

Scien-
ze

Dieci
anni di
editoria
2003-
2013



EDIZIONI
DELLA
NORMALE

Scienze

Appunti - Lecture Notes

Colloquia

CRM Series - Pubblicazioni del Centro
di ricerca matematica Ennio De Giorgi
Mathematica

Quaderni - Selections / Monographs

Tesi - Theses

Fuori collana

Dieci anni di editoria 2003-2013

La Scuola Normale Superiore fin dalla sua origine ha sviluppato una importante attività editoriale, connessa in modo diretto alla ricerca e alla didattica secondo un intreccio caratteristico durato fino ai nostri tempi. Come è naturale, ci sono stati periodi di attività più intensa ed altri nei quali essa si è sviluppata più lentamente, anche per ragioni estranee alla Scuola. Fra i periodi in cui le pubblicazioni della Normale si sono imposte per qualità e livello spicca certamente la lunga direzione di Giovanni Gentile che, dopo una fase di crisi dovuta anche alla guerra, riportò la Scuola e le sue edizioni a un notevole sviluppo qualitativo e quantitativo, nella Classe di Lettere come nella Classe di Scienze, i due pilastri su cui la Normale è stata fondata dall'inizio fino ad ora.

Sono questi gli anni nei quali la Scuola pubblica libri di giovani allievi destinati poi a imporsi nella *res publica* letteraria; libri apparsi, talvolta, in prima redazione negli *Annali della Classe di Lettere* che, insieme agli *Annali della Classe di Scienze*, hanno rappresentato una delle leve principali, anche per prestigio e autorevolezza, delle edizioni della Scuola.

Nel 2003 l'attività editoriale della Normale è stata radicalmente ripensata in ogni settore: nella struttura, nella grafica e anche nel pubblico di riferimento. Alla base di questa trasformazione ci sono stati mutamenti del "mondo storico", ma anche processi che hanno coinvolto lo sviluppo della Scuola, l'ampliarsi e il complicarsi della sua presenza, e della sua influenza, sia in Italia che sul piano internazionale. Basta pensare alla situazione dei professori e degli allievi della Normale: fino agli anni Sessanta veniva ammesso un piccolo numero di allievi, mentre il perfezionamento era limitato a un gruppo anche più ristretto di candidati. Simmetricamente, l'organico dei professori era circoscritto a pochissime unità, in una struttura che rimaneva fortemente centralistica: il Direttore era nominato dal Ministro della Pubblica Istruzione. Con la direzione di Gilberto Bernardini questa situazione è mutata profondamente, con una notevole trasformazione del volto e della funzione della Normale. È sufficiente citare, anche in questo caso, qualche cifra: oggi sono ammessi al corso ordinario 32 allievi nella Classe di Lettere e 36 nella Classe di Scienze, mentre è aumentato in proporzione il numero degli allievi ammessi al corso di perfezionamento, e si è notevolmente ampliato e consolidato l'organico dei professori della Scuola.

Il ripensamento dell'attività editoriale si è inserito in questo generale processo di trasformazione, e ha avuto l'ambizione di mettere le edizioni al passo dei tempi, in Italia e sul piano internazionale.

I volumi, prima distinti in Pubblicazioni della Classe

di Lettere e Pubblicazioni della Classe di Scienze, sono stati raccolti in una struttura unitaria, denominata Edizioni della Normale; le collane riorganizzate in modo radicale; la veste grafica integralmente rifatta, mentre la programmazione editoriale ha cominciato, in modo consapevole, a rivolgersi a un pubblico più largo, coinvolgendo personalità provenienti da altri ambienti, anche attraverso la traduzione di libri coerenti con le linee scientifiche e culturali della Scuola nel campo letterario e in quello scientifico.

Il catalogo che segue intende illustrare concretamente questi propositi, e gli esiti che essi hanno avuto in dieci anni di attività.

Sta al lettore giudicare del lavoro svolto. Conviene, comunque, anche in questo caso citare qualche cifra: sono stati pubblicati circa 200 libri, un numero non indifferente, tanto più significativo se si pensa alle dimensioni della Scuola Normale Superiore; sono stati coinvolti studiosi di ogni parte del mondo; alcuni dei volumi pubblicati sono già diventati testi di riferimento in Italia e fuori.

Le Edizioni della Normale stanno ora per entrare in una nuova fase collegandosi, come è accaduto anche in passato, sia a trasformazioni di ordine generale del mondo degli studi sia a quelle della Scuola in questo ultimo periodo.

Innovando il modello tradizionale la Normale ha deciso di fondersi con l'Istituto di scienze umane, con importanti conseguenze strutturali, scientifiche e culturali. Accanto alle due Classi è ora prevista la nascita di una nuova Scuola di dottorato - destinata ad

affiancarsi al tradizionale PhD -, che avrà sede a Firenze, in Palazzo Strozzi. Essa avrà il compito propriamente strategico di estendere le linee di ricerca della Normale in campi o nuovi o non sviluppati in modo organico nel passato, aprendosi con particolare energia a presenze e collaborazioni di tipo internazionale, secondo una impostazione propria della Scuola.

Si tratta di un momento di straordinaria novità ed importanza, al quale le Edizioni della Normale non possono restare estranee. Si è perciò cominciato a rinnovare ed estendere il modello di University Press rappresentato dalle Edizioni della Normale sul piano organizzativo e su quello scientifico avviando, tra l'altro, due nuove collane che intendono raccogliere in una nuova esperienza il "passato" e il "futuro" delle Edizioni. La prima - *Hermes. Classici tradotti* - si propone di presentare in lingua italiana, con commento e nuove edizioni critiche, alcuni dei testi fondamentali del pensiero occidentale ed orientale, iniziando con la pubblicazione del *De Incantationibus* di Pietro Pomponazzi, libro capitale della filosofia rinascimentale. La seconda - *Variazioni* -, suonando il tasto della diversità dei "generi", visibile anche nella veste grafica, vuole pubblicare testi di diverso carattere e vocazione, con una speciale attenzione alle nuove generazioni di lettori e di studiosi e con uno sguardo aperto in molteplici direzioni, come risulta dagli autori e dai temi trattati.

È con questo spirito che offriamo al lettore questo catalogo di un decennio di attività editoriale: bilancio di un lavoro, strumento di nuovo lavoro.

Michele Ciliberto
Maria Vittoria Benelli

**Scien-
ze**

**Mario Tosi and
Patrizia Vignolo
Statistical Mechanics
and the Physics of Fluids**

2005

ISBN 88-7642-144-0

pp. XII-194, € 18.00

This volume collects the lecture notes of a course on statistical mechanics, held at Scuola Normale Superiore for third-to-fifth year students in physics and chemistry.

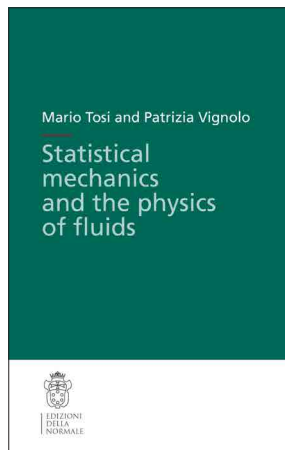
Three main themes are covered in the book.

The first part gives a compact presentation of the foundations of statistical mechanics and their connections with thermodynamics.

Applications to ideal gases of material particles and of excitation quanta are followed by a brief introduction to a real classical gas and to a weakly coupled classical plasma, and by a broad overview on the three states of matter.

The second part is devoted to fluctuations around equilibrium and their correlations. Coverage of liquid structure and critical phenomena is followed by a discussion of irreversible processes as exemplified by diffusive motions and by the dynamics of density and heat fluctuations.

Finally, the third part is an introduction to some advanced themes: supercooling and the glassy state, non-Newtonian fluids including polymers and liquid crystals, and dynamic instabilities and turbulence. These topics, which are largely taken over from the book by N.H. March and M. Tosi on *Introduction to Liquid State Physics*, are meant to stimulate the reader to further study of the literature in these technically important areas.



**Mariano Giaquinta and
Luca Martinazzi**

**An Introduction to the
Regularity Theory
for Elliptic Systems,
Harmonic Maps
and Minimal Graphs
2012²**

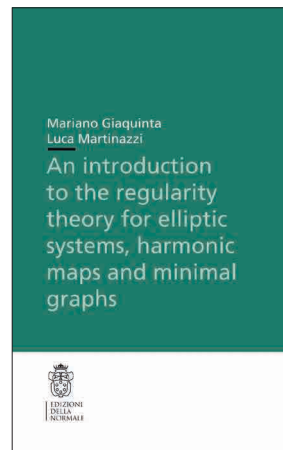
ISBN 978-88-7642-442-7

e-ISBN 978-88-7642-443-4

pp. XIII-366, € 26.00

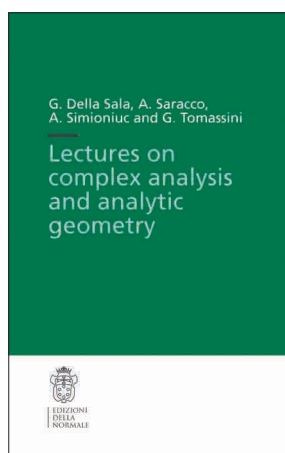
This volume deals with the regularity theory for elliptic systems. We may find the origin of such a theory in two of the problems posed by David Hilbert in his celebrated lecture delivered during the International Congress of Mathematicians in 1900 in Paris. During the last century these two problems have generated a great deal of work, usually referred to as regularity theory, which makes this topic quite relevant in many fields and still very active for research.

