

2. S. Sinha *et al.*, *Nature* **402**, 537 (1999).
3. H. Cai *et al.*, *Nature Neurosci.* **4**, 233 (2001); Y. Luo *et al.*, *Nature Neurosci.* **4**, 235 (2001).
4. M. Farzan *et al.*, *Proc. Natl. Acad. Sci. U.S.A.* **97**, 9712 (2000).
5. U. Bodendorf *et al.*, *J. Biol. Chem.* **276**, 2019 (2001).
6. H. Cai *et al.*, unpublished observation.

Chiral Selection When Stirred, not Shaken

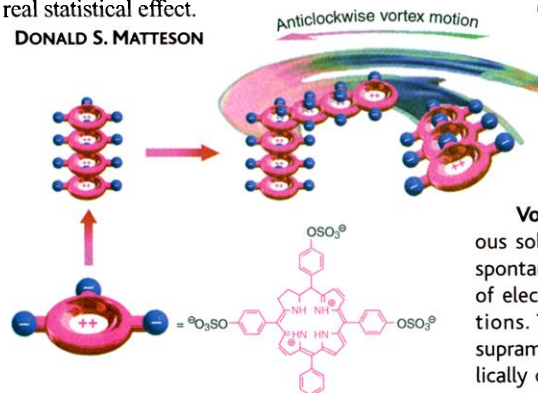
I AM PUZZLED BY THE REPORT THAT THE chirality of aggregates of certain porphyrin derivatives can be influenced by the direction of turning the solution in a rotary evaporator, put forward by J. M. Ribó and co-authors (Reports, "Chiral sign induction by vortices during the formation of mesophases in stirred solutions," 15 Jun., p. 2063). I have always worked under the assumption that the ordinary laws of thermodynamics and kinetics apply rigorously to the asymmetric selectivity of any process.

The results reported—a consistent 85% statistical bias in the chirality of porphyrin aggregates—would seem to require that one aggregation initiation step (essentially a crystal seeding) have about a 5-kilojoule-per-mole higher free energy than its opposite enantiomer. What could the source of such an

energy difference possibly be? The rotation frequency, about 10 hertz, or the maximum linear speed of the rotating solution, about 1 meter per second, is many orders of magnitude below the energy difference that is needed between the two chiralities of aggregates in the initiation step.

Chirality necessarily involves three dimensions. Surface effects could conceivably provide the energy bias needed in the third dimension. There has to be some mechanism to concentrate the exceedingly diffuse chiral bias energy of the entire system to a chemically significant level in a microscopic domain to produce any real statistical effect.

DONALD S. MATTESON



Department of Chemistry, Washington State University, Pullman, WA 99164-4630, USA. E-mail: dmatteson@wsu.edu

Response

OUR RESULTS CANNOT BE INTERPRETED IN terms of a symmetry breaking exerted by an external polarization (such as asymmetric induction or asymmetric amplification). In this case—that is, in the typical context of organic chemistry reactions—the arguments raised by Matteson would be valid, and the asymmetric induction or chirality selection would be understood within the classical analysis of the coordinate reaction model.

Conversely, our scenario, by no means in contradiction with thermodynamics, corresponds to a spontaneous symmetry breaking process—a far-from-equilibrium cooperative phenomenon that takes place during an

Vortex motion as a chiral force. In aqueous solution, zwitterionic porphyrin molecules spontaneously assemble into stacks as a result of electrostatic and hydrogen-bonding interactions. These aggregates then assemble into supramolecular fiberlike structures that are helically oriented in the direction opposite to the vortex motion.

80% increase
in impact factor (2000: 1.798)

Journal of Biomedical Science

Sponsored by the National Science Council, Taipei

A rapidly developing interdisciplinary journal with a global perspective on basic and clinical biomedical research, *Journal of Biomedical Science* is indexed in Current Contents, Medline and 16 major data banks, and is widely distributed in Asia, the Americas, and Europe. The journal invites the submission of papers on significant original research and of current review articles. All manuscripts are stringently peer-reviewed. There is no page charge for publication.

