermodynamic limit in equilibrium, and also the recent work on the existence of solutions to equations of motion in

the limit of an infinite number of particles. The final article by Professor Balescu is naturally related to those of Resibois and Lebowitz being a review of the formulation of non-equilibrium statistical mechanics from the Liouville equation with particular emphasis on the projection of asymptotic general kinetic equations.

Finally, we would like to thank the National Science Foundation and the University of Texas at Austin for its financial support of the Advanced School which made these lectures possible. We also should not finish without thanking Barbara Melton for her diligent typing of this manuscript.

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