However, the purpose of this volume, addressed mainly to students, is much more limited. We aim to illustrate only some of the basic ideas and techniques introduced in this context, confining ourselves to important but simple situations and refraining from completeness. In fact some relevant topics are omitted. In this second deeply revised edition we also included the regularity of 2^p -dimensional weakly harmonic maps, the partial regularity of stationary harmonic maps, and their connections with the case $p=1$ of the L^p theory, including the celebrated results of Wente and of Coifman-Lions-Meyer-Semmes.



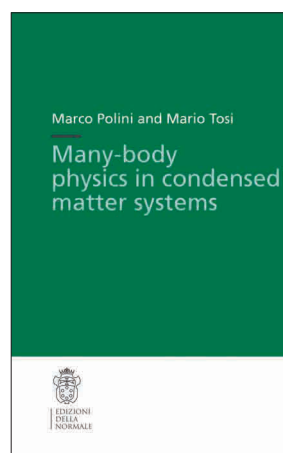
**Giuseppe Della Sala,
Alberto Saracco
Alexandru Simioniuc
and Giuseppe Tomassini**
**Lectures on Complex
Analysis and Analytic
Geometry**
2006
ISBN 88-7642-199-8
pp. XIX-430, € 25.00

This book is an introduction to the theory of holomorphic functions of several complex variables. It is based on the courses attended by the students of mathematics at Scuola Normale Superiore. Its treated subjects range from an advanced undergraduate course to a Ph.D. level. The book is largely divided into three parts. All the topics of these lectures are basic and we have no presumption of giving a complete outline either of the main developments or of the interface with other fields of mathematical research. However, we believe that they provide good material to approach the broad subject of several complex variables, and that they could be a good source of interesting problems and themes in the subject.



**Marco Polini and
Mario Tosi**
**Many-body Physics in
Condensed
Matter Systems**
2006
ISBN 88-7642-192-0
pp. IX-320, € 24.00

This volume collects the lecture notes of an introductory course on the theory of many-body systems, held at the Scuola Normale Superiore. It is mainly addressed to fourth and fifth-year undergraduates and to first-year graduates in physics and chemistry. The book is also suitable for researchers in the field wanting to gain a general introductory overview of its modern focal points. Starting from a set of notes first prepared in 1994, which were mainly focused on conduction electrons in metals and semiconductors, these lecture notes are now being reprinted with some major changes and additions in order to provide the reader with an overview of recent developments in the understanding of low-dimensional electron fluids and of confined quantum gases made from bosonic and fermionic atoms and molecules. The book is divided into seven chapters and includes 18 appendices on specialized topics.



Paolo Azzurri
Problemi di meccanica
2008²
ISBN 978-88-7642-317-8
pp. VIII-156, € 18.00

Il presente volume contiene una selezione di esercizi proposti agli studenti del primo anno della Classe di Scienze della Scuola Normale per il corso di meccanica del prof. Lorenzo Foà, negli anni 2003–2007. Il libro di riferimento per il corso è *Classical Mechanics* di D. Rutherford (1957).

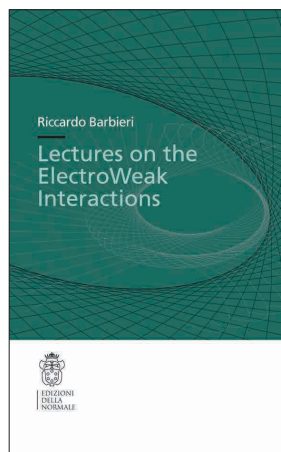
I problemi trattati riguardano la cinematica e la dinamica del punto materiale, la cinematica e la dinamica dei sistemi, moti in campi centrali, la dinamica del corpo rigido, le oscillazioni e la meccanica analitica con formalismo lagrangiano.

In questa seconda edizione, a pochi mesi di distanza dalla prima, sono stati aggiunti sette problemi risolti e, in particolare, sono stati rivisti e modificati i testi delle soluzioni dei problemi 1 e 5.

Riccardo Barbieri
**Lectures on the
ElectroWeak Interactions**
2007
ISBN 978-88-7642-311-6
pp. 81, € 18.00

Elementary particle physics is the quadrant of nature whose laws can be written in a few lines with absolute precision and the greatest empirical adequacy. If this is the case, as I believe it is, it must be possible and is probably useful to introduce the students and the interested readers to the entire subject in a compact way. This is the main aim of these Lectures.

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Giuseppe Da Prato
Introduction to
Stochastic Analysis and
Malliavin Calculus
2008²

ISBN 978-88-7642-337-6
pp. XVI-211, € 25.00

This volume presents an introductory course on differential stochastic equations and Malliavin calculus. The material of the book has grown from a series of courses delivered at the Scuola Normale Superiore of Pisa (and also at the Universities of Trento and Funchal) and has been refined over several years of teaching experience in the subject. The lectures are addressed to a reader who is familiar with basic notions of measure theory and functional analysis.

The first part is devoted to the Gaussian measure in a separable Hilbert space, the Malliavin derivative, the construction of the Brownian motion and Itô's formula. The second part deals with differential stochastic equations and their connection with parabolic problems.

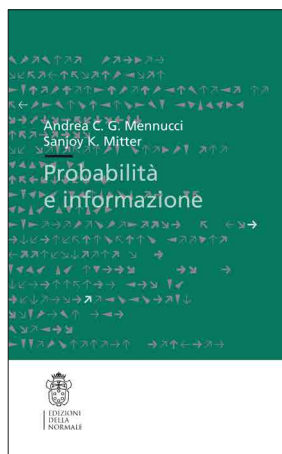
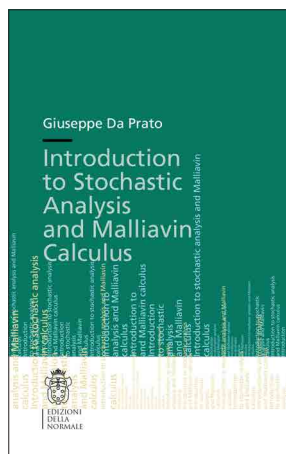
The third part contains an introduction to Malliavin calculus. Several applications are given, notably the Feynman-Kac, Girsanov and Clark-Ocone formulae, the Krylov-Bogoliubov and Von Neumann theorems.

Andrea C.G. Menzucchi,
Sanjoy K. Mitter
Probabilità e
informazione
2008²

ISBN 978-88-7642-324-6
pp. XVI-440, € 20.00

Questo volume raccoglie i risultati di dieci anni di esperienza didattica in corsi di probabilità, tenuti sia alla Scuola Normale Superiore che all'Università di Pisa. Questi corsi, rivolti a studenti di Matematica, Fisica e Informatica (e anche di Chimica e Biologia) hanno presentato la probabilità in maniera elementare, con particolare attenzione alla probabilità discreta, ma sempre rivolgendo lo sguardo anche alla teoria più generale. Il testo presenta tutti i risultati oramai classici, quali le leggi dei grandi numeri (per processi correlati e per catene di Markov) e del limite centrale (con dimostrazione per il caso bernoulliano) e propone anche sviluppi più avanzati, quali la speranza e varianza condizionale, il processo di Poisson, la teoria di grandi deviazioni e la teoria ergodica (in forma semplificata).

Come Breiman ebbe a commentare, «La teoria della probabilità ha una mano sinistra e una destra - la destra è la rigorosa fondazione basata sulla teoria della misura - e la sinistra è la "intuizione probabilistica" basata su situazioni reali», la sinergia fra i due aspetti si rispecchia nei numerosi esercizi (la maggior parte con soluzione), negli esempi e nelle applicazioni che arricchiscono questo testo. In questa stessa esigenza si colloca, in particolare, il capitolo dove si presenta la teoria dell'informazione e dei codici.



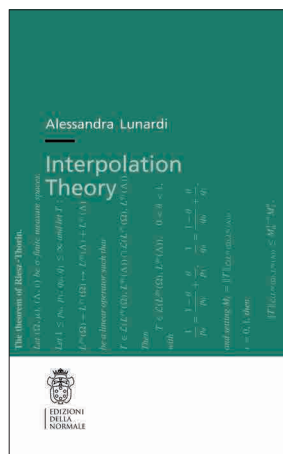
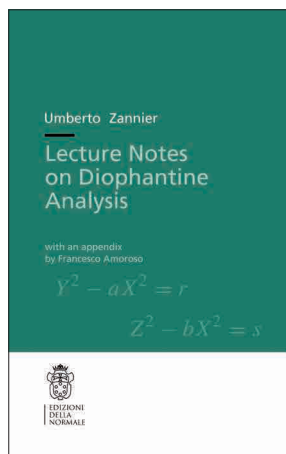
Umberto Zannier
**Lecture Notes on
 Diophantine Analysis**
 2009
 ISBN 978-88-7642-341-3
 pp. xvi-233, € 25.00

These lecture notes originate from a course delivered at the Scuola Normale in 2006. The book mainly deals with Diophantine problems on affine curves, in practice describing the integer solutions of equations in two variables. This case historically suggested some major ideas for more general problems. Starting with linear and quadratic equations, the important connections with Diophantine Approximation are presented and Thue's celebrated results are proved in full detail. In later chapters more modern issues on heights of algebraic points are dealt with, and applied to a sharp quantitative treatment of the unit equation. The volume also contains several Supplements, hinted exercises and an Appendix on recent work on heights.

Alessandra Lunardi
Interpolation Theory
 2009²
 ISBN 978-88-7642-342-0
 pp. xi-191, € 25.00

This book is the second edition of 1999 lecture notes of the courses on interpolation theory that the author delivered at the Scuola Normale in 1998 and 1999. In the mathematical literature there are many good books on the subject, but none of them is very elementary, and in many cases the basic principles are hidden below great generality. In this second edition, the principles of interpolation theory are illustrated aiming at simplification rather than at generality. The abstract theory is reduced as far as possible, and many examples and applications are given, especially to operator theory and to regularity in partial differential equations. Moreover the treatment is self-contained, the only prerequisite being the knowledge of basic functional analysis.

