—Branch-size distribution and coherent anomaly method—

13:00 ~ 15:00

8. 佐藤信一（静岡大教養）；カオティック・ダイナミックスの multifractal 構造
9. 早川美徳（東北大通研）；DLAモデルの成長界面の性質

15:30 ~ 17:30

10. 原啓明（東北大工）．岡山誠司（一橋大経）；ランダム媒質中のクラックのサイズ分布
11. 田口善弘（東工大理）；Sierpinski carpet 上の物理現象のユニバーサリティ

11月7日　　9:00 ~ 12:00

12. 長谷　隆（静岡大工短．東工大理）；DLAフラクタルのくりこみ群アプローチ
13. 早川尚男（神戸大理）；DLCAに対するくりこみ群アプローチ
14. 大槻弘幸（中央大理工）；格子DLAにおける異方的パターンへのクロスオーバー

13:00 ~ 16:00

15. 太田正之輔（九大教養）；DLAと結晶成長
16. 近藤　宏．沢田　康次（東北大通研）；金属葉の成長形態
17. 本庄春雄（九大教養）；DLAと樹枝状結晶

1. Workshop on DLA and Related Problems

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Fractal Aggregates: What They Are and How They Grow

Since the introduction of the diffusion-limited aggregation (DLA) model by Witten and Sander[1], interest in nonequilibrium growth and aggregation processes has grown rapidly. Although the development of the DLA model was motivated by experimental work on metal particle aggregates[2], it does not provide a good description of this type of colloidal aggregation process. However, the DLA model does provide a basis for understanding a wide variety of processes in which a random growth process is controlled by a field obeying the Laplace equation. Some examples include electrodeposition, fluid-fluid displacement in porous media and Hele-Shaw cells, random dendritic growth, dielectric breakdown and the dissolution of porous media. Typical examples of all of these processes were presented and the use of the DLA model to represent these processes was described. The effects of the (Euclidean) dimensionality of the embedding space or lattice and boundary conditions were discussed using both the results of experiments and computer simulations.

A variety of examples of colloidal aggregations which can be described by cluster-cluster aggregation models were also presented. The role played by the cluster trajectories and size distribution in determining the fractal dimensionality was described. In particular, it was noted that the range of universality associated with most nonequilibrium growth and aggregation models is much smaller than it was (optimistically) believed to be a few years ago.

1. T. A. Witten and L. M. Sander, Phys. Rev. Lett. 47, 1400 (1981).
2. S. R. Forrest and T. A. Witten, J. Phys. A12, L109 (1979).

The Effects of Lattice Anisotropy on Diffusion-Limited Aggregation

In a few years following the introduction of the Witten-Sander model for diffusion-limited aggregation, a simple picture emerged for the structure of the clusters generated by this model. According to this picture, these clusters were self-similar fractals with fractal dimensionalities which depended only on the dimensionality of the embedding space or lattice in which the simulation is carried out. In recent years this picture has undergone substantial revision as the scale of simulation has increased. Clusters grown on a square lattice grow from a more or less circular shape (for clusters containing a few thousand sites) via a diamond-like shape (for clusters containing about 10^5 sites) to a cross-like shape (for clusters containing more than 10^6 sites). At the same time the effective fractal dimensionality decreases from a value of about 1.71 for small cluster sizes to a value close to (but larger than) 1.5 as $s\to\infty$ (where s is the cluster size).

Theoretical argumentsl[1,2] and simulation results now indicated that the asymptotic ($s\to\infty$) fractal dimensionality depends on the lattice structure. In the limit in which the lattice anisotropy is small (or fluctuations are large) the clusters appear to have a universal fractal dimensionality ($D \simeq 1.71$ for $d = 2$ and $D \simeq 2.52$ for $d = 3$). However, as the cluster size is increased (or the "noise" in the algorithm is reduced), both the overall shape of the cluster and the fractal dimensionality begin to change. The effects of lattice anisotropy are largest for lattices of low symmetry and there is some indication from both theoretical arguments[2] and simulation results that for lattices with n-fold symmetry a critical value (n^*) exists above which the lattice anisotropy no longer influences the long length scale structure. Simulation results indicate that $n^* \simeq 6$. Simulations carried out with noise reduction indicate that clusters of intermediate sizes appear to be self-affine but the asymptotic $s\to\infty$ structure is self-similar.

1. L. Turkevich and H. Scher, Phys. Rev. Lett. 55, 1026 (1985).
2. R. C. Ball, Physica 104A, 62 (1986).

2. 有限の活性時間をもつ拡散律速凝集

中部大・工　宮 島 佐 介
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ボストン大　H. E.スタンレー

拡散粒子がクラスターに付着後，有限時間τだけ活性であり他の続いて到着する拡散粒子を捕獲することが出来るとする一般化された拡散律速凝集について調べたので報告する。

$\tau=\infty$のとき，このモデルは従来の拡散律速凝集（DLA）のモデルとなり，$\tau=1$とすると拡散による高分子成長（Self-avoiding walk (DLSAW)）のモデルとなる。従って，このモデルは，従来の DLA と DLSAW とを補間するモデルである。その時（一般のτのとき），成長様式がどうなるかということが問題点で，つまり成長の様子はDLAとDLSAW の間のフラクタル次元を示すかどうかという点が興味ある所である。

扨てここで時間の単位が決められねばならないが，とりあえず１粒子が付着した時に１単位の時間が進むものとする。ブラウン運動している時間も考慮する様に変更することは難かしくないが，パターンについて本質的に変ることは期待出来ない。 Eden model やEpidemic model