SESSÕES DA ACADEMIA BRASILEIRA DE CIÊNCIAS

RESUMOS DAS COMUNICAÇÕES

ATP-DIPHOSPHOHYDROLASE (ECTO-ATPase) ON THE TEGUMENT OF *SCHISTOSOMA MANSONI*

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An ATP-diphosphohydrolase activity was detected on the tegument of *S. mansoni*. The enzyme possesses a broad nucleotide specificity, and displays a basal ATPase activity (40 nmolPi released $\times mg^{-1} \times min^{-1}$) that is maximally stimulated by micromolar Mg^{2+} and remains constant up to millimolar Mg^{2+} concentrations. Maximal activity (170 nmolPi $\times min^{-1}$) is attained at micromolar Ca^{2+} concentrations in the presence of micromolar Mg^{2+}, and millimolar Mg^{2+} totally inhibits the Ca^{2+}-activated enzyme. ATP hydrolysis is not inhibited by vanadate, an inhibitor of P-type ATPases, and is insensitive to calmodulin. Possible enzyme combinations (adenylate kinase, alkaline phosphatase, ATP pyrophosphatase and inorganic pyrophosphatase) that could lead to an apparent ATP-diphosphohydrolase activity were excluded by the following observations: ATP and ADP-spliting activities were unaffected by the presence of 10 μM Ap_5 A, an inhibitor of adenylate kinase, or by the presence of 10 mM glucose plus 16 IU/ml of hexokinase as an ATP-trapping system; in addition, enzyme activity was not abolished by the alkaline phosphatase inhibitors levamisole or tetramisole, and no pyrophosphatase activity could be detected in the presence of lmM pyrophosphate. In the presence of both ATP and ADP, enzyme activity was close to the arithmetic mean of the rates in the presence of the individual substrates, suggesting the existence of a single ATP-diphosphohydrolase enzyme. ATP-diphosphohydrolase activity was located on the outer surface of the tegument of *S. mansoni* by immobilizing freshly obtained adult worms in an agarose gel followed by incubation of the gel at 37°C in the presence of substrates. Calcium phosphate precipitates were formed around the worms resulting from the ecto-ATPase activity. — (*21 de janeiro de 1992*).

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URN SCHEME TO OBTAIN PROPERTIES OF STIRLING NUMBERS OF SECOND KIND

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Using the capture-recapture urn model described in Leite & Pereira (Sequential Analysis. 1987. 6(2), 179-186) several interesting properties of Stirling numbers of second kind are easily obtained. We follow the same lines of Yamato (Commun. Statist. – Theory Meth., 1990. 19(10), 3915-3923) that described an urn model for the Stirling numbers of first kind. — (*14 de abril de 1992*).

ON TWO RESULTS IN PERCOLATION IN HIGH DIMENSIONS

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In 1990 Kesten [Kesten, H., Asymptotics in high dimensions for percolation, in *Disorder in Physical Systems*, A volume in honour of John Hammersley (Grimmett, G. R., Welsh, D. J. A., eds), Oxford Science Pub-

lications, Claredon Press, Oxford 1990, pp. 219-240] proved that the critical probability $p_s(n)$ for site percolation in $\mathbb{Z}^n$ is at most

$$\frac{1 + O((\log\log n)^2/\log n)}{2n}.$$

Coupled with the easy lower bound of $1/(2n-1)$, this result shows that $p_s(n) = (1 + o(1))/2n$. In this communication we first present the improved upper bound $p_s(n) \leq (1 + n^{-1/3+o(1)})/2n$ obtained in joint work with Bollobás (Cambridge) [Bollobás, B., Kohayakawa, Y., Percolation in high dimensions, to appear]. Our proof differs greatly from that of Kesten, and in particular it is entirely combinatorial.