10



Gianni Fochi
Chimica da capire
Compendio di chimica generale con brevi cenni di chimica inorganica descrittiva
2009
ISBN 978-88-7642-346-8
pp. XVIII-251, € 25.00

Questo libro vuole fornire agli studenti del primo anno di un corso universitario gli elementi essenziali per una introduzione alla chimica generale. Esso si segnala all'attenzione del lettore per la sua impostazione: l'esperienza didattica ha infatti convinto l'autore che l'introduzione dei concetti fondamentali debba precedere il confronto con la vastità del sapere chimico, cioè con la congerie di fatti sperimentali inquadrabili in un gran numero di settori diversificati. A questo scopo la termodinamica, che nei manuali trova di solito spazio solo verso la fine e come argomento accessorio, diventa la chiave di volta per la comprensione dell'equilibrio chimico, che è il fondamento della chimica stessa. Altra caratteristica dell'opera è la mole contenuta con la selezione degli argomenti essenziali ad una preparazione di base, suscettibili, se necessario, di successivi approfondimenti; alcuni capitoli, per il loro valore propedeutico, possono costituire inoltre un ottimo punto di riferimento anche per studenti dell'ultimo anno delle scuole medie superiori.

Luigi Ambrosio
Corso introduttivo alla teoria geometrica della misura e alle superfici minime
2010 (ristampa)
ISBN 978-88-7642-410-6
pp. 125, € 20.00

Il testo contiene le lezioni di un corso svolto nell'anno accademico 1995/96 presso la Scuola Normale Superiore. I concetti di base della Teoria Geometrica della Misura sono presentati al lettore senza richiedere particolari prerequisiti. Particolare enfasi viene data alla teoria in codimensione uno, la cosiddetta teoria degli insiemi di perimetro finito. In questo ambito è descritto tutto il percorso che va dall'esistenza di soluzioni deboli fino alla loro regolarità.



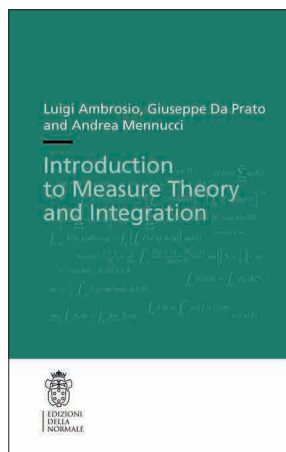
**Luigi Ambrosio,
Giuseppe Da Prato and
Andrea Mennucci
Introduction to Measure
Theory and Integration
2011**

ISBN 978-88-7642-385-7
e-ISBN 978-88-7642-386-4
pp. xi-187, € 25.00

This textbook collects the notes for an introductory course in measure theory and integration. The course was taught by the authors to undergraduate students of the Scuola Normale Superiore, in the years 2000-2011. The goal of the course was to present, in a quick but rigorous way, the modern point of view on measure theory and integration, putting Lebesgue's Euclidean space theory into a more general context and presenting the basic applications to Fourier series, calculus and real analysis. The text can also pave the way to more advanced courses in probability, stochastic processes or geometric measure theory.

Prerequisites for the book are a basic knowledge of calculus in one and several variables, metric spaces and linear algebra.

All results presented here, as well as their proofs, are classical. The authors claim some originality only in the presentation and in the choice of the exercises. Detailed solutions to the exercises are provided in the final part of the book.



**Gianfranco Pradisi
Lezioni di metodi
matematici della fisica
2012**

ISBN 978-88-7642-441-0
pp. xv-539, € 32.00

Il libro scaturisce da una raccolta di argomenti scelti di Metodi Matematici della Fisica, che l'autore ha affrontato in diversi anni di didattica presso il Dipartimento di Fisica dell'Università di Roma "Tor Vergata", e si configura come un tentativo di collegare strumenti e metodi propri della Fisica Teorica con procedure più squisitamente formali della Fisica Matematica, attraverso il comun denominatore dell'Analisi Complessa. L'autore ha inteso, da un lato, fornire una panoramica di risultati entrati ormai nel novero degli argomenti 'classici', dall'altro aprire la strada all'utilizzo di tecniche di vasta applicazione nella ricerca, in special modo nella Fisica Teorica.

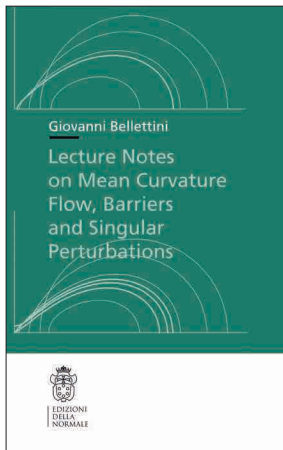
Il testo prende le mosse dalle funzioni di variabile complessa per approdare alle equazioni differenziali, sia ordinarie che a derivate parziali, spaziando attraverso diverse classi di funzioni speciali, tra cui le funzioni gamma e beta di Eulero, la funzione zeta di Riemann, la funzione di Airy, le funzioni ellittiche e la vasta classe delle funzioni ipergeometriche. Notevole rilievo viene assegnato alla teoria delle distribuzioni e alle funzioni di Green, agli sviluppi asintotici e alle trasformate integrali. Infine, il testo affronta in dettaglio alcuni aspetti relativi a funzionali e operatori lineari su spazi di Hilbert di dimensione infinita.



**Giovanni Bellettini
Lecture Notes on Mean
Curvature Flow,
Barriers and Singular
Perturbations**

2013
ISBN 978-88-7642-428-1
e-ISBN 978-88-7642-429-8
€ 28.00

The aim of this book is to give an introduction to mean curvature flow using, as much as possible, a parameter-free approach. Some relevant aspects of mean curvature flow are illustrated, such as the role of the signed distance function and the comparison principle, and their use in the theory of minimal barriers is explained. Some simple examples of singularities are discussed. Finally, also making use of a formal asymptotic inner and outer expansion, we prove the convergence of the singularly perturbed parabolic Allen-Cahn equation to mean curvature flow for sufficiently short times, and provide an error estimate.



**Colloquium De Giorgi
edited by U. Zannier**

2006 (2007)
ISBN 978-88-7642-212-6
pp. x-57, € 16.00

2007 and 2008 (2009)
ISBN 978-88-7642-344-4
pp. xii-98, € 20.00

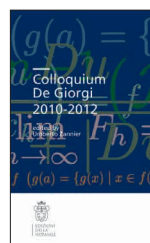
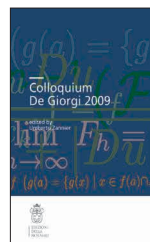
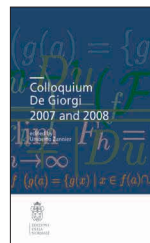
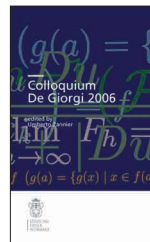
2009 (2012)
ISBN 978-88-7642-388-8
e-ISBN 978-88-7642-387-1
pp. xiii-53, € 20.00

2010-2012 (2013)
ISBN 978-88-7642-455-7
e-ISBN 978-88-7642-457-1
pp. xiv-68, € 20.00

Since 2001 the Scuola Normale Superiore of Pisa has organized the “Colloquium De Giorgi”, a series of colloquium talks named after Ennio De Giorgi.

The Colloquium is addressed to a general mathematical audience, and especially meant to attract graduate students and advanced undergraduate students. The lectures are intended to be not too technical, in fields of wide interest.

They must provide an overview of the general topic, possibly in a historical perspective, together with a description of more recent progress. The idea of collecting the materials from these lectures and publishing them in annual volumes came out recently, as a recognition of their intrinsic mathematical interest, and also with the aim of preserving memory of these events.



Matematica, cultura e società 2004 (2005)

ISBN 88-7642-158-0
pp. 155, € 12.00

Matematica, cultura e società 2005 (2006)

ISBN 88-7642-188-2
pp. 123, € 14.00

Matematica, cultura e società 2006 (2009)

ISBN 978-88-7642-315-4
pp. VIII-90, € 14.00

Matematica, cultura e società 2007-2008 (2012)

ISBN 978-88-7642-382-6
pp. VI-305, € 28.00

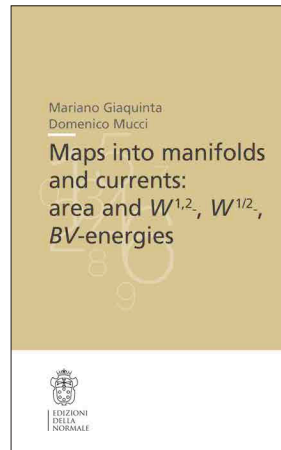
«Matematica, Cultura e Società» è il titolo di una rassegna di conferenze pubbliche che dal 2003 il Centro De Giorgi dedica alla divulgazione della matematica e, più in generale, del sapere scientifico. Fin dai suoi esordi, lo spirito che anima questo progetto è mosso dalla volontà di creare un canale di comunicazione tra il mondo della ricerca scientifica e il resto della società. Nonostante l'eterogeneità di prospettive, impostazioni e approcci sia uno dei tratti che caratterizzano la rassegna, ciascun contributo, al di là dell'argomento specifico trattato, ci dice qualcosa sulla funzione che la matematica riveste nella costruzione della nostra società, come sul ruolo che occupa nel nostro sistema culturale.

