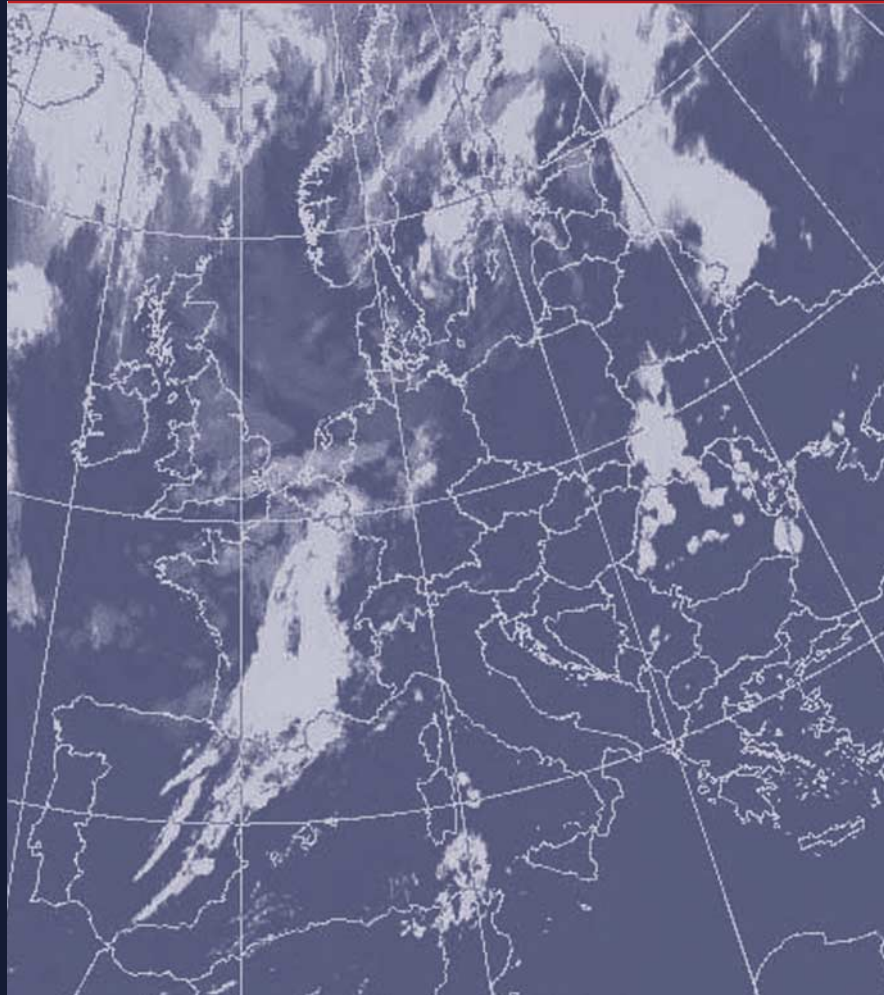


EUROPEAN REVIEW

REASON AND
UNREASON IN
TWENTY-FIRST
CENTURY SCIENCE



Kungl. KUNGL. VITTERHETS HISTORIE
OCH ANTIKVITETS AKADEMIE
Vitterhetsakademien



CALOUSTE
GULBENKIAN
FOUNDATION

INTERDISCIPLINARY JOURNAL OF THE HUMANITIES AND SCIENCES
OF THE ACADEMIA EUROPAEA: THE ACADEMY OF EUROPE

CAMBRIDGE
UNIVERSITY PRESS

EUROPEAN REVIEW

Published in Association with the Academia Europaea

EDITOR-IN-CHIEF

Professor Theo D'haen
English and Comparative Literature,
Leuven University, Blijde Inkomststraat 21-3311,
B-3000 Leuven, BELGIUM
e-mail: theo.dhaen@arts.kuleuven.be

EDITORIAL BOARD

Professor Ivan T. Berend
Department of History,
UCLA, 11367 Bunche Hall Box 951446
CA 90095-1446 Los Angeles, UNITED STATES
e-mail: iberend@history.ucla.edu
Fax: (1)-310-206-9630

Sir Arnold Burgen
8a Hills Avenue,
Cambridge CB1 7XA, UK
e-mail: asub@cam.ac.uk

Professor Gian Vittorio Caprara
Universita degli studi di Roma, Dipartimento di Psicologia,
Facoltà di Medicina e Psicologia,
via dei Marsi 78, 00185 Rome, ITALY
e-mail: gianvittorio.caprara@uniroma1.it

Professor Barbro Johansson
Wallenberg Neuroscience Center Exp. Brain Research Lab.
BMC A13, SE-221 84 Lund, SWEDEN
e-mail: barbro.johansson@med.lu.se

Professor Giuseppe Longo
Centre Cavailles, CNRS et Ecole Normale Supérieure,
29 Rue d'Ulm, 75005 Paris, FRANCE
e-mail: longo@di.ens.fr

Professor Stephan Leibfried
Center for Social Policy Research, University of Bremen,
Parkallee 39, 28209 Bremen, GERMANY
e-mail: stlf@zes.uni-bremen.de