For subscriptions and free sample copies,
please contact:

S. Karger AG,
P.O. Box, CH-4009 Basel, Switzerland
Fax +41 61 306 12 34
E-Mail karger@karger.ch

KARGER

A Selection of Articles Published in 2000

- Actions of Melatonin in the Reduction of Oxidative Stress
- Adeno-Associated Virus-Based Vectors in Gene Therapy
- Preventive and Therapeutic Vaccines for Human Papillomavirus-Associated Cervical Cancers
- Discrete Intracellular Ca^{2+} Pools Coupled to Two Distinct Ca^{2+} Influx Pathways in Human Platelets
- Role of Dual Pacemaker Mechanisms in Sinoatrial Node Discharge
- Rapid Full-Length Genomic Sequencing of Two Cytopathically Heterogeneous Australian Primary HIV-1 Isolates
- Hepatitis B Virus Core Protein Interacts with the C-Terminal Region of Actin-Binding Protein
- p53 Gene Status Modulates the Chemosensitivity of Non-Small Cell Lung Cancer Cells
- Age-Associated Changes in Interferon- γ and Interleukin-4 Secretion by Purified Human CD4 $^{+}$ and CD8 $^{+}$ T Cells
- Reduction of Lipopolysaccharide-Induced Neurotoxicity in Mouse Mixed Cortical Neuron/Glia Cultures by Ultralow Concentrations of Dynorphins
- Characterization of TRBP1 and TRBP2. Stable Stem-Loop Structure at the 5' End of TRBP2 mRNA Resembles HIV-1 TAR and Is Not Found in Its Processed Pseudogene
- Genetic Reassortment and Patch Repair by Recombination in Retroviruses

Read it online: www.karger.com/journals/jbs

Please direct your submissions and any inquiry to:

Dr. S.H.H. Chen
JBS Editorial Office
Room 1701
106 Heping E RD, Sec 2
Taipei 106, Taiwan, ROC
Tel. +886 2 2737 7973
Fax +886 2 2737 7248
E-Mail tjhsu@nsc.gov.tw

Dr. K.T. Jeang
NIAID/NIH, Building 4
Room 306
Bethesda, MD 20892, USA
Tel. +1 301 496 6680
Fax +1 301 480 3686
E-Mail kjeang@niaid.nih.gov

Dr. J.-Y. Wu
Dept. of Molecular
Biosciences
1043 Haworth Hall
University of Kansas
Lawrence, KS 66045, USA
Tel. +1 785 864 4557
Fax +1 785 864 5374
E-Mail jyw@uakans.edu

Dr. B. Berkhout
Academic Medical Center
University of Amsterdam
Meibergdreef 15
1105 AZ Amsterdam
The Netherlands
Tel. +31 20 566 4853
Fax +31 20 691 6531
E-Mail b.berkhout@amc.uva.nl

SCIENCE'S COMPASS

aggregation process in a nonhomogeneous system. In these nonequilibrium situations, symmetry breaking can occur as a consequence of weak stochastic fluctuations coupled with an autocatalytic process. In the absence of any external polarization, the chirality sign of the supramolecular structures formed during this aggregation process is determined by chance and the "racemic order" would be achieved after a large enough number of experiments. This perfectly symmetric bifurcation situation is, however, modified in our case. Our results strictly point out that the direction of the stirring vortex, a weak external polarization force, selects the chirality sign of these aggregates, introducing a bias on the otherwise random selection due to stochastic fluctuations. Moreover, this is also an example of how information can be exchanged between the molecular and macroscopic levels in the self-assembly of hierarchical structures in processes governed by nonlinear effects out of thermodynamic equilibrium.

J. M. RIBÓ,¹* J. CRUSATS,¹ F. SAGUÉS,²

J. CLARET,² R. RUBIÉS¹

¹Departments of Organic Chemistry, and ²Physical Chemistry, University of Barcelona, Martí i Franquès 1, 08028 Barcelona, Catalonia, Spain

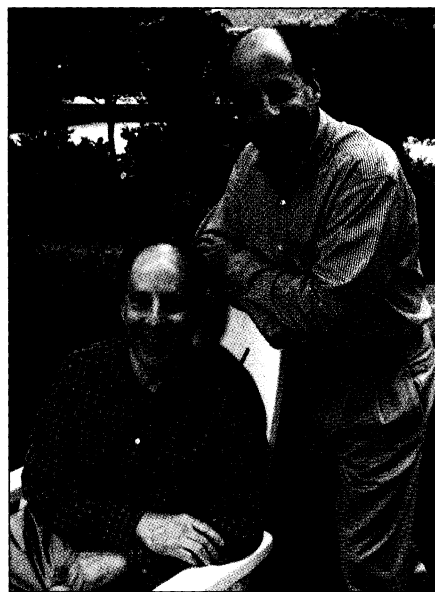
*To whom correspondence should be addressed.
E-mail: jmr@qo.ub.es