**Mariano Giaquinta and Domenico Mucci
Maps into Manifolds and Currents: Area and $W^{1,2}$, $W^{1/2}$ -, BV -energies 2006**

ISBN 88-7642-200-5
pp. XXII-391, € 24.00

This volume deals with the problem of characterizing the limit points of sequences of smooth maps from the unit ball of \mathbb{R}^n with values into a smooth boundaryless Riemannian manifold and with equibounded 'integral energies'. After surveying some known results about Cartesian currents and graphs with finite area and finite boundary area, we do characterize, as in the title, weak limits of sequences of smooth maps with equibounded $W^{1,2}$, $W^{1/2}$, or BV energies.

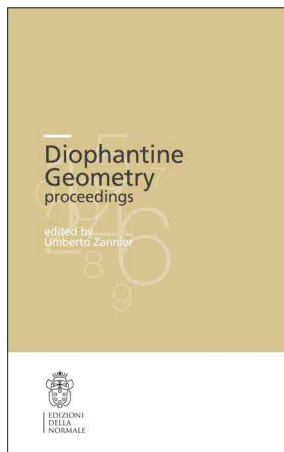
14



**Diophantine Geometry
Proceedings edited by
Umberto Zannier
2007**

ISBN 978-88-7642-206-5
pp. xvii-390, € 26.00

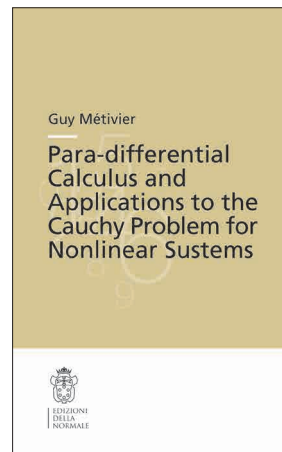
The book contains research papers on Diophantine Geometry, written by participants to a related workshop held at the Centro De Giorgi of the Scuola Normale of Pisa during the period April-July 2005. The authors are eminent experts in the field; actually, several interacting subfields of the main topic are represented here, which is particularly useful to get a broad overview of recent research developments.



**Guy Métivier
Para-differential
Calculus and
Applications to the
Cauchy Problem for
Nonlinear Systems
2008**

ISBN 978-88-7642-329-1
pp. xi-138, € 24.00

The main aim is to present at the level of beginners several modern tools of micro-local analysis which are useful for the mathematical study of nonlinear partial differential equations. The core of these notes is devoted to a presentation of the para-differential techniques, which combine a linearization procedure for nonlinear equations, and a symbolic calculus which mimics or extends the classical calculus of Fourier multipliers. These methods apply to many problems in nonlinear PDE's such as elliptic equations, propagation of singularities, boundary value problems, shocks or boundary layers. However, in these introductory notes, we have chosen to illustrate the theory on two selected and relatively simple examples, which allow becoming familiar with the techniques. They concern the well-posedness of the Cauchy problem for systems of nonlinear PDE's, firstly hyperbolic systems and secondly coupled systems of Schrödinger equations which arise in various models of wave propagation.

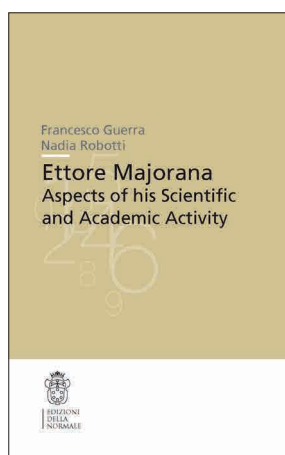


**Francesco Guerra and
Nadia Robotti
Ettore Majorana
Aspects of his Scientific
and Academic Activity**

2008

ISBN 978-88-7642-331-4
pp. xii-243, € 24.00

Little more than one hundred years have gone by since the birth of Ettore Majorana, a highly renowned theoretical physicist. His career was brief and irregular but very intense, and he disappeared in March 1938 in circumstances that still are not completely clear. This volume is a contribution to a better understanding of the scientific, academic and human personality of Ettore Majorana, beyond the layers of legendary aspects which have accumulated over the years. Based on primary sources alone—scientific literature of the period and numerous archival documents—the figure of Ettore Majorana emerges in a completely new light. A rich reproduction of original documents completes the volume.



**Mathematical Methods
in Biomedical Imaging
and Intensity-Modulated
Radiation Therapy
(IMRT)**

**edited by Yair Censor,
Ming Jiang and Alfred
K. Louis**

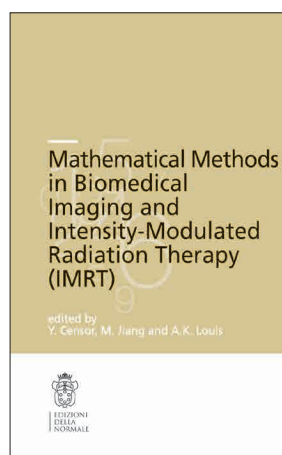
2008

ISBN 978-88-7642-314-7
pp. xx-523, € 30.00

This book contains papers presented by leading experts at the “Interdisciplinary Workshop on Mathematical Methods in Biomedical Imaging and Intensity-Modulated Radiation Therapy (IMRT)” held at the Centro di Ricerca Matematica (CRM) Ennio De Giorgi at Pisa, Italy, from October 15 to 19, 2007.

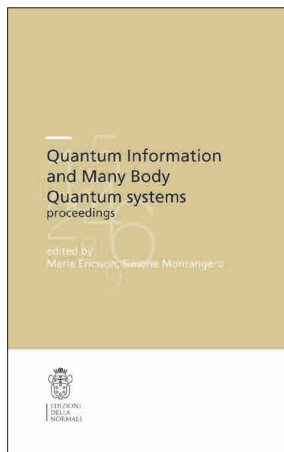
The book consists of research and review papers by leading experts and practitioners in biomedical imaging and intensity-modulated radiation therapy (IMRT). The topics include mathematical aspects and practical problems in current major and emerging technologies for the diagnostic and therapeutic medicine and biology research. The contributed work signifies the interdisciplinary cooperation between mathematicians and scientists from medical physics, engineering, clinical medicine and biology, that leads to mathematically-based better solutions of practical problems in biomedical imaging and IMRT.

This book is also a survey of important research directions and opportunities in mathematics induced by problems in biomedical imaging and radiation planning applications.



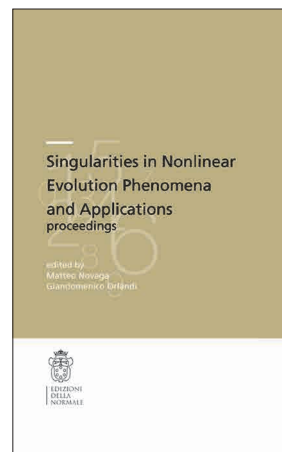
**Quantum Information
and Many Body
Quantum Systems
Proceedings**
edited by Marie Ericsson
and Simone Montangero
2008
ISBN 978-88-7642-307-9
pp. XIII-171, € 29.00

In the most recent years growing attention has been dedicated to many body quantum systems from the point of view of quantum information. Indeed, after the initial investigation of simple systems as single or two qubits, the need for understanding the characteristics of a realistic quantum information device necessarily leads to the study of many body quantum systems. These studies are also driven by the very fast development of experiments which in recent years have reached the goal of coherent control of a few qubits with a roadmap for further scaling and improvement of coherent control and manipulation techniques. This book gives a selection of the current research topics in the field of quantum information for many body quantum systems together with open problems.



**Singularities in
Nonlinear Evolution
Phenomena and
Applications.
Proceedings**
edited by Matteo
Novaga and
Giandomenico Orlandi
2009
ISBN 978-88-7642-343-7
pp. XIII-234, € 29.00

This volume collects some contributed papers by the participants to the workshop “Singularities in nonlinear evolution phenomena and applications”, which has been held at the Centro di Ricerca Matematica E. De Giorgi, from May 26th to May 30th 2008. The topic of the workshop was the formation and the evolution of singular structures, like systems of points, curves and surfaces. Such questions naturally arise in many models from Physics, Biology, Image Processing and Applied Mathematics in general, and have attracted a lot of attention in recent years. Their analysis requires sophisticated tools and an interdisciplinary approach, and poses new challenging mathematical problems.



Probability, Uncertainty and Rationality
 edited by Hykel Hosni and Franco Montagna

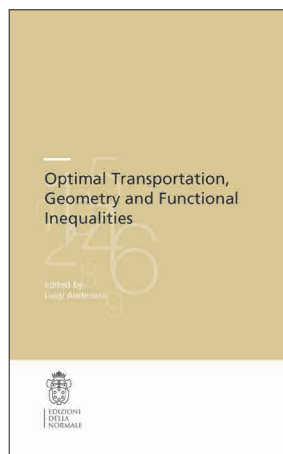
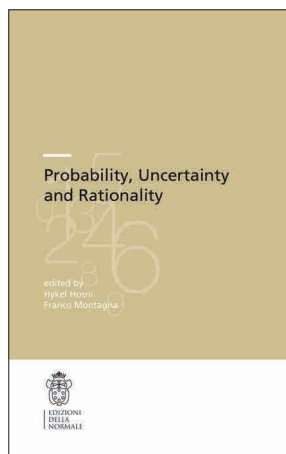
2010
 ISBN 978-88-7642-347-5
 pp. xv-291, € 29.00

This volume explores, from a mathematical and a philosophical perspective, the virtuous circle connecting logic and rationality. While logic lends its methods, techniques and ideas to the investigation of rationality, the practical problems which arise in modelling rational behaviour, especially in the social sciences, motivate logicians to develop more refined logical formalisms. This is why non classical logics - a unifying theme of this volume - play a fundamental role in the construction of formal models of rationality.

