Xavier Le Pichon

Honorary Professor at the Collège de France

2002 Balzan Prize for Geology

One of the pioneers of the Plate Tectonics Theory and of the high resolution exploration of plate boundaries in the ocean depths with submersibles.

Institution Administering Research Funds: Collège de France

Advisers for the Balzan General Prize Committee: Eugen Seibold † and Enric Banda

A Geodynamic Research Team in Aix-en-Provence

The research team of Professor Le Pichon moved to the Université Paul Cézanne, Aix-Marseille III, to install a new outpost of the Collège de France there in 2003. The second part of the Balzan Prize was used in part to finance new scientific equipment (a system to visualize seismic reflection data, a system to process images, a SIG and a rapid computer system). In addition, it was used to complement post-doctoral salaries and to finance geological field work. Xavier Le Pichon highlighted two projects in which young researchers who benefited in part from the Balzan financing have been especially active.

1. The first project concerned *the tectonics of the Western Gulf of Mexico* and was the result of cooperation with oil companies over four years. The young researchers involved were N. Flotté, L. Husson, C. Le Roy and L. Andréani. The results of the research have been published in a special issue of the *Bulletin de la Société Géologique de France* 179, co-published with the American Association of Petroleum Geology in 2008. The main result of the project is to have established that this continental margin, which was thought to be inactive since the Jurassic period, has been affected by active tectonics in the last 30 million years.

2. The second project concerned *the geodynamics of the Provence basin*. It was published as a special issue of the *Bulletin de la Société Géologique de France* 181, and was the result of research carried out in this part of France since the research team moved to Aix-en-Provence in 2003. The young researchers involved were N. Flotté,

L. Husson, Y. Hamon, J.Y. Lin, L. Andréani and N. Loget. The main result of this project is to have established that the so-called alpine tectonics is the result of en masse gravity gliding of the thick Triassic salt layer. This gliding occurred when the Alps were uplifted during the Miocene epoch.

Researchers:
Louis Andréani
Nicolas Flotté
Youri Hamon
Laurent Husson
Charlotte Le Roy
Jing-Yi Lin
Nicolas Loget

Publications:
Le Pichon X, Chamot-Rooke N, Rangin C, Sengor AMC. 2003. The North Anatolian Fault in the Sea of Marmara. Journal of Geophysical Research. 108: B42179.

Nouze H, Henry P, Noble M, Martin V, Pascal G. 2004. Large gas hydrate accumulations on the eastern Nankai Trough inferred from new high-resolution 2-D seismic data. Geophysical Research Letters. 31: L13308.

Kreemer C, Chamot-Rooke N. 2004. Contemporary kinematics of the southern Aegean and the Mediterranean Ridge. Geophysical Journal International. 157: 1377-1392.

Kreemer C, Chamot-Rooke N, Le Pichon X. 2004. Constraints on the evolution and vertical coherency of deformation in the Northern Aegean from a comparison of geodetic, geologic, and seismologic data. Earth and Planetary Science Letters. 225: 329-346.

Loevenbruck A, Cattin R, Le Pichon X, Dominguez S, Michel R. 2004. Co-seismic slip resolution ant post-seismic relaxation time of the 1999 Chi-Chi earthquake as constrained by geological observations, geodetic measurements and seismicity. Geophysical Journal International. 158: 310-326.

Nielsen C, Chamot-Rooke N, Rangin C, The ANDAMAN Cruise Team. 2004. From partial to full strain partitioning along the Indo-Burmese hyper-oblique subduction. Marine Geology. 209: 1-4, 303-327.

Rangin C, Le Pichon X, Demirbag E, Imren C. 2004. Strain localisation in the sea of Marmara.

Propagation of the North Anatolian Fault in a narrow inactive pullapart. Tectonics. 23(2): TC2014.

Le Pichon X, Kreemer C, Chamot-Rooke N. 2005. Asymmetry in elastic properties and the evolution of large continental strike-slip faults. Journal of Geophysical Research. 110: B03405.

Sengor C, Tuyusuz O, Imren C, Sakin M, Eyidogan H, Gorur N, Le Pichon X, Rangin C. 2005. The North Anatolian Fault: A new look. Annual Review of Earth and Planetary Sciences. Volume 33: 37-112.

Bousquet R, Goffé R, Le Pichon X, De Capitani C, Chopin C, Henry P. 2005. Comment of "Subduction Factory: 1. Theoretical mineralogy, densities, seismic wave speeds, and H2O contents" by Bradley R. Hacker, Geoffrey A. Abers, and Simon M. Peacock. Journal of Geophysical Research. 110: B02206.

Bulletin de la Société Géologique de France. 179, 2, 2008:

[Contents: Rangin C, Le Pichon X, Martinez-Reyes J, Aranda-Garcia M. Gravity Tectonics and Plate Motions: The western margin of the Gulf of Mexico, 107-116; Flotté N, Martinez-Reyes J, Rangin C, Le Pichon X, Husson L, Tardy M. The Rio Bravo Fault, a major late Oligocene left-lateral shear zone, 147-161; Husson L, Henry P, Le Pichon X. Thermal regime of the NW shelf of the Gulf of Mexico. Part A: Thermal and pressure fields, 129-137; Husson L, Le Pichon X, Henry P, Flotté N, Rangin C. Thermal regime of the NW shelf of the Gulf of Mexico. Part B: Heat Flow, 139-146; Rangin C, Le Pichon X, Flotté N, Husson L. Cenozoic gravity tectonics in the northern Gulf of Mexico induced by crustal extension: a new interpretation of multichannel seismic data, 117-128; Le Roy C, Rangin C, Le Pichon X, Nguyen Thi Ngoc H, Andréani L, Aranda-Garcia M. Neogene crustal shear zone along the western Gulf of Mexicomargin and its implications for gravity sliding processes: Evidences from 2D and 3D multichannel seismic data, 175-185; Andréani L, Rangin C, Martinez-Reyes J, Le Roy C, Aranda-Garcia M, Le Pichon X, Peterson-Rodriguez R. The Neogene Veracruz Fault: evidences for left-lateral slip along the Southern Mexico Block, 195-208; Andréani L, Le Pichon X, Rangin C, Martinez-Reyes J. The Southern Mexico Block: Main boundaries and new estimation for its Quaternary motion, 209-223.]

Bulletin de la Société Géologique de France. 181, November 2010:

[Contents: Le Pichon X, Rangin C. Introduction - Geodynamics of the France SoutheastBasin: importance of gravity tectonics, 475; Le Pichon X, Rangin C, Hamon Y, Loget N, Lin JY, Andréani L, Flotté N. Geodynamics of the France Southeast Basin, 477-501; Rangin C, Le Pichon X, Hamon Y, Loget N, Crespy A. Gravity tectonicsin the SE Basin (Provence, France) imaged from seismic reflection data, 503-530; Andréani L, Loget N, Rangin C, Le Pichon X. New structural constraints on the southern Provence thrust belt (France): evidences for an Eocene shortening linked to the Corsica-Sardinia subduction, 547-563.]