

Ilya PRIGOGINE

Born: January 1917, Moscow (Russia)

Died: May 2003, Brussels (Belgium)

At the age of four Ilya Prigogine and his family leave the Soviet Union and finally settle in Belgium in 1929. He completes his secondary studies of Greek and Latin at the atheneum of Elsene (Brussels) and is fascinated by history, archeology and music (He was lifelong a very good piano player). Although his parents wish him to become a lawyer, he opts for chemistry at the ULB (Free University of Brussels), graduates as master in 1939 and obtains his doctorate in 1941. He is to a great extent influenced by his mentors Théophile De Donder (1894-1975) and Jean Timmermans (1882-1971). After receiving Belgian citizenship in 1949, he becomes professor at his alma mater. In 1959 he is appointed director of the International Solvay Institute in Brussels and shortly after professor at the University of Texas at Austin (USA). From 1961 till 1966 he is affiliated with the Enrico Fermi Institute at the University of Chicago. In 1967 he becomes in Austin the co-founder of the Center for Statistical Mechanics, later renamed after him and actually called “Center for Statistical Mechanics and Complex Systems”. From 1967 on he divides his time between Austin and Brussels. In 1989 he is awarded the title of Viscount by the King of Belgium.

The classical thermodynamics consider only systems in equilibrium. The Norwegian Nobel Prize winner for chemistry (1968) Lars Onsager (1903-1976) has already drawn the attention to this limitation and makes the first move into a study of the thermodynamics of nonequilibrium systems. Prigogine extends the idea to systems far from this nonequilibrium: the *dissipative* structures.

Ilya Prigogine attaches great importance to the notion “time”, which he explains in his book “*The End of Certainty*” (1977). Equilibrium systems are reversible in time: they proceed backward and forward in time without preference. This preference is imposed by circumstances from the outside, i.e. a determinism denying the “arrow of time”. The arrow of time drives the system towards irreversibility. Most natural processes occur in function of time. So, determinism is no longer a viable scientific hypothesis. The complete timevolume provides information where future is as much deterministic as the past.

Prigogine chooses some examples of irreversibility: diffusion, radioactive decay, solar energy, weather, the biological cell, the origin and evolution of life. Organisms are unstable systems existing far from thermodynamic equilibrium and can only be explained statistically (in terms of probability) and not deterministic.

According to Prigogine the Newtonian physics have evolved three times: first with the introduction of the wave function in quantum mechanics, next with the introduction of the role of time in the theory of relativity and finally with the recognition of the indeterminism in unstable systems.

Prigogine extends his theories of dissipative structures and thermodynamic irreversibility to other sciences. They lead to the study of structures organizing themselves out of a chaos, to the origin of complexity of biological beings, to the introduction of the creative and irreversible role played by the factor time in natural sciences.

He even adapts his opinions to vehicular traffic models in the urban networks applying the Bose-Einstein (1894-1974 and 1979-1955) statistics.

His ideas are published in a large number of articles and in the following books:

- Thermodynamics of Irreversible Processes (2nd Edition – 1961)
- Kinetic Theory of Vehicular Traffic (1971)
- Membranes, Dissipative Structures and Evolution (1975)
- Self-Organization in Non-Equilibrium Systems (1977)
- La Nouvelle Alliance (1977 – with Isabelle Stengers)
- From Being to Becoming (1980)
- Order out of Chaos: Man's New Dialogue with Nature (1984)
- Chaotic Dynamics and Transport in Fluids and Plasmas (1993)
- Advances in Chemical Physics (2002)
- Le monde s'est-il créé tout seul ?

« The chaos is the way to renovation and creativity » is one of Prigogine's best known quotes. Or to adapt it: "Crises are challenges".

Accidental events also played a role in his private life. During a congress he falls in love with the Polish chemical engineer Marina Prokopovicz ... and marries her two days later!

Prigogine has two sons, Yves and Paul.

Prigogine dies on May 28 2003. He received the Nobel Prize for Chemistry in 1977 and 53 honorary titles for his work