Optimal Transportation, Geometry and Functional Inequalities
 edited by Luigi Ambrosio

2010
 ISBN 978-88-7642-373-4
 pp. vi-120, € 26.00

In 2008, a school on the theory of Optimal Transportation and its applications took place in Pisa, with lectures by F. Barthe, W. Gangbo, F. Maggi and R. McCann. This book collects the notes of the first three lecturers. These notes provide a deep insight into the topics of concentration inequalities, evolution PDE's of Hamiltonian type, geometric and functional inequalities.



Asymptotics in Dynamics, Geometry and PDEs; Generalized Borel Summation
edited by Ovidiu Costin, Frédéric Fauvet, Frédéric Menous and David Sauzin

2011
vol. I
ISBN 978-88-7642-374-1
e-ISBN 978-88-7642-379-6
pp. XIV-260, € 29.00
vol. II
ISBN 978-88-7642-376-5
e-ISBN 978-88-7642-377-2
pp. XII-276, € 29.00

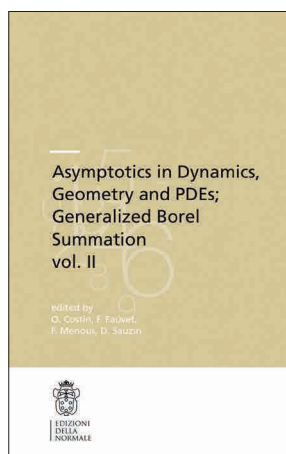
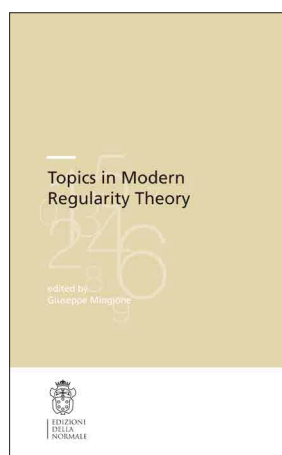
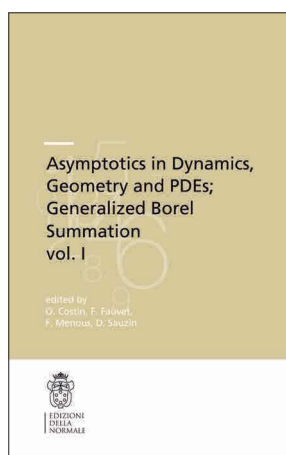
These are the proceedings of a one-week international conference centered on asymptotic analysis and its applications. They contain major contributions dealing with

- Mathematical Physics: PT symmetry, perturbative Quantum Field Theory, WKB analysis;
- local dynamics: parabolic systems, small denominator questions;
- new aspects in mould calculus, with related combinatorial Hopf algebras and application to multizeta values;
- a new family of resurgent functions related to Knot Theory.

Topics in Modern Regularity Theory
edited by Giuseppe Mingione

2012
ISBN 978-88-7642-426-7
e-ISBN 978-88-7642-427-4
pp. XI-202, € 29.00

This book contains lecture notes of a series of courses on the regularity theory of partial differential equations and variational problems, held in Pisa and Parma in the years 2009 and 2010. The contributors, Nicola Fusco, Tristan Rivière, Ernst Kuwert and Reiner Schätzle, provide three updated and extensive introductions to various aspects of modern Regularity Theory concerning: mathematical modelling of thin films and related free discontinuity problems, analysis of conformally invariant variational problems via conservation laws, and the analysis of the Willmore functional. Each contribution begins with a very comprehensive introduction, and is aimed to take the reader from the introductory aspects of the subject to the most recent developments of the theory.



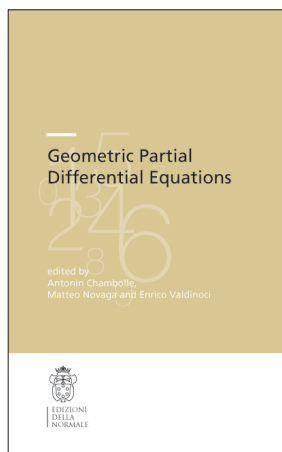
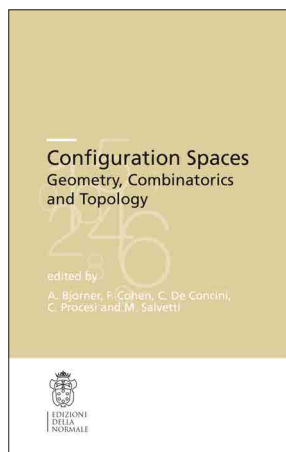
**Configuration Spaces
Geometry,
Combinatorics and
Topology**
edited by **Anders
Bjorner, Corrado De
Concini, Claudio Procesi
and Mario Salvetti**
2012
ISBN 978-88-7642-430-4
e-ISBN 978-88-7642-431-1
pp. XIX-536, € 29.00

These proceedings contain the contributions of some of the participants in the "intensive research period" held at the De Giorgi Research Center in Pisa, during the period May-June 2010. The central theme of this research period was the study of Configuration Spaces from various points of view. This topic originated from the intersection of several classical theories: Braid groups and related topics, configurations of vectors (of great importance in Lie theory and Representation theory), Arrangements of Hyperplanes and of Subspaces, Combinatorics, Singularity theory. Recently, however, Configuration Spaces have acquired independent interest and indeed the contributions in this volume go far beyond the above subjects, making it attractive to a large audience of mathematicians.

**Geometric Partial
Differential Equations**
edited by **Antonin
Chambolle, Matteo
Novaga and Enrico
Valdinoci**
2013
ISBN 978-88-7642-472-4
e-ISBN 978-88-7642-473-1
€ 29.00

This book is the outcome of a conference held at the Centro di Ricerca Matematica Ennio De Giorgi in September 2012. The aim of the conference was to discuss recent results on nonlinear partial differential equations, and more specifically geometric evolutions and reaction-diffusion equations. Particular attention was paid to self-similar solutions, such as solitons and travelling waves, asymptotic behaviour, formation of singularities and qualitative properties of solutions. These problems arise in many models, in Physics, Biology, Image Processing and Applied Mathematics in general, and have attracted a lot of attention in recent years.

20



The Seventh European Conference on Combinatorics, Graph Theory and Applications EuroComb 2013
 edited by Jaroslav Nešetřil and Marco Pellegrini
 2013
 ISBN 978-88-7642-474-8
 e-ISBN 978-88-7642-475-5
 € 29.00

In the tradition of EuroComb'01 (Barcelona), Eurocomb'03 (Prague), EuroComb'05 (Berlin), Eurocomb'07 (Seville), Eurocomb'09 (Bordeaux), and Eurocomb'11 (Budapest), this volume covers recent advances in Combinatorics and Graph Theory, including applications in other areas of Mathematics, Computer Science and Engineering. Topics include, but are not limited to: Algebraic Combinatorics, Combinatorial Geometry, Combinatorial Number Theory, Combinatorial Optimization, Designs and Configurations, Enumerative Combinatorics, Extremal Combinatorics, Ordered Sets, Random Methods, Topological Combinatorics. The volume includes about 100 extended abstracts accepted by the Program Committee of Eurocomb 2013, formed by 24 experts in the field. This makes Eurocomb 2013 held in Pisa one of the most selective meetings in the field of combinatorics and discrete mathematics worldwide.



**Gerolamo Saccheri
 Euclide vendicato da ogni neo**
 a cura di
Vincenzo De Risi
 2011
 vol. I, Edizione del testo, pp. LXXIX-252
 vol. II, Riproduzione anastatica, pp. XVI-142 e 6 ill.
 ISBN 978-88-7642-404-5
 € 40.00

La collana *Mathematica*, che si apre con questo volume, propone l'edizione cartacea e digitale di alcuni tra i più significativi autori e testi della tradizione matematica italiana, dal Medioevo al primo Novecento. Essa intende in particolare favorire una rinnovata circolazione di opere rare, mettendo a disposizione degli studiosi, e più in generale di un pubblico colto, testi difficilmente reperibili o dei quali non esista ancora un'edizione moderna. In questo ambito particolare rilievo ha una figura come quella del matematico Gerolamo Saccheri (1667-1733), di cui Vincenzo De Risi presenta qui una delle opere fondamentali in una traduzione corredata di apparato critico. Un importante e assai documentato saggio introduttivo getta luce sulla genesi e sulla fortuna dell'opera divenuta, al di là delle intenzioni del suo autore, una sorta di atto fondativo delle ricerche sulle geometrie non euclidee.

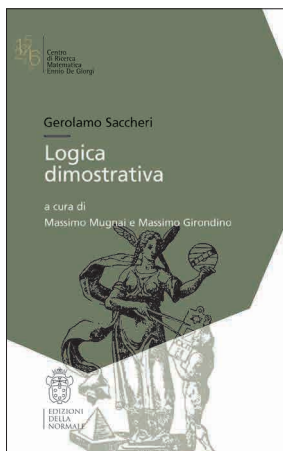
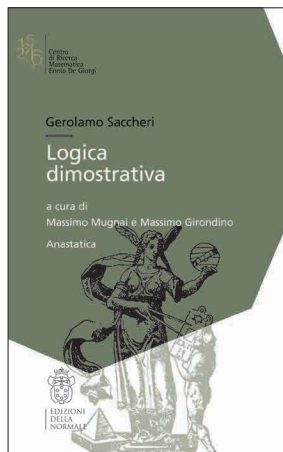


Ruggiero Giuseppe Boscovich
Viaggio astronomico e geografico nello Stato della Chiesa (1750-1752)
 introduzione di **Luigi Pepe**
 traduzione e note di **Stefano Franchini**
 2011
 ISBN 978-88-7642-422-9
 pp. xxviii-144, € 20.00



Nel Settecento Ruggiero Giuseppe Boscovich era considerato uno dei più autorevoli scienziati della sua epoca e certamente i contributi che egli ha offerto sono stati assai importanti e continuano ad essere degni di attenzione. In occasione del terzo centenario della nascita - era nato a Ragusa il 18 maggio 1711 -, le Edizioni della Normale pubblicano nella collana Mathematica il *Viaggio astronomico e geografico nello Stato della Chiesa*, uno dei suoi testi più affascinanti sia sul piano scientifico che su quello letterario.