Professor Ole Petersen
Cardiff School of Biosciences,
Cardiff University, Biomedical Sciences Building,
Museum Avenue, Cardiff CF10 3AX, UK
e-mail: petersenoh@cardiff.ac.uk

Professor Juergen Renn
MPI fuer Wissenschaftsgeschichte Wilhelmstrasse 44,
Berlin 10117, GERMANY
e-mail: renn.office@mpiwg-berlin.mpg.de

Professor Piotr Sztompka
Institute of Sociology, Jagiellonian University,
Grodzka 52, 31-044 Cracow, POLAND
e-mail: ussztomp@cyf-kr.edu.pl Fax: (48)12-222129

Professor Denis Weaire
School of Physics, Trinity College
Dublin 2, IRELAND
e-mail: dweaire@tcd.ie

Professor Henk Wesseling
Wijtenbachweg 43, 2341 VX Oegstgeest,
THE NETHERLANDS
e-mail: h.l.wesseling@tele 2.nl

Professor Björn Wittrock
Swedish Collegium for Advanced Study,
Götavägen 4, Se-752 36 Uppsala, SWEDEN
e-mail: bjorn.wittrock@swedishcollegium.se

Professor Barbara Wright
Department of French,
Trinity College, Arts Building, Dublin 2, IRELAND
e-mail: bwright@tcd.ie

CONSULTING EDITORS

Professor Werner Arber, University of Basel, Switzerland
Professor Paul Crutzen, Max-Planck-Institut für Chemie, Germany

Viscount Etienne Davignon, Société Générale de Belgique, Belgium
Professor Edmond Malinvaud, Paris, France
Professor Hubert Markl, University of Constance, Germany
M Thierry de Montbrial, Institut Français des Relations Internationales,
France

Professor Quentin Skinner, Christ's College, Cambridge, UK

Subscriptions

European Review (ISSN 1062-7987; electronic 1474-0575) is published quarterly in February, May, July and October. The subscription price of volume 21 (2013) (which includes postage) is £220 net (USA, Canada and Mexico US\$384) for institutions print and electronic, institutions electronic only £190/\$331; £31 net (USA, Canada and Mexico US\$57) for individuals ordering direct from the publisher and certifying that the journal is for their personal use. Single parts cost £59 (USA, Canada and Mexico US\$99) plus postage. Members of the Academia Europaea receive online access to the journal as part of their membership subscription.

Orders, which must be accompanied by payment, may be sent to any bookseller, subscription agent or direct to the publisher: Cambridge University Press, The Edinburgh Building, Shaftesbury Road, Cambridge CB2 8RU; or in the USA, Canada and Mexico: Cambridge University Press, Journals Fulfillment Department, 100 Brook Hill Drive, West Nyack, NY 10994-2133. EU subscribers (outside the UK) who are not registered for VAT should add VAT at their country's rate. VAT registered subscribers should provide their VAT registration number. Japanese prices for institutions are available from Kinokuniya Company Ltd, PO Box 55, Chitose, Tokyo 156, Japan.

Prices include delivery by air. Copies of the journal for subscribers in the USA, Canada and Mexico are sent by air to New York.

Application to mail at Periodicals Postage Rates is pending at New York, NY.

Please enquire about special rates for members of other learned societies, e-mail: journals@cambridge.org

Copying

This journal is registered with the Copyright Clearance Center, 222 Rosewood Drive, Danvers, MA 01923, USA. Organisations in the USA who are also registered with CCC may therefore copy material (beyond the limits permitted by sections 107 and 108 of U.S. Copyright law) subject to payment to CCC of the per-copy fee of \$12.00. This consent does not extend to multiple copying for promotional or commercial purposes. Code 1062-7987/2013 \$12.00.

ISI Tear Sheet Service, 3501 Market Street, Philadelphia, PA 19104, USA, is authorised to supply single copies of separate articles for private use only.

Organisations authorised by the Copyright Licensing Agency may also copy material subject to the usual conditions.

For all other use, permission should be sought from Cambridge University Press.

For further information on *European Review* or other Press titles access journals.cambridge.org/erw or cambridge.org.

This journal issue has been printed on FSC-certified paper and cover board. FSC is an independent, non-governmental, not-for-profit organization established to promote the responsible management of the world's forests. Please see www.fsc.org for information.

Printed in the UK by Bell & Bain Ltd., Glasgow.

