



NATO Science for Peace and Security Series
E: Human and Societal Dynamics - Vol. 50

Constructal Human Dynamics, Security and Sustainability

Edited by
Adrian Bejan
Sylvie Lorente
António Miguel
A. Heitor Reis

IOS
Press



*This publication
is supported by:*

The NATO Science for Peace
and Security Programme



NATO Science for Peace and Security Series

This Series presents the results of scientific meetings supported under the NATO Programme: Science for Peace and Security (SPS).

The NATO SPS Programme supports meetings in the following Key Priority areas: (1) Defence Against Terrorism; (2) Countering other Threats to Security and (3) NATO, Partner and Mediterranean Dialogue Country Priorities. The types of meeting supported are generally "Advanced Study Institutes" and "Advanced Research Workshops". The NATO SPS Series collects together the results of these meetings. The meetings are co-organized by scientists from NATO countries and scientists from NATO's "Partner" or "Mediterranean Dialogue" countries. The observations and recommendations made at the meetings, as well as the contents of the volumes in the Series, reflect those of participants and contributors only; they should not necessarily be regarded as reflecting NATO views or policy.

Advanced Study Institutes (ASI) are high-level tutorial courses to convey the latest developments in a subject to an advanced-level audience.

Advanced Research Workshops (ARW) are expert meetings where an intense but informal exchange of views at the frontiers of a subject aims at identifying directions for future action.

Following a transformation of the programme in 2006 the Series has been re-named and re-organised. Recent volumes on topics not related to security, which result from meetings supported under the programme earlier, may be found in the NATO Science Series.

The Series is published by IOS Press, Amsterdam, and Springer Science and Business Media, Dordrecht, in conjunction with the NATO Public Diplomacy Division.

Sub-Series

A. Chemistry and Biology	Springer Science and Business Media
B. Physics and Biophysics	Springer Science and Business Media
C. Environmental Security	Springer Science and Business Media
D. Information and Communication Security	IOS Press
E. Human and Societal Dynamics	IOS Press

<http://www.nato.int/science>

<http://www.springer.com>

<http://www.iospress.nl>



Constructal Human Dynamics, Security and Sustainability

Edited by

Adrian Bejan

*Department of Mechanical Engineering and Materials Science
Duke University
Durham, NC, USA*

Sylvie Lorente

*University of Toulouse
Institut National des Sciences Appliquées, Laboratoire Matériaux et Durabilité
des Constructions, Toulouse, France*

António Miguel

*Physics Department
University of Évora
Évora, Portugal*

and

A. Heitor Reis

*Physics Department
University of Évora
Évora, Portugal*

IOS
Press

Amsterdam • Berlin • Tokyo • Washington, DC

Published in cooperation with NATO Public Diplomacy Division

Proceedings of the NATO Advanced Research Workshop on
Constructal Human Dynamics, Security and Sustainability
Évora, Portugal
20 - 23 May 2008

© 2009 IOS Press.

All rights reserved. No part of this book may be reproduced, stored in a retrieval system, or transmitted, in any form or by any means, without prior written permission from the publisher.

ISBN 978-1-58603-959-2

Library of Congress Control Number: 2008942280

Publisher

IOS Press BV
Nieuwe Hemweg 6B
1013 BG Amsterdam
Netherlands
fax: +31 20 687 0019
e-mail: order@iospress.nl

Distributor in the UK and Ireland

Gazelle Books Services Ltd.
White Cross Mills
Hightown
Lancaster LA1 4XS
United Kingdom
fax: +44 1524 63232
e-mail: sales@gazellebooks.co.uk

Distributor in the USA and Canada

IOS Press, Inc.
4502 Rachael Manor Drive
Fairfax, VA 22032
USA
fax: +1 703 323 3668
e-mail: iosbooks@iospress.com

LEGAL NOTICE

The publisher is not responsible for the use which might be made of the following information.

PRINTED IN THE NETHERLANDS

Contents

Preface and Organising Committee	v
Constructal Theory and Design <i>A. Bejan and S. Lorente</i>	1
Constructal View of City Flow Structure and People Safety <i>A. Heitor Reis</i>	21
Flow Systems, Catastrophes, and Public Policy <i>Gilbert W. Merckx</i>	37
Developing Constructal Theory as a Tool for Global Security and Sustainability <i>Wayne O. Miller</i>	49
Pattern Formation and Self-Organization in Living Systems: a Unified View of Coral Colonies and Crowd Dynamics <i>António F. Miguel</i>	61
Constructal Placement of Decontamination on Nuclear Waste Areas <i>Sylvie Lorente</i>	85
Some Transfer Phenomena Regarding the Safety of Deep Geological Repositories of Radioactive Wastes <i>Fabien Frizon</i>	101
Constructal Patterns in Air Traffic Flows and in Sustainable Information Systems <i>Stephen Périn</i>	133
Constructal Flow of Education and Research <i>A. Bejan</i>	157
Subject Index	175
Author Index	177