Gerolamo Saccheri
Logica dimostrativa
 a cura di **Massimo Mugnai**
 e **Massimo Gironidino**
 2012
 vol. I, Edizione del testo,
 pp. LXVIII-295
 vol. II, Riproduzione
 anastatica, pp. 170
 ISBN 978-88-7642-437-3
 € 40.00



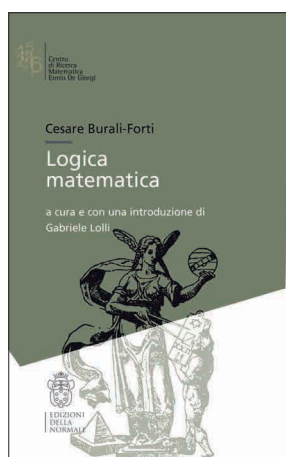
Dopo che Giovanni Vailati, in un celebre saggio del 1903, richiamò l'attenzione sulla *Logica dimostrativa* di Gerolamo Saccheri, quest'opera fu ben presto avvolta da una sorta di 'aura mitica'. Per lungo tempo, la rarità del testo e il ruolo peculiare che in esso era attribuito alla regola logica della cosiddetta *consequentia mirabilis*, ne fecero un'opera di culto, che molti menzionavano ma che pochissimi avevano letto. In quest'edizione, per la prima volta, si situa la *Logica dimostrativa* nel contesto storico-culturale che le fu proprio, mettendo in rilievo come, pur mantenendo tratti di originalità, sia un'opera che deve molto alla tradizione logica del tempo, finora in gran parte inesplorata. Il testo tradotto in italiano è ampiamente commentato e corredato da documenti sulla vita e l'attività filosofico-teologica di Saccheri. L'introduzione e le note forniscono una bussola che consente al lettore di orientarsi nei meandri di una dottrina per molti aspetti desueta, che però ha costituito per secoli lo standard dell'insegnamento della logica nella cultura occidentale.

Cesare Burali-Forti
Logica matematica
a cura e con una
introduzione di
Gabriele Lolli

2012

ISBN 978-88-7642-391-8
pp. LXIII-373, € 30.00

A soli cinque anni dall'inizio della costruzione della pasigrafia da parte di Giuseppe Peano, Cesare Burali-Forti pubblica nel 1894 il volume *Logica matematica* firmando quello che si può considerare il primo manuale di logica simbolica moderna. Ma l'interesse e il valore di quest'opera non si riducono a una priorità di carattere storico: come dimostra Gabriele Lolli in un'ampia introduzione, essa, oltre a essere una presentazione esauriente della sua logica, rimane un punto di riferimento essenziale, anche rispetto alla seconda edizione pubblicata nel 1919.

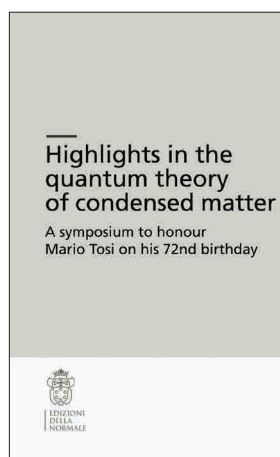


Highlights in the quantum theory of condensed matter. A symposium to honour Mario Tosi on his 72nd birthday
edited by **Fabio Beltram**

2005
ISBN 88-7642-170-x
pp. XIX-282, € 23.00

The birth of condensed matter physics in Italy is linked to a small number of very distinguished scientists. Mario Tosi, Professor of Physics of Matter at the Scuola Normale Superiore, is unquestionably among the leading figures, a true founder of the theoretical activity in the country and a true catalyst of novel research directions internationally. This volume collects the proceedings of a symposium held at Scuola Normale Superiore, designed to show Mario Tosi's broad, deep influence in very diverse areas of the quantum theory of condensed matter. The topics covered in the volume represent the breadth of his interests and the highlights in the quantum theory of condensed matter:

- Liquids
- Electronic states in complex structures
- Quantum degenerate gases
- Many-body physics



**Alexander Holevo
Probabilistic and
Statistical Aspects of
Quantum Theory**

2011

ISBN 978-88-7642-375-8

e-ISBN 978-88-7642-378-9

pp. xvi-323, € 28.00

This book is devoted to aspects of the foundations of Quantum Mechanics in which probabilistic and statistical concepts play an essential role. The main part of the book concerns the quantitative statistical theory of quantum measurement, based on the notion of Positive Operator-valued Measures (opp: a Positive Op-val Measure). During the past years there has been substantial progress in this direction, stimulated to a great extent by new applications such as Quantum Optics, Quantum Communication and high-precision experiments. The questions of statistical interpretation, quantum symmetries, theory of canonical commutation relations and Gaussian states, uncertainty relations, as well as new fundamental bounds concerning the accuracy of quantum measurements, are discussed in this book in an accessible yet rigorous way. Compared to the first edition, there is a new Supplement devoted to the hidden variable issue. Comments and the bibliography have also been extended and updated.

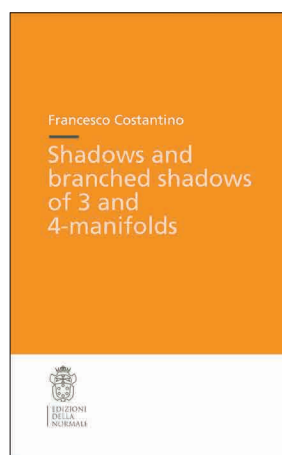
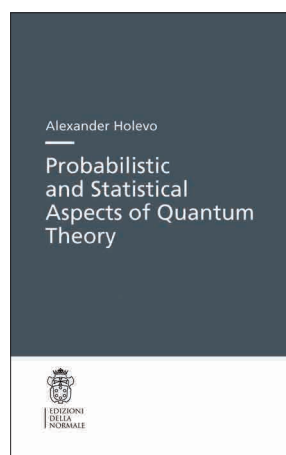
**Francesco Costantino
Shadows and branched
shadows
of 3 and 4-manifolds**

2005

ISBN 88-7642-154-8

pp. xx-183, € 10.00

The theory of shadows of 3 and 4-manifolds represents a bridge between combinatorics of polyhedra and low-dimensional topology. On one side, it allows a purely combinatorial approach to the study of smooth 4-manifolds and, on the other side, it indicates relations between old-standing problems in group theory and recent topological results on 4-dimensional manifolds. The present Ph.D. thesis is devoted to further develop these connections and to find new applications to low-dimensional topology. The results proved, for the most part, seem to strengthen the idea that topology of 3-manifolds can be used as a guide to study the 4-dimensional case and that polyhedra can be used as a 'bridge': in many cases the 4-dimensional results based on shadows restrict through the theory of spines to results about 3-dimensional topology and geometry. On the 3-dimensional side, a new notion of 'shadow-complexity' of 3-manifolds is defined.



Stefano Francaviglia
Hyperbolicity equations for cusped 3-manifolds and volume-rigidity of representations

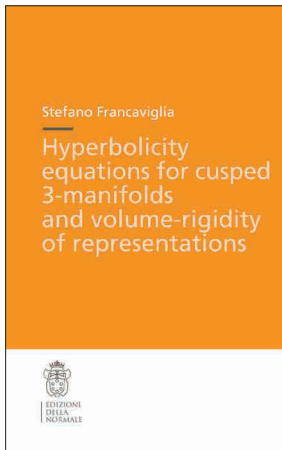
2005

ISBN 88-7642-167-x

pp. 136, € 10.00

One of the most useful tools for studying hyperbolic 3-manifolds is the technique of ideal triangulations, introduced by Thurston to understand the hyperbolic structure of the complement of the figure-eight knot. If a 3-manifold is equipped with an ideal triangulation, one tries to construct a hyperbolic structure on the manifold by defining the structure on each tetrahedron and then by requiring global compatibility. Straight hyperbolic ideal tetrahedra are parameterized by complex numbers with positive imaginary part, and compatibility translates into algebraic equations in the parameters.

In most of this work we consider generalized solutions of the compatibility equations, without restrictions on the imaginary part, and we investigate which such solutions define a global structure.



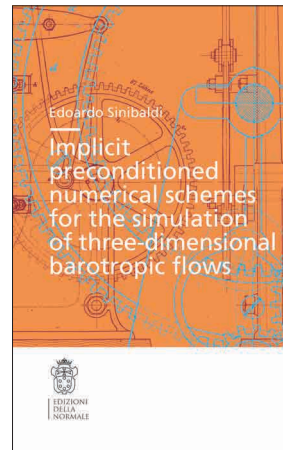
Edoardo Sinibaldi
Implicit preconditioned numerical schemes for the simulation of three-dimensional barotropic flows

2007

ISBN 978-88-7642-310-9

pp. ix-206, € 18.00

By starting from a specific industrial problem related to the propellant flow within a liquid propellant rocket engine, a numerical method for simulating three-dimensional, generic barotropic flows in rotating frames is developed. A novel finite volume compressible approach for unstructured grids is proposed, suitably preconditioned for accurately dealing with nearly-incompressible flows; the time-advancing is performed by a novel, generic, linearized implicit scheme. A constructive procedure for solving the one-dimensional Riemann problem associated with a generic convex barotropic state law is presented as well. All the proposed numerical ingredients are validated against one-dimensional exact solutions or three-dimensional experimental data related to complex, industrial flows also involving cavitation phenomena.



