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CV
Born April, 28, 1955 Paris 6ème
1974–1977 : Ecole Normale Supérieure de Cachan
1976 : Master in pure Mathematics
1977–1980 : Teaching maths in high school
1981 : Agregation of Mathematics (Univ. Paris VI)
1982 : Master in astronomy and celestial mechanics (Paris Observatory)
1984 : Thesis (Paris Observatory)
1985–1986 : Consultant at Jet Propulsion Laboratory (NASA, USA)
1985–2010 : Researcher and Director of Research CNRS, ASD, IMCCE-Observatoire de Paris
2010– : Director of Research of highest class, CNRS, ASD, IMCCE-Observatoire de Paris

Responsabilities
Head of the Astronomy and Dynamical System group.
Member of the Academy of Sciences (2003) and Bureau des Longitudes (2011).
Vice-President of IAU Division A (2012) ; Member of OC of IAU Commission 7 ; member of the Ed. Board of Celestial Mechanics (1999) and of the *Celestial Mechanics Institute*(2008). PI of the SESAME/MESOP and EQUIPEX/MesoPSL projects aiming to build a computer mesocenter at Paris Observatory and PSL. Member of the IMCCE councils ; of the SC of CNRS GRAM program ; of SC of Labex ESEP and UnivEarth ; of the Scientific Council of PSL ; of the Blaise Pascal chairs committee (2011).
Past responsabilities : PI of the l'ANR ATS-CM (2007-2011) ; Co-I of GTS-next (ITN, 2008-2012) ; Member of the Orientation council of Cergy-Pontoise University(2005-2009), of the SC of IPGP (1998-2004) ; President of the evaluation committees of Cassini and Galilée Laboratories (2007) ; Member of the AERES committees of AIM et IPGP (2008) ; Member of the Editorial Board of Nonlinearity (1993–1999) ;

Teaching
Graduate M2 class at Paris Observatory Dynamics of the Solar System.
Master M1 class in physics at l'ENS : Dynamics of planetary systems.

Distinctions
1993 : Pontecoulant Prize from Academy of Sciences
1993 : IBM Prize
1994 : Silver Medal from CNRS
1997 : Elected, Corresponding Member of the French Academy of Sciences
2003 : Elected, Member of the French Academy of Sciences
2007 : Brouwer Award (Division of Dynamical Astronomy, AAS)
2011 : Elected, Member of the Bureau des Longitudes

Main results [1]

Long term evolution of the Solar system. Paleoclimates [A3, A14, A16, A17, A20]

- Construction of a solution for the motion of the planets of the solar system over 20 Myr (1993), 40 Myr (2004), and 50 Myr (2011). These solutions are world references since 1991 for paleoclimates studies of the Earth and Mars. They were used for the first astronomical calibration of the Neogene period (0–23.03 Myr) in the geological time scale GTS2004 adopted by the International commission of stratigraphy (ICS) in 2004 (`http://www.obspm.fr/actual/nouvelle/oct04/geo.en.shtml`). Demonstration of the impossibility to predict the precise motion of the Earth beyond 60 Myr because of the gravitational perturbations of Ceres and Vesta and their chaotic behavior (`http://www.obspm.fr/actual/nouvelle/jul11/ceres.en.shtml`).
- First paleoclimate study of the layers observed in the Martian ice caps by Mars Global Surveyor. Analysis of Martian paleoclimates (`http://www.obspm.fr/actual/nouvelle/oct02/mars.en.shtml`).

Chaotic motion of the Solar system [A1, A2, A8, A9, A18, A19, B1]

- Discovery of the chaotic motion of the Solar System, and more paticularily of the inner solar system (Mercury, Venus, Earth, Mars), with a Lyapunov characteristic time scale of about 5 Myrs. Description of the main source of this chaotic behavior.
- First study of the diffusion of the orbital motion of the planets over billions of years. The motion of the outer planets (Jupiter, Saturn, Uranus, Neptune) is relatively regular. The diffusion of the orbits of Venus and the Earth is moderated. The diffusion of the orbits of Mercury and Mars is large. For Mercury, evidence of a possibility of collision with Venus in less than 5 Gyr. Confirmation of these results by direct integration in 2009, showing also the possibility of collision of Mercury, Venus, or Mars with the Earth in less than 5 Gyr (`http://www.obspm.fr/actual/nouvelle/jun09/colli.en.shtml`).

Chaotic behavior of the obliquity of the planets [A5, A6, A16, B2]

- First global study of the stability and chaotic behavior of the spin axis of the planets in the Solar System. Evidence of regularity for the outer planets. Proposition of a scenario for the reversal of Venus rotation using the chaotic behavior of its spin axis.
- Demonstration of the present stability of the Earth spin axis. Discovery of a large chaotic zone for the obliquity of the Earth, ranging from 60 to 90 degrees.
- Discovery of the stabilizing effect of the Moon on the Earth axis : without the Moon, the Earth would be in a large chaotic zone allowing variations of the Earth obliquity from 0 to 85 degrees.
- Discovery of the chaotic behavior of the obliquity of Mars, with a chaotic zone ranging from 0 to 60 degrees.

Planetary accretion [A11]

- Construction of a small analytical model of planetary accretion based on the conservation of the angular momentum deficit (AMD) allowing to study the self organization of planetary systems.