It is known that the critical probability for bond percolation is no greater than the critical probability for site percolation. In a remarkable paper in which Hara and Slade [Hara, T., Slade, G., Mean-field critical phenomena for percolation in high dimensions *Comm. Math. Physics* 128, 333-391, 1990] prove that the so-called triangle condition holds in certain percolation processes in $\mathbb{Z}^n$, it is shown that the critical probability $p_b(n)$ for bond percolation in $\mathbb{Z}^n$ equals $(1 + O(1/n))/2n$. Our combinatorial methods can be used to estimate $p_b(n)$ as well, and they give a result that is only slightly weaker than that of Hara and Slade, namely that $p_b(n) \leq (1 + O((\log n)^2/n))/2n$.

The second result in this communication concerns a percolation model in $\mathbb{Z}^2$. Let $r \geq 1$ be given. We denote by Γ_r the infinite graph whole vertex set is $\mathbb{Z}^2$ and where two distinct vertices $x, y \in \mathbb{Z}^2$ are adjacent if and only if their ℓ_∞-distance is at most r. Note that Γ_r is a d-regular graph, where $d = d(r) = 4r^2 + 4r$. For a graph G and $0 \leq p \leq 1$, we denote by $\mathcal{G}(G, p)$ the space of random subgraphs G^p of G, whose edges are chosen independently of one another, and an arbitrary fixed edge e is present in G^p with probability p.

Let $\epsilon > 0$ be fixed. The space $\mathcal{G}(\Gamma_r, p)$ has been considered by Penrose [Penrose, M. D., Long-range bond and continuum percolation, to appear], who has in particular proved that the probability $\theta(c) = \theta_r(c)$ that the origin $(0,0) \in \mathbb{Z}^2$ belongs to an infinite component in $\Gamma_r^p (p = c/d)$ is asymtotically the same as the probability that a Galton-Watson Poisson branching process with mean number of offspring per particle equal to c does not become extinct. In joint work Bollobás, extending techniques used to deal with $p_s(n)$, we have given a streamlined proof of this result of Penrose.

Let us close by mentioning an open problem. Let $J_d (d \geq 1)$ be an infinite d-regular graph, and let us consider the space $\mathcal{G}(J_d, p)$. Under what conditions is it true that the critical probability for percolation in J_d equals $1/d$ asymptotically as $d \to \infty$? — *(14 de abril de 1992).*

THE INCOMPLETENESS OF FINITE GAMES WITH NASH EQUILIBRIA

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Os teoremas existentes em economia ocupam-se usualmente em provar a existência (ou não existência) de situações de equilíbrio, situações essas previamente definidas através de um critério formal. Nos últimos anos, contudo, tem havido um maior interesse em aspectos metamatemáticos dos vários modelos econômicos, especialmente em suas propriedades computacionais; por exemplo, Allain Lewis ("On Turing Degrees of Walrasian Models and a General Impossibility Result in the Theory of Decision Making", preprint, U. of California at Irvine) provou a não-computabilidade dos equilíbrios não-triviais de Arrow-Debreu enquanto Prasad (J. of Math. Economics, 20, 1991, 429) demonstrou a existência de jogos com estratégias infinitas nos quais os equilíbrios de Nash são incompatíveis. Entretanto, ao comentar os jogos com estratégias finitas, Prasad afirmou ser imediato que tais jogos seriam sempre compatíveis, pois tal cálculo poderia ser executado por pura força mecânica, comparando-se todas as combinações possíveis que por ventura surgiriam. Baseando-se em resultados obtidos por N. da Costa e F. A. Doria para a resolução do Problema de Hirsch (Int. J. Theoretical Phys., 30, 1991, 1041 e Found. Phys. Letters, 4, 1991, 363), demonstra-se que com tais técnicas são construídas expressões para a função parada de uma máquina de Turing dentro da álgebra de funções de uma variável real, e ao formarmos funções utilidades com essas expressões, obtemos jogos finitos para os quais os equilíbrios de Nash não são computáveis. Além disso, podemos obter funções características para cada grau da hierarquia de Turing dentro dessa mesma álgebra, e assim descrever jogos finitos cujos graus de dificuldade da computação