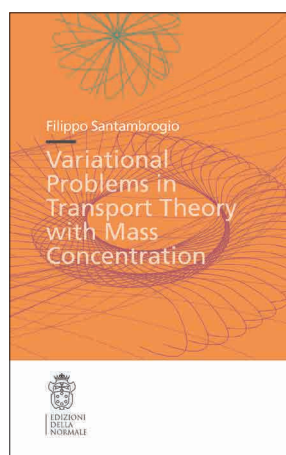
**Filippo Santambrogio
Variational Problems in
Transport Theory with
Mass Concentration**

2007

ISBN 978-88-7642-312-3

pp. VII-196, € 18.50

The thesis mainly deals with variational problems involving optimal transportation of probability measures, in competition with concentration effects. First, some problems where measures have to be selected minimizing transport costs between them but satisfying some concentration criteria are presented in the first chapters, with possible applications mainly to urban planning (where the concentrated measures stand for services in the city and the diffuse ones for population). A second part of the thesis is devoted to optimization problems where the concentration or diffusion phenomena occur directly at the level of the transportation structure: for instance in most communication networks, as well as in river basins and blood vessels joint transportation is favoured, while some models for traffic congestion or compressible fluid mechanics give rise to problems where spread configurations are preferred.



**Mohammad Reza
Bakhtiari
Quantum Gases in
Quasi-One-Dimensional
Arrays**

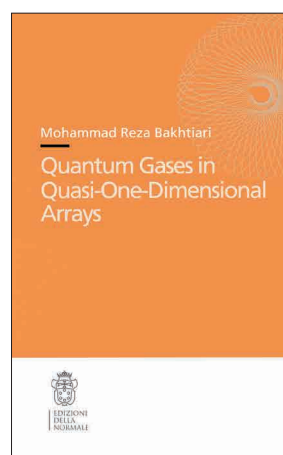
2007

ISBN 978-88-7642-319-2

pp. IX-168, € 18.50

The experimental achievement of Bose-Einstein condensation (1995) and of Fermi degeneracy (1999) in ultra-cold, dilute gases has opened a new field in atomic physics and condensed matter physics.

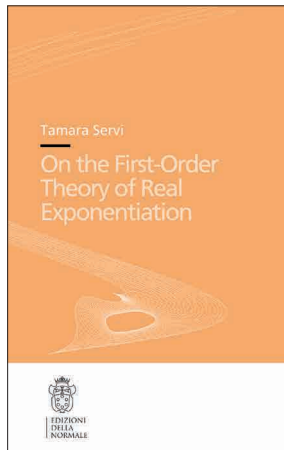
In this thesis, first an overview of theoretical and experimental facts on ultra-cold atomic gases is presented. Then a Green's function scheme to study coherent transport by fermions through a one-dimensional array of potential wells is described. Within this scheme different geometries for the array like single-period, double-period and Fibonacci-ordered quasi-periodic array are considered. In conclusion, a novel spin-density-functional approach is introduced to study the ground-state of a one-dimensional trapped Fermi gases inside one-dimensional optical lattices. This approach enables the author to investigate both repulsive and attractive Fermi gases within a local-spin-density approximation. Different phases caused by a spin-dependent trap for repulsive gas and also by a spin-imbalanced population for attractive gas are analyzed.



Tamara Servi
**On the First-Order
Theory of Real
Exponentiation**
2008

ISBN 978-88-7642-325-3
pp. XII-110, € 18.50

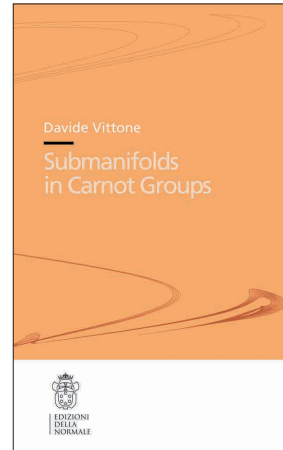
The first-order theory of real exponentiation has been studied by many mathematicians in the last fifty years, in particular by model theorists, real geometers and number theorists. The aim of this work is to present the results obtained so far in this area and to improve and refine them. In the early 1990s A. Macintyre and A.J. Wilkie proved that the theory of real exponentiation is decidable, provided that Schanuel's conjecture holds. In the proof of their result, they proposed a candidate for a complete and recursive axiomatization of the theory. While simplifying their axiomatization, the author of this book analyses (in the first three chapters) the model theory and geometry of a broad class of functions over real closed fields. Even though the methods used are elementary, the results hold in great generality. The last chapter is devoted solely to the decidability problem for the real exponential field.



Davide Vittone
**Submanifolds in Carnot
Groups**
2008

ISBN 978-88-7642-327-7
pp. XX-178, € 18.50

The book is devoted to the study of submanifolds in the setting of Carnot groups equipped with a sub-Riemannian structure; particular emphasis is given to the case of Heisenberg groups. A Geometric Measure Theory viewpoint is adopted, and features such as intrinsic perimeters, Hausdorff measures, area formulae, calibrations and minimal surfaces are considered. Area formulae for the measure of submanifolds of arbitrary codimension are obtained in Carnot groups. Intrinsically regular hypersurfaces in the Heisenberg group are extensively studied: suitable notions of graphs are introduced, together with area formulae leading to the analysis of Plateau and Bernstein type problems.



Alessio Figalli
**Optimal Transportation
and Action-Minimizing
Measures**

2008

ISBN 978-88-7642-330-7

pp. XIX-251, € 18.50

In this book recent developments in the theory of optimal transportation and some of its applications to fluid dynamics are described.

New variants of the original problem are explored and some common (and sometimes unexpected) features in this emerging variety of problems are figured out.

In Chapter 1 the optimal transportation problem on manifolds with geometric costs coming from Tonelli Lagrangians is studied, while in Chapter 2 a generalization of the classical transportation problem called the optimal irrigation problem is considered. Then, Chapter 3 is about the Brenier variational theory of incompressible flows, which concerns a weak formulation of the Euler equations viewed as a geodesic equation in the space of measure-preserving diffeomorphism. Chapter 4 is devoted to the study of regularity and uniqueness of solutions of Hamilton-Jacobi equations applying the Aubry-Mather theory. Finally, the last chapter deals with a DiPerna-Lions theory for martingale solutions of stochastic differential equations.

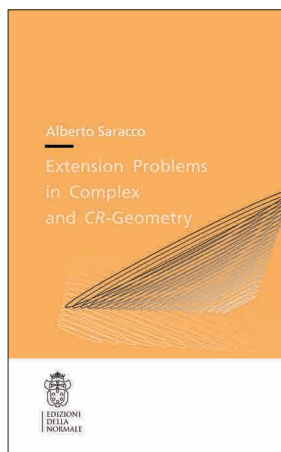
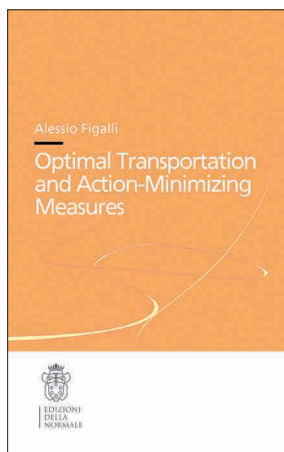
Alberto Saracco
**Extension Problems
in Complex and
CR-Geometry**

2008

ISBN 978-88-7642-338-3

pp. XIV-153, € 18.50

This book is both a survey of some aspects of extension problems in Complex Analysis and Geometry and a collection of results by the author. After recalling the preliminary and necessary notions of complex analysis, the survey focuses on extension of holomorphic functions (filling both compact and non-compact holes), on the reflection principle, on extension results via cohomology vanishing, and on the boundary problem. The last two subjects include detailed results by the author on non-compact extension: the cohomology of semi q -coronae and the unbounded boundary problem.



Luigi Manca
Kolmogorov Operators
in Spaces of Continuous
Functions and Equations
for Measures

2008

ISBN 978-88-7642-336-9

pp. xiv-127, € 18.50

The book is devoted to study the relationships between Stochastic Partial Differential Equations and the associated Kolmogorov operator in spaces of continuous functions.

In the first part, the theory of a weak convergence of functions is developed in order to give general results about Markov semigroups and their generator.

In the second part, concrete models of Markov semigroup deriving from Stochastic PDEs are studied. In particular, Ornstein-Uhlenbeck, reaction-diffusion and Burgers equations have been considered. For each case the transition semigroup and its infinitesimal generator have been investigated in a suitable space of continuous functions.

The main results consist in showing that the set of exponential functions provides a core for the Kolmogorov operator.

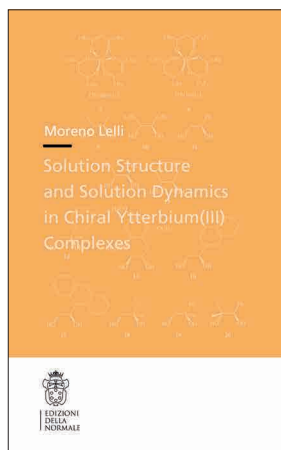
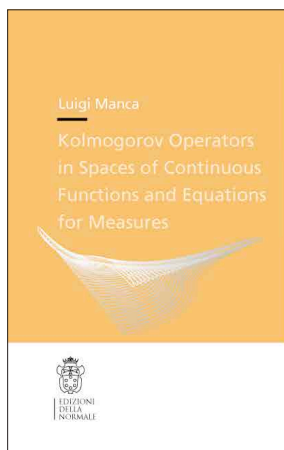
Moreno Lelli
Solution Structure
and Solution Dynamics
in Chiral Ytterbium(III)
Complexes

2009

ISBN 978-88-7642-349-9

pp. xvii-169, € 18.50

The determination of the molecular structure in solution is an important target of the modern chemistry. In many fields, the knowledge of the structural and the dynamics information in solution are a fundamental tool for a complete understanding of chemical processes, from catalytic mechanisms to biological activities of proteins. This book proposes a methodology to investigate the structure and the dynamics in solution of chiral ytterbium(III) complexes, based on a combined use of spectroscopic techniques such as Nuclear Magnetic Resonance and Circular Dichroism. This method has been applied here to the study of several ytterbium(III) complexes, recently proposed in scientific literature as catalysts for stereoselective organic reactions. The results evidenced that the structure in solution is sometime different from that one obtained in the solid state from X-ray crystallographic diffraction, furnishing a more suitable basis for the investigation of the catalytic mechanism in solution phase. Furthermore, one chapter has been dedicated to the use of Yb(III) ions as probe for the determination of the absolute configuration of an important class of molecules such as chiral 1,2-diols. This is also an example to how this methodology can be extended to other fields of chemistry.



