

---

# NON-MARKOVIAN MODELS OF CELL CYCLE AND IMMUNE STATUS

**Ryszard Rudnicki**

We present a fairly general structured model, in which individuals are described by a variable that changes over time according to some process (deterministic or stochastic) until a critical moment (for example: death or reproduction) occurs at time  $\tau$ . Here  $\tau$  is a random variable whose distribution depends on the initial state of the individual. Once the critical moment has passed, the state of the model modifies according to some law that depends on the state at the critical moment. Unfortunately, the time-evolution of this model cannot be described directly by a differential equation. One of the main issues is to show how to transfer this model to a new one which can be studied by semigroup of operators and how to study its asymptotic behaviour. Such a general model has many applications. We will present its applications to cell cycle [1] and to immune status [2].

## References

1. K. Pichór, R.R., Cell cycle length and long-time behaviour of an age-size model, *Math. Methods Appl. Sci.* 2022.
2. K. Pichór, R.R., Asymptotic properties of a general model of immune status, *SIAM J.Appl.Math.* 2023.

Ryszard Rudnicki, Institute of Mathematics, Polish Academy of Sciences  
e-mail : `rudnicki@us.edu.pl`

---