2006 Brouwer Award Winner - Jacques Laskar

Jacques Laskar is a planetary dynamicist who started his scientific career relatively late, working in classical celestial mechanics at the Bureau des Longitudes in Paris. In 1988, he had a fundamental breakthrough when, rather than trying to solve analytically the full equations of planetary motion (which gives a solution valid only over a short timescale), he used analytic series manipulations to obtain the planets' secular equations of motion by averaging over the mean longitude terms and then integrating the secular equations numerically. This allowed him to study the evolution of the solar system over 10 to 100 million year timescales, and to demonstrate that the motion of the terrestrial planets is chaotic. His secular solution compared successfully with full direct simulations performed by others. Laskar's work has thus been fundamental in helping to reveal the chaotic nature of the solar system. In the course of such studies, Laskar developed a new tool based on frequency analysis to discriminate regular orbits from chaotic ones that is today widely used for a variety of problems in conservative dynamics.

He and his collaborators have also made important contributions to the study of planetary spin axis dynamics. They expanded on previous works to show that the evolution of the Martian spin axis is chaotic and that the motion of Earth's spin axis would be chaotic without the Moon. Laskar and his student, Correia, have also demonstrated that the current retrograde spin of Venus could be obtained from almost any initial condition when the perturbations of Venus's orbit by the other planets, and plausible models for its atmospheric tides and core-mantle interactions, are accounted for.

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