Gianluca Crippa
**The Flow Associated
to Weakly Differentiable
Vector Fields**

2009

ISBN 978-88-7642-340-6

pp. xv-163, € 18.50

The aim of this book is to provide a self-contained introduction and an up-to-date survey on many aspects of the theory of transport equations and ordinary differential equations with non-smooth velocity fields. The interest in this topic is motivated by important issues in nonlinear PDEs, in particular conservation laws and fluid mechanics. A fascinating feature of this research area, which is currently of concern in mathematics, is the interplay between PDE techniques and geometric measure theory techniques.

Several masterpieces appear in the related literature, balancing completely rigorous proofs with more heuristic arguments. A consistent part of the book is based on results obtained by the author in collaboration with other mathematicians. After a short introduction to the classical smooth theory, the book is divided into two parts. The first part focuses on the PDE aspect of the problem, presenting some general tools of this analysis, many well-posedness results, an abstract characterization of the well-posedness, and some examples showing the sharpness of the assumptions made. The second part, instead, deals with the ODE aspect of the problem, respectively by an abstract connection with the PDE, and by some direct and simple (but powerful) a priori estimates.

Filippo Callegaro
**Cohomology of Finite
and Affine Type
Artin Groups over
Abelian Representations**

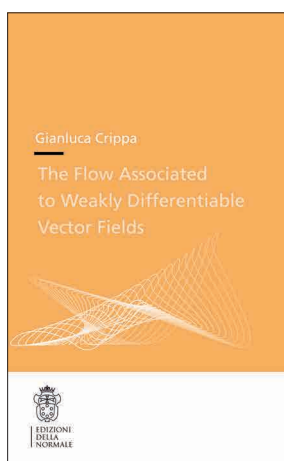
2009

ISBN 978-88-7642-345-1

pp. xix-137, € 18.50

The classical theory of braids is deeply connected with the theory of reflection groups and there are many relations between Artin groups and Coxeter groups. It turns out that the classifying spaces of Artin groups of finite type are affine varieties, the complement of the singularities associated to Coxeter groups.

In order to study the topology of the Milnor fiber of these non-isolated singularities together with the monodromy action it is useful to compute the cohomology of the Artin groups with coefficients in an abelian representation. In this book a description of this cohomology for Artin groups of type A and B and for affine Artin groups of the same type is given



Giuseppe Della Sala
Geometric Properties
of Non-compact CR
Manifolds

2010

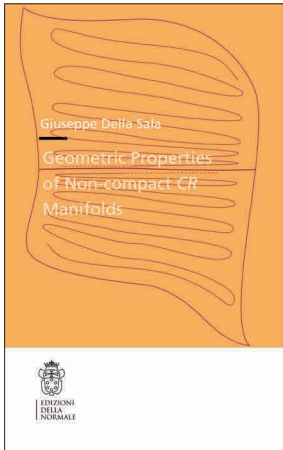
ISBN 978-88-7642-348-2

pp. xv-103, € 18.50

The book deals with some questions related to the boundary problem in complex and in CR geometry. After a brief introduction summarizing the main results on the extension of CR functions, it is shown in chapters 2 and 3 that, employing the classical Harvey-Lawson theorem and under suitable conditions, the boundary problem for non-compact maximally complex real submanifolds of C_n , $n \geq 3$ is solvable.

In chapter 4, the regularity of Levi flat hypersurfaces C_n ($n \geq 3$) with assigned boundaries is studied in the graph case, in relation to the existence theorem proved by Dolbeault, Tomassini and Zaitsev.

Finally, in the last two chapters the structure properties of non-compact Levi-flat submanifolds of C_n are discussed; in particular, using the theory of the analytic multifunctions, a Liouville theorem for Levi flat submanifolds of C_n is proved.



Paola Boito
Structured Matrix
Based Methods for
Approximate Polynomial
GCD

2011

ISBN 978-88-7642-380-2

e-ISBN 978-88-7642-381-9

pp. xvi-199, € 18.50

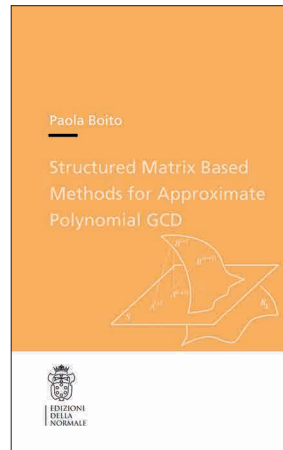
Defining and computing a greatest common divisor of two polynomials with inexact coefficients is a classical problem in symbolic-numeric computation.

The first part of this book reviews the main results that have been proposed so far in the literature.

As usual with polynomial computations, the polynomial GCD problem can be expressed in matrix form: the second part of the book focuses on this point of view and analyses the structure of the relevant matrices, such as Toeplitz, Toeplitz-block and displacement structures.

New algorithms for the computation of approximate polynomial GCD are presented, along with extensive numerical tests.

The use of matrix structure allows, in particular, to lower the asymptotic computational cost from cubic to quadratic order with respect to polynomial degree.



**Federico Poloni
Algorithms for
Quadratic Matrix
and Vector Equations**

2011

ISBN 978-88-7642-383-3

e-ISBN 978-88-7642-384-0

pp. XVI-235, € 18.50

This book is devoted to studying algorithms for the solution of a class of quadratic matrix and vector equations.

These equations appear, in different forms, in several practical applications, especially in applied probability and control theory.

The equations are first presented using a novel unifying approach; then, specific numerical methods are presented for the cases most relevant for applications, and new algorithms and theoretical results developed by the author are presented.

The book focuses on “matrix multiplication-rich” iterations such as cyclic reduction and the structured doubling algorithm (SDA) and contains a variety of new research results which, as of today, are only available in articles or preprints.

**Guido De Philippis
Regularity of Optimal
Transport Maps and
Applications**

2013

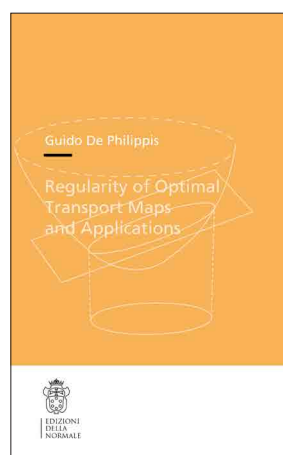
ISBN 978-88-7642-456-4

e-ISBN 978-88-7642-458-8

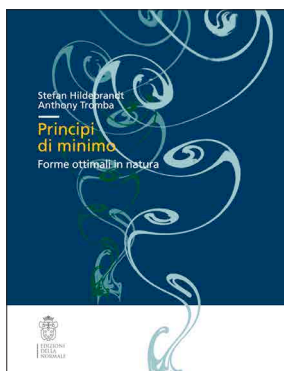
pp. XIX-165, € 18.50

This book concerns with the regularity of optimal transport maps and its applications to the semi-geostrophic system. The first two chapters survey the known theory; in particular a self-contained proof of Brenier's theorem on existence of optimal transport maps and of Caffarelli's theorem on Hölder continuity of optimal maps are included.

In the third and fourth chapters the Sobolev regularity of optimal transport maps is involved, while in Chapter 5 the above-mentioned results lead to a proof of the existence of an Eulerian solution to the semi-geostrophic equation. Chapter 6 is about partial regularity of optimal maps with respect to a generic cost function. More precisely it is shown that if the target and source measures have smooth densities then the optimal map is always smooth outside a closed set of measure zero.



**Stefan Hildebrandt,
Anthony Tromba**
Principi di minimo
Forme ottimali in natura
2007 (ristampa)
ISBN 88-7642-178-5
pp. 295, ill. a colori,
€ 35.00



Perché le uova sono a forma di uova, e i pesci a forma di pesce? Perché i pianeti e le stelle sono a forma di sfera piuttosto che di quadrato o piramide? Che cosa può spiegare le somiglianze tra forme e la loro varietà in natura? Sono queste alcune delle domande alle quali Stefan Hildebrandt e Anthony Tromba tentano di dare una risposta in *Principi di minimo*. Trattando del calcolo delle variazioni - una branca della matematica che si occupa di forme ottimali in geometria ed in natura, con problemi di massimo e di minimo -, gli autori cercano di rintracciare le leggi fondamentali che governano gli schemi di design della natura e integrano la trattazione scientifica con un ricco apparato di illustrazioni e di esempi: dai nuclei atomici alle bolle di sapone, dalle spirali ai frattali. Questo libro è la traduzione di *The Parsimonious Universe* (New York, Springer 1996), che a sua volta è una versione riveduta e ampliata dell'originale pubblicato da W.H. Freeman nel 1984 con il titolo *Mathematics and Optimal Form*. In seguito sono apparse traduzioni in tedesco, francese, olandese, spagnolo e giapponese.

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