Retrograde rotation of Venus. [A13]

- Long time study of the spin of Venus. Demonstration of the existence of 4 possible final states for a telluric planet with a dense atmosphere (with A. Correia). Evidence that the retrograde rotation of Venus is a natural outcome of its dynamics.

[1]The referenced papers follow

Mercury's 3/2 spin-orbit resonance. [A15]

– Evidence that the chaotic behavior of the orbital motion of Mercury allows the planet to cross many times the 3/2 resonances during its history, thus increasing the capture probability into this resonance to about 55.4 %. The 3/2 spin orbit resonance thus becomes the most probable outcome of the planet (with A. Correia) (`http://www.obspm.fr/actual/nouvelle/jul04/merc.en.shtml`).

Frequency analysis of dynamical systems. [A2, A4, A7, A9]

– Elaboration of the Frequency Map Analysis, a numerical method for the study of the global dynamics of Hamiltonian systems with several degrees of freedom (≥ 2). Clear visualisation of the chaotic diffusion and Arnold Web in several 3 degrees of freedom examples.
– Demonstration of the theoretical basis of the Frequency Map Analysis, and of its convergence for KAM regular orbits.

Beam stability in particle accelerators. [A7, A12]

– First application of the Frequency Map Analysis to the global study of the dynamics in particle accelerators. First application to the improvement of the behavior of a real machine (ALS, Berkeley) (`http://cerncourier.com/cws/article/cern/28368`).
– First experimental frequency map of a working accelerator at ALS, Berkeley. Frequency map analysis has since become a standard technique for the improvement and maintenance of accelerators.

Additional results

Development of the INPOP planetary ephemerides [84, 95, 110]

– Construction (with A. Fienga, M. Gastineau, and H. Manche) of the high precision INPOP planetary ephemerides. INPOP is fitted to all available planetary observations, and is in par with the DE ephemerides from JPL/NASA. INPOP is the official ephemerides for the reduction of Gaia data, and is used to test alternative gravitational models at the Solar System scale (`http://www.imcce.fr/inpop`).

Dynamics of extra solar planets [73, 90, 93, 98, 105, 114, 119]

– Characterization (with A. Correia and in collaboration with the HARPS group) of the dynamics of several multi-planetary extra solar systems. First system in 5 :1 resonance (HD202206). First system in 3 :2 resonance (HD45364). Demonstration of the existence of a 3 :1 resonance in HD60532. Determination of the inclinations in GJ876. Elaboration of an analytical method allowing to take into account the dissipative tidal effects in HD10180.

Construction of the computer algebra system TRIP [11, 77]

– Construction since 1988 (with M. Gastineau since 1998) of a general computer algebra system (TRIP) adapted to celestial mechanics and perturbation series (`http://www.imcce.fr/trip`). TRIP is at present the most powerful system for some polynomial computations.

20 main references + 2 general audience papers

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[A17] **Laskar, J.**, Robutel, P., Joutel, F., Gastineau, M., Correia, A. C. M., Levrard, B. : 2004, A long term numerical solution for the insolation quantities of the Earth, *A&A*, **428**, 261–285

[A18] **Laskar, J.** : 2008, Chaotic diffusion in the Solar System *Icarus*, **196**, 1–15

[A19] **Laskar, J.**, Gastineau, M. : 2009, Existence of colisional trajectories of Mercury, Mars and Venus with the Earth *Nature*, **459**, 817–819

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[B2] **Laskar, J.** : 1993, La Lune et l'origine de l'Homme, Pour la Science, 186, 34–41 (avril 1993), août 1993 et janvier 1995

Plenary invited conferences

– Dynamics Days, Poznan, (Poland) 10-13 june 1992
– XIth ICMP International conference in mathematical physics, Paris 18–23 june 1994,
– 3 rd ECM European Congress in Mathematics, Budapest, Hungary, 21–27 july 1996,
– DPG (German Physical Society) Conference, Heidelberg, 17–20 march 1999,
– TH2002, International Conference on Theoretical Physics Paris, UNESCO, 22-27 July 2002
– Enoc (5th Euromech Nonlinear Dynamics Conference) 2005 Eindhoven, 7-12 august

Named conferences

– 3rd Shrödinger lecture, Erwin Schrödinger Institute for Mathematical Physics, Vienna, Austria, 2 April 1998
– Mutch Lecture, Brown University, Department of Geological Sciences, 7 December 2000
– Bernoulli lecture, University of Groningen 22 May 2001
– Goedel Lecture, Autrian Academy of Sciences, 27 November 2002
– Brouwer Award Lecture, American Astronomical Society, DDA, May 2007, Ann Arbor, USA
– Heilborn Lecture, Northwestern Univ., 'Chaotic motion of the Solar System' Jan. 2010, USA

J. Laskar published more than 120 papers in international journals and was an invited speaker in more than 120 scientific meetings and as many seminars and colloquiums or summer schools. He supervised 14 thesis.

Papers in international journals

[1] **Laskar, J.**, Marchal, C. : 1984, Triple close approach in the three-body problem. A limit for the bounded orbits, *Celest. Mech.*, **32**, 1–15

[2] Bretagnon, P., Simon, J-L., **Laskar, J.** : 1985, Presentation of new solar and planetary tables of interest for historical calculations, *Journal for the History of Astronomy*, **xvi**, 39–50

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