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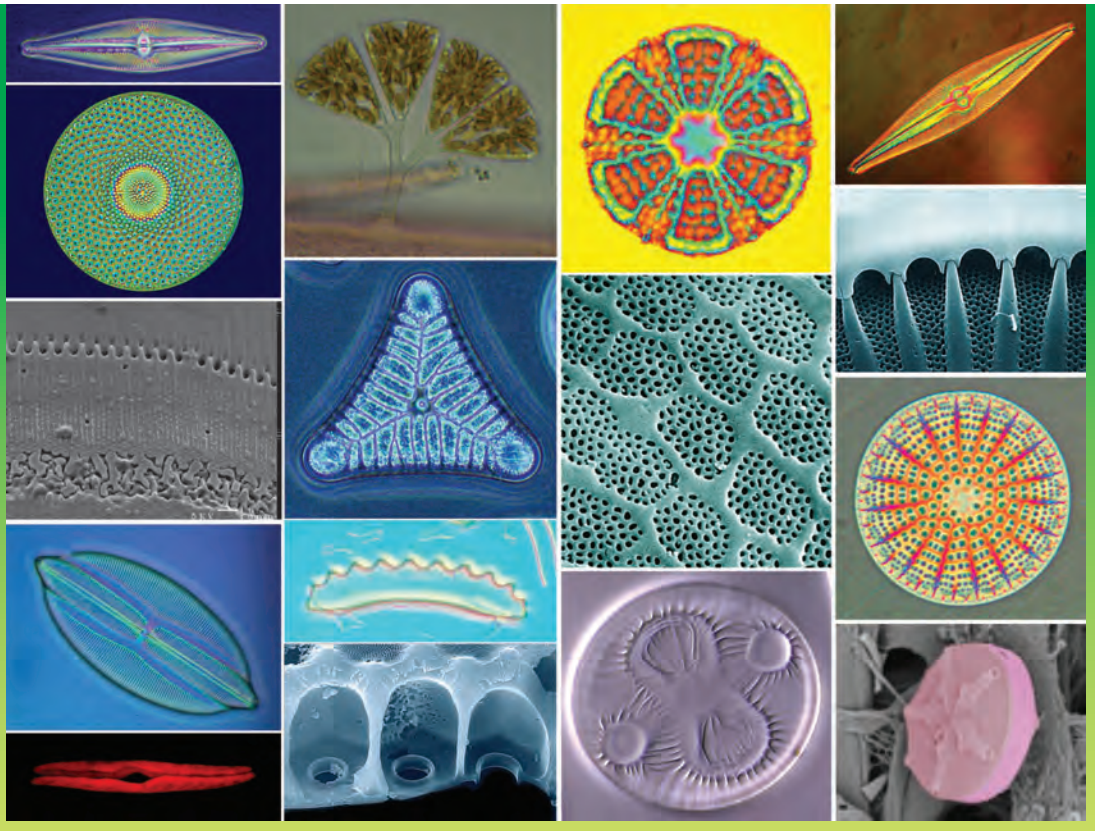

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*A Special Issue on*

## Diatom Nanotechnology

*GUEST EDITORS*

Richard Gordon, Frithjof Sterrenburg, and Kenneth Sandhage

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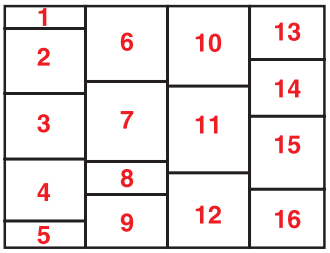


**ON THE COVER:** Diatoms have fascinated scientists and amateurs for well o ver 200 years. In celebration of their beauty , we present a montage of a fe w species and close-ups on the co ver of this special issue on Diatom Nanotechnology: Journal of Nanoscience and Nanotechnology 5(1) (2005), tak en with various microscopy techniques. These show the incredible variety of shapes, patterns, and details available to behold and perhaps use in diatom nanotechnology . Please contact the microscopists for further details. (Richard Gordon, GordonR@ms.Umanitoba.ca)