© Academia Europaea 2013

European Review

VOLUME 21 SUPPLEMENT 1 July 2013

Reason and Unreason in Twenty-first Century Science

Sponsor Information

Acknowledgements and Speaker Affiliations	S1
Preface	
Peter Lachmann	S3
Introduction: Reason and Unreason in Twenty-first Century Science	
Michael Hanlon	S4
Session 1 – Origins of Reason, Methodology and the Rise of Irrationality	
The Unnatural Nature of Science	
Lewis Wolpert	S9
Making Sense of Science and Evidence	
Tracey Brown	S14
A Theology of Everything	
George V. Coyne S.J.	S20
Session 2 – Risk, Probability and the Precautionary Principle in Scientific Scepticism	
A Small Chance of Disaster	
John Broome	S27
From Evidence to Understanding: A Precarious Path	
David J. Hand	S32
Experimental and Epidemic Risks: Matters of Science and Judgement	
Sheila M. Bird	S40
Cargo Cult Science	
Michael Hanlon	S51
Session 3 – Case Studies	
Controversies in Vaccination	
Roman Prymula	S56
Alternative Medicine: My Part in its Downfall	
David Colquhoun	S62

Genetic Modification and the Public Good Ingo Potrykus	S68
Assisted Reproduction, the Law and Public Attitudes: A Danish Perspective Berit A. Faber	S80
Climate Change Sceptics Bernard Legras	S85
Session 4 – Reason and Evidence in Ethics	
Science, Reasons and Normativity Onora O’Neill	S94
Science, Technology and Preservation of the Life-world Dermot Moran	S100
Ethics Evolve Peter Lachmann	S109
What it is to be Good John Harris	S114
The Essence of Morality Anthony Kenny	S123

Sponsor Information

Kungl. Vitterhets Historie och Antikvitets Akademien



Kungl. KUNGL. VITTERHETS HISTORIE
OCH ANTIKVITETS AKADEMIEN
Vitterhetsakademien

<http://www.vitterhetsakad.se/om>

The Royal Swedish Academy of Letters, History and Antiquities
Académie Royale Suédoise Belles-Lettres, de l'Histoire et des
AntiquitésKönigl. Schwedische Akademie für Literatur, Geschichte und Altertümer

When the Academy was founded by Queen Lovisa Ulrika on March 20, 1753, it was named Kongl. Svenska Witterhets Akademien (the Royal Swedish Academy of Letters). When Gustav III reconstituted the Academy in 1786, it was given the name that is still current.

The Academy mainly works in the domain of the humanities and social sciences. Under its current charter, adopted in 1988, the Academy has the following duties:

- to promote research and other activities in the humanities, theology, law, and social science disciplines, as well as stewardship of cultural milieus;
- to collaborate with Swedish bodies and associations with a similar academic orientation;
- to initiate and support international collaboration in the disciplines within the Academy's domain of activities and thereby maintain connections with foreign academies and international academic organizations;
- to publish academic writings in the Academy's domain;
- bestow support and awards on deserving researchers and others who have furthered the objectives of the Academy;
- to issue statements in matters related to the domain of the Academy's activities at the behest of the government or a public authority or if it serves the interests of the Academy.

Sponsor Information



CALOUSTE
GULBENKIAN
FOUNDATION

<http://www.gulbenkian.pt/index.php?section=9&langId=1>

Origins

The Family

Calouste Gulbenkian was born in Scutari (now Üsküdar), Istanbul on 23 March 1869, the son of Sarkis and Dirouhie Gulbenkian, members of an illustrious Armenian family whose origins date back to the fourth century.

Their ancestors were the Princes of Rechduni, who owned lands south of Lake Van, in Armenia. The Rechduni settled in Caesareia, Cappadocia, one of the earliest centres of Eastern Christianity, in the eleventh century, when King Senekerim of Vaspurakan was on the throne. They adopted the family name Vart Badrik, a Byzantine noble title, replacing it with the Turkish form Gulbenkian when the Ottomans came to power in the seventeenth century.

During the 400 years that the family stayed in Cappadocia, every generation was involved in patronage of the arts and in welfare work. Our research has further shown that from 1800 the successive Gulbenkian generations played a major role in supporting both the Armenian community and the wider Ottoman community in which they served as loyal citizens (they funded hospitals, schools, churches, artists and intellectuals, food distribution in time of famine and, later on, after the genocide, they provided housing and granted property for refugees in Mesopotamia).

In 1880, Sarkis Gulbenkian, Calouste's father, settled by the Bosphorus. He was an affluent merchant who had recently acquired concessions in the oil fields of the Russian Caucasus.

The Foundation

The Calouste Gulbenkian Foundation is a Portuguese private institution of public utility whose statutory aims are in the fields of arts, charity, education and science. Created by a clause in Calouste Sarkis Gulbenkian's will, the Foundation's statutes were approved in 1956.

The Foundation actively pursues its statutory aims in Portugal and abroad through a wide range of direct activities and grants supporting projects and programmes.

The Foundation has an orchestra and a choir that perform throughout the year within a regular season, and organises solo and collective exhibitions of work by Portuguese and foreign artists. It also organises international conferences, meetings and courses, awards subsidies and scholarships for specialist studies and doctorates in Portugal and abroad, and supports programmes and projects of a scientific, educational, artistic and social nature. Moreover, the Calouste Gulbenkian Foundation is actively involved in publishing, especially through its programme for university textbooks. It also fosters cooperation projects with Portuguese-speaking African countries and East Timor pursuing the Millennium goals, promotes Portuguese culture abroad, and operates a programme to preserve evidence of the Portuguese presence in the world. In addition to the activities pursued in Portugal and abroad for the promotion of Portuguese culture, the Foundation supports the Armenian Diaspora worldwide in order to preserve its language and culture.