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ABSTRACTS of contributed papers

ТЕЗИСЫ секционных докладов

SECTIONS XVI - XXV СЕКЦИИ

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EXVII. BIOPHYSICS OF CONTROL PROCESSES. RHYTHMIC PHENOMENA IN BIOLOGY

EXУII. БИОФИЗИКА РЕГУЛЯТОРНЫХ ПРОЦЕССОВ. РИТМИЧЕСКИЕ ЯВЛЕНИЯ В БИОЛОГИИ

EXУIIaI/I

КОЛЕБАНИЯ В КОНЦЕНТРАЦИОННЫХ СИСТЕМАХ

А.М.Жаботинский (Институт биологической физики АН СССР, Пущино Московской обл., СССР)

Очень часто сложное поведение биологических систем на самых разных уровнях есть следствие концентрационной динамики. Это является причиной интереса к теоретическому исследованию и моделированию поведения сложных концентрационных систем. В сообщении будут рассмотрены:

I. Гомогенные системы идеального перемешивания. Осуществимость сложных динамических режимов. Наборы временных и концентрационных масштабов. Простейшие химические генераторы.

2. Распределенные системы с диффузионным типом связи. Различные типы пространственно-временной организации.

3. Гетерогенные системы. Роль структуры в усложнении поведения концентрационной системы.

EXVIIaI/I

OSCILLATIONS IN CONCENTRATIONAL SYSTEMS

A.M.Zhabotinsky (Institute of Biophysics, Acad. Sci. USSR, Pushchino, Moscow Region, USSR)

It is not infrequently that a complicated behavior of biological systems at quite different levels is due to the concentrational dynamics. This provokes interest in theoretical investigations and in simulation of the complicated concentrational system behavior. The present contribution will cover:

1. Homogeneous systems with ideal stirring. The feasibility of complicated dynamical models. Temporal and concentrational scale sets. The simplest chemical generators.

2. Distributed systems with the diffusional type of connection. Various types of spatial-temporal organization.

3. Heterogeneous systems. The role of structure in complication of the concentrational system behavior.

the amphibian neural plate and a piece of its embryonic skin. It is supposed that each cell of such rudiments possesses a programme of movement which depends on its position in relation to the neighbouring cells. Several mathematical models are considered, simulating gastrulation, neurulation, eversion in Volvox etc. These processes are approximated by the encirclement of a straight line where the distances between the neighbouring cells are constant. Not only cell migrations but cell proliferation as well is taken into consideration.

EXVIIaI/4

A CHEMICAL "UNIVERSAL CIRCUIT"

O.E.Rössler, D.Hoffmann (Lehrstuhl für Theoretische Chemie der Universität Tübungen, Tübingen, BRD)

In 1930, S.E.Khaikin introduced the notion "universal circuit" for a simple electronic oscillator which could, by continuous change of a single parameter (i.e., a potentiometer), be tuned-through from the quasi-linear behaviour of an R-C generator towards the quasi-discontinuous behaviour of a relaxation oscillator, whereby the amplitude of oscillation remains approximately constant.

A two-component abstract reaction system is presented which shows the same behavioral qualities. The 'potentiometer' is a single effective rate constant which can for instance be changed via the concentration of a participating pool substance. The described oscillator is sort of a prototype both for the generation of harmonic oscillations and for the production of threshold-controlled relaxation oscillations in a chemical system. At the same time, the relation between the two fundamental types of oscillators named becomes especially transparent.

The design of chemical relaxation oscillators is of possible impact for two, so far unrelated, disciplines: chemical systems technology, on one hand, and biophysics, on the other hand.

EXVIIaI/5

REVERSAL OF INHIBITION OF ENZYMES AND THE MODEL OF A SPIKE OSCILLATOR WITH PROPAGATED WAVES

F.F.Seelig, H.R.Karfunkel (Lehrstuhl für Theoretische Chemie der Universität Tübingen, Tübingen, BRD)

Enzymes can be regulated in their catalytic activity by inhibitors and activators which may be substrates or products of the catalyzed reaction. Indirect activation without the need of allosteric effects is possible, if the (competitive) inhibitor reacts with the substrate or product forming a third compound thus reversing the inhibition. This principle gives rise to the design of an extremely non-linear relaxation oscillator where the substrate S being yielded by a constant flow from a pool behaves like a saw-tooth oscillator and the product P being destroyed by a first

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