1 *Pinnularia* #1: A typical pennate diatom shell, light microscopy, Jamin Lebedeff interference light microscopy, length = 195 µm. Stephen Nagy, snagymd@pol.net.
2 *Craspedodiscus coscinodiscus* : Jamin-Lebedeff interference light microscopy, diameter = 150 µm, Stephen Nagy, snagymd@pol.net.
3 *Ellerbeckia arenaria*: scanning electron micrograph detail on a single shell (sup - plied by Annemarie Schmid), height of teeth-like structures 0.7 µm, Ille C. Gebeshuber and James C. Weaver, gebeshuber@iap.tuwien.ac.at.
4 *Navicula lyra*: differential interference contrast (DIC) light micrograph, length = 41 µm, Stephen Nagy, snagymd@pol.net.
5 *Gyrosigma*: confocal scanning laser micrograph, girdle view showing the chloro - plast arrangement, chloroplast length = 68.5 µm, Maria Blasi and Mònica Roldán, monicaroldan@ub.edu.
6 *Licmophora*: light micrograph of live cells, girdle view (for individual cells, apical axis = 5–6 µm), Charles J. O'Kelly, cokelly@bigelow.org.
7 *Triceratium morlandii* : Phase light microscopy of a triangular diatom shell, width = 72 µm, Stephen Nagy, snagymd@pol.net.
8 *Eunotia serra* : differential interference contrast light microscopy, length about 100 µm, Patrick M. Eggleston, pegglest@keene.edu.
9 *Coscinodiscus wailesii*: loculate areolae, mean diameter of the chambers = 4 µm. Mario De Stefano, mario.destefano6@tin.it.
10 *Actinoptychus sp.*: a centric diatom, Jamin-Lebedeff interference light microscopy, diameter = 60 µm, Stephen Nagy, snagymd@pol.net.
11 *Campyloneis grevillei var. argus*: scanning electron micrograph detail of the external surface of the siliceous cribra, mean pore diameter 1.5 µm, Mario De Stefano, mario.destefano6@tin.it.
12 *Auliscus sculptus*: imaged with differential interference contrast light microscopy. Eduardo A. Morales, morales@acnatsci.org, diameter = 79 µm.
13 *Pinnularia* #2: Jamin-Lebedeff interference light microscopy, length = 185 µm. Stephen Nagy, snagymd@pol.net.
14 *Planothidium quarnerensis*: detail of the column-shaped internal costae linking the valvocopula, spacing between costae = 1.5 µm, Mario De Stefano, mario.deste - fano6@tin.it.
15 *Arachnoidiscus ehrenbergii* : desilicified, Jamin-Lebedeff interference light microscopy, diameter = 78 µm, Stephen Nagy, snagymd@pol.net.
16 *Asteriomphalus spp.* : scanning electron microscopy, diameter = 40 µm, Ivo Grigorov, ivo_grigorov@hotmail.com.



## REVIEWS



*A major goal of this r esearch is to e xploit diatom pr oficiency in bio genic silica formation to develop strategies for bio-inspired nanofabrication of silicon based materials. Development of high-throughput methods for the functional analysis of diatom genes is a key step toward this goal. In this article we review the different techniques available to investigate gene and protein function in diatoms. Choice of a diatom model organism should be made on the basis of several criteria, such as the ease of g enetic manipulation, ecolo gical relevance, or biomine r alization capability.* Phaeodactylum tricornutum *is one of the principal thr ee species that are candidates for such a model. For this species we have accomplished the f irst large-scale analysis of 12,000 e xpressed sequence ta gs (ESTs) and have or ganized it in a queryable database ,* Phaeodactylum tricornutum *database (PtDB). A summary of the functional analysis of this EST collection is pr esented, and genes of particular interest are highlighted.*