

## Pure and Applied Mathematics, friends or enemies?

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We begin by a short discussion of various definitions of applied mathematics. Then two mathematical models of natural phenomena will be presented.

The first one is a system of interacting particles which occupy lattice sites. We look for configurations of particles which minimize the interaction energy, the so-called ground-state configurations. We ask whether non-periodic ground-state configurations can be stable against small perturbations of interactions and thermal motions. Such stable structures can be then viewed as microscopic models of quasicrystals [1].

Gene expression and regulation can be modeled by deterministic kinetic ordinary differential equations or by stochastic Markov jump processes. It is natural to assume that biochemical processes involve time delays. We show that time delays do not necessarily lead to oscillations as it is usually expected [2].

## References

- [1] J. Miękiś, *Classical lattice-gas models of quasicrystals*, J. Stat. Phys. 97: 835-850 (1999).
- [2] J. Miękiś, J. Poleszczuk, M. Bodnar, and U. Foryś, *Stochastic model of gene expression with delayed degradation*, Bull. Math. Biol. 73: 2231-2247 (2011).