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Book Review: *Phase Transitions and Critical Phenomena*

Phase Transitions and Critical Phenomena, Vol. 12. C. Domb and J. L. Lebowitz, eds. Academic Press, 1988, xvii + 498 pp.

This 12th volume of the series on phase transitions and critical phenomena provides and excellent selection of reviews. The results discussed present a variety of active research topics that are rapidly developing and stimulating the use of innovative techniques, both theoretical and experimental.

The volume opens with Dietrich's comprehensive review of wetting phenomena (with an emphasis on statics) and their relevance to nucleation and melting. Major results are interpreted in the light of mean-field theories or exactly solved models of wetting, drawing particular attention to their importance in designing real experiments. More recent theoretical developments elaborate on solid-on-solid models and yield new evidence of the potentialities of surface phenomena in probing the molecular interactions in (bulk) systems.[1]

The article by den Nijs concentrates on the modern understanding of two-dimensional commensurate–incommensurate phase transitions. A detailed, rather technical, analysis of the critical behavior driven by domain wall excitations is reported, motivated by specific examples in physisorption. Global predictions outside the scope of the single-domain wall approximation rely on recent studies of finite-size scaling and await refined simulations and theoretical tools able to isolate chiral melting transition lines from regions of competing disorder. Studies of real substrate properties will provide further insight into the critical nature of the domain wall fluctuations.

From the era of "No more fractals!" and proliferating log–log plots and magic jargon, Meakin's work rethinks the excitement of fractal

[1] See also V. Privman and N. M. Švrakić, *J. Stat. Phys.* **51**:1111 (1988), for most recent results.

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geometries. Computer experiments and a growing variety of real structures, in a wide range of fractal dimensionalities, are fully explored in the search for a unifying classification of diffusion-limited aggregation models and relatives. As a result, typical shapes of aggregates are identified with substrate properties and growth process details, despite an intriguing lack of universality. An overall analytical treatment, organizing the interplay of the many parameters controlling the aggregation so as to ultimately predict a particular pattern and type of branching is gaining substance but remains challenging in many aspects. The sections on fractal measure are especially well formulated and illustrated, again reminding us that real-space growth processes are not simple to describe theoretically.

Generally, this volume is well written for anyone familiar with the standard techniques in cooperative phenomena. It will provide a useful reference and introduction, both for beginner graduate students and for expert researchers.

Maria C. T. P. C. Bartelt
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