

Movies about diatoms and their movements

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ABSTRACT. Diatoms are unique unicellular photosynthetic organisms that have siliceous frustules around their cell membrane. Diatom cells are capable of independent movements in the aquatic medium, which is important for their life strategy. This article summarizes my main observations on the movements of diatoms, including some hypotheses. The material is presented in the form of six video films.

Keywords: diatoms, movement, gliding motility

The video films showing the movements of various diatom cells were created during the preparation of a series of works in this field. Files are available at <http://limnolwbiol.com/index.php/LFWB/article/view/994/684> under Creative Commons Attribution 4.0 International Public License. There are six videos:

1. "Bertrand1990 1 L'Equilibre.avi"

(Bertrand, 1990; 1991a).

The characteristic shape of the diatom *Rhoicosphenia abbreviata* would seem to not allow apical and transapical movements. This study demonstrates with the help of analyses of graphical statics that the forces involved explain and confirm the reality of the observed movements.

2. "Bertrand1991 2. Synthase-Mouvements.avi"

(Bertrand, 1991b; 1992).

This film shows all possible movements of raphid diatoms performed in the aquatic environment as well as a synthetic table showing the relationship with substrates. Apical, and transapical movements, horizontal, vertical, polar and conical rotations of 12 species are shown. The totality of all possibilities is executed by *Gomphonema acuminatum*.

3. «Bertrand1994 3 Cymbella triangulum.avi»

(Bertrand, 1994a; Bertrand and Coste, 1994).

This video shows for the first time the diatom *Cymbella triangulum*, new to the European continent. Its movements, dimensions, morphology and ecological preferences are described.

4. "Bertrand1994 4 Cocconeis pediculus.avi"

(Bertrand, 1994b; 1995a).

This video shows how easily the diatom *Cocconeis pediculus* performs a transapical movement despite the

cylindrical-concave shape in the apical direction of its hypovalve. The diatom generally uses this particular geometry to position itself tightly on supports such as green algae of the genus *Cladophora*.

Brief biography J.R. BERTRAND

J. BETRAND born on 15.03.1931 in St. Benoit sur Loire France

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Amateur microscopist from 1942 to 1986.

Profession: engineer in industrial mechanics from 1960 to 1985.

Independent researcher from 1986 to now (2022)

Member of the Association des Diatomistes de Langue Française (ADLaF)

Member of the International Society for Diatom Research until 2015

Specialist in diatom movements from 1990 to 2005
Specialist in pond ecology from 2007 to 2017.

Specialist in diatoms on lichens from 2015 to present.

Taught diatoms in a French public service Agence de l'Eau; DREAL (3 years)

Taught general microscopy at the Natural History Museum of Orléans (12 years)

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5. “Bertrand1995 Les Diatomees.avi” (Bertrand, 1995b).

This documentary introduces the microscopic world of diatoms, unsuspected by most people. How to find them, how to observe them, their delicate beauty, their way of life, their usefulness, and how they inspired artists.

6. “Bertrand1999 Les Diatomees.avi” (Bertrand, 1999).

This video traces the search for the causes of diatom movements to the absence of rigid supports, i.e., just using the surface tension of water. It shows the researcher’s background, calculations, thoughts and the means implemented to try to propose a credible hypothesis.

A summary of my theories of diatom motility is given in Bertrand (2021).

Conflict of interest

The authors declare that they have no competing interests.

References

Bertrand J. 1990. Mouvements des diatomées I. L’Equilibre Dynamique Chez. *Rhoicosphénia abbreviata* (Agardh) Lange-Bertalot [Movements of diatoms I: The dynamic equilibrium of *Rhoicosphénia abbreviata* (Agardh) Lange-Bertalot] [movie]. In: Association des Diatomistes de Langue Francaise, 10eme Colloque, foundation Oceanographique Ricard. (in French)

Bertrand J. 1991a. Mouvements des diatomées. I. L’équilibre dynamique chez *Rhoicosphenia abbreviata* [Diatoms movements. I. The dynamic stability of *Rhoicosphenia abbreviata*]. *Cryptogamie Algologie* 12(1): 11-29. (in French)

Bertrand J. 1991b. Mouvements des diatomées. II. Synthèse des Mouvements [Movements of diatoms II: Summary

of movements] [movie]. In: Association des Diatomistes de Langue Francaise, 11eme Colloque. (in French)

Bertrand J. 1992. Mouvements des diatomées. II - Synthèse des mouvements [Diatoms movements II - Synthesis of movements]. *Cryptogamie Algologie* 13(1): 49-71. (in French)

Bertrand J. 1994a. *Cymbella triangulum*, une nouvelle espèce européenne [*Cymbella triangulum*, a new European species] [movie]. In: 13 eme Colloque des Diatomistes de Langue Francaise. (in French)

Bertrand J., Coste M. 1994. *Cymbella triangulum* (Ehenbr.) Cleve (Bacillariophyceae). Un taxon nouveau pour la flore européenne. Caractéristiques morphologiques et écologiques [*Cymbella triangulum* (Ehenbr.) Cleve (Bacillariophyceae). A new taxon for European flora. Morphological and ecological characteristics]. *Cryptogamie Algologie* 15(2): 147-158. (in French)

Bertrand J. 1994b. Mouvements des diatomées. IV. Les Mouvement Transapical de *Cocconeis pediculus* [Movements of diatoms. IV. The Transapical Movement of *Cocconeis pediculus*] [movie]. In: Association des Diatomistes de Langue Francaise, 13eme Colloque. (in French)

Bertrand J. 1995a. Mouvements des diatomées. IV. Le mouvement transapical de *Cocconeis pediculus* Ehrenberg [Diatom movements. IV. Transapical movement of *Cocconeis pediculus* Ehrenberg]. *Cryptogamie Algologie* 16(1): 1-20. (in French)

Bertrand J. 1995b. Les Diatomees Joyaux du Monde microscopique [The Diatoms, Jewels of the Microscopic World] [movie]. In: XIVème Colloque des Diatomistes de Langue Française. (in French)

Bertrand J. 1999. Les Diatomées et la tension superficielle: un outil de recherche et de démonstration [Diatoms and surface tension: a tool for research and demonstration] [movie]. In: Association des Diatomistes de Langue Francaise, 18eme Colloque. (in French)

Bertrand J. 2021. Movements of diatoms VIII: Synthesis and hypothesis. In: Cohn S.A., Manoylov K.M., Gordon R. (Eds.), *Diatom gliding motility*. Beverly, MA, USA: Wiley-Scrivener, pp. 283-294. DOI: [10.1002/9781119526483.ch12](https://doi.org/10.1002/9781119526483.ch12)