CORRECTIONS AND CLARIFICATIONS

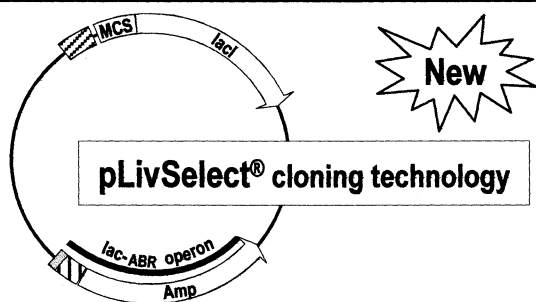
REPORTS: "A transcriptionally active complex of APP with Fe65 and histone acetyltransferase Tip60" by X. Cao and T. C. Sudhof (6 Jul., p. 115). The second word in the title was incorrect. The title should have been "A transcriptionally active complex of APP with Fe65 and histone acetyltransferase Tip60."

REPORTS: "Cooperation and competition in the evolution of ATP-producing pathways" by T. Pfeiffer, S. Schuster, and S. Bonhoeffer (20 Apr., p. 504). Two mistakes were made in parameters that affect information in note 27 and figure 1. First, in note 27 the probability with which resource is added to a site is 0.00005 instead of 0.0005. Second, all diffusion rate constants need to be divided by 4; thus, D^N in both instances in the legend to figure 1 should have been 5 instead of 20, and the values for D^N along the z axis in figure 1C should have been 5, 3.75, and 2.5 instead of 20, 15, and 10, respectively. In addition, the diffusion rate constant D^S in note 27 should have been 0.25 instead of 1.

NEWS FOCUS: "Twin stars of astrophysics make room for two" by M. Sincell (10 Aug., p. 1040). In this profile of astrophysicists Fred and Don Lamb, the caption to the accompanying photograph (reprinted here) misidentified the brothers. Fred is on the left and Don on the right. *Science* deeply regrets the error.



CREDIT: BILL WIEGAND/UNIVERSITY OF ILLINOIS



A revolution in DNA cloning

- ★ Direct selection without need of blue/white
- ★ 100% accuracy with zero background
- ★ High efficiency with low cost
- ★ Easy to use and very fast

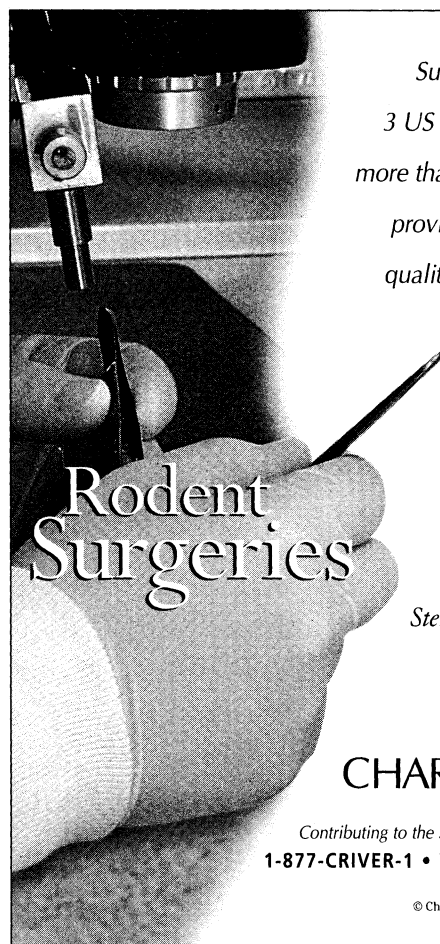
The best choice for PCR cloning, genomic DNA/cDNA cloning, and shotgun cloning sequencing

pLivSelect®-PCR Cloning Kits
pLivSelect®-I Cloning Kits
are now available at prompt prices



5020 Fairway St. Suite 220
Montreal, QC Canada, H8T 1B8
Tel: 1-514-633-6006, Fax: 1-514-633-6011
Tol free: 1-888-368-8368
email: info@biost.com; Web: www.biost.com

- Other products and technical services
- are also available.



Surgical staffs at our
3 US locations perform
more than 55 procedures,
providing unsurpassed
quality and availability.

Cannulations
Catheterizations
Custom Surgeries
Stereotaxic Procedures

CHARLES RIVER
LABORATORIES

Contributing to the Search for Healthier Lives™

1-877-CRIVER-1 • WWW.CRIVER.COM

© Charles River Laboratories, Inc., 2001