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Editor: Saul LUBKIN

Recent Progress in Functional Analysis

Klaus D. BIERSTEDT
José BONET
Manuel MAESTRE
Jean SCHMETS
Editors

RECENT PROGRESS IN FUNCTIONAL ANALYSIS

Proceedings of the International Functional Analysis Meeting
on the Occasion of the 70th Birthday of
Professor Manuel Valdivia, Valencia, Spain, July 3–7, 2000

Edited by

Klaus D. BIERSTEDT
University of Paderborn
Paderborn, Germany

José BONET
Technical University of Valencia
Valencia, Spain

Manuel MAESTRE
University of Valencia
Valencia, Spain

Jean SCHMETS
University of Liège
Liège, Belgium



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RECENT PROGRESS IN FUNCTIONAL ANALYSIS

NORTH-HOLLAND MATHEMATICS STUDIES 189
(Continuation of the Notas de Matemática)

Editor: Saul LUBKIN
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PREFACE

During its meeting before the Second European Congress in Mathematics in Budapest in 1996, the Council of the European Mathematical Society decided that the Third European Congress of Mathematics would be held in Barcelona in July 2000. Klaus D. Bierstedt, a member of this Council, who had also been one of the organizers of the International Functional Analysis Meeting on the Occasion of the 60th Birthday of Professor M. Valdivia at Peñíscola, Spain, October 22–27, 1990, immediately suggested to organize a satellite meeting on functional analysis in Valencia during the week before the Third European Congress. José Bonet and Manuel Maestre from the two universities of Valencia agreed with this suggestion and decided to hold such a meeting, ten years after the one in Peñíscola, and now on the occasion of the 70th birthday of Professor Valdivia. The preparations for the conference started in 1998, the Scientific Committee was formed, and the first Plenary Speakers were invited.

The Proceedings of the International Functional Analysis Meeting of 1990 had been published as volume 170 (1992) in the series North-Holland Math. Studies. During the International Congress of Mathematicians 1998 in Berlin, Bierstedt and Bonet asked Drs. Arjen Sevenster, Associate Publisher of Elsevier Science, if the Proceedings of the meeting in Valencia in 2000 could again be published in the series North-Holland Math. Studies, one year after the conference. The reaction of Sevenster was very positive; the contract was signed some months later. We thank Drs. Sevenster and the Elsevier/North-Holland company for publishing this book.

The preface of the Proceedings of the Peñíscola meeting contained a short summary of the merits of Professor Valdivia, and the first article in the book, “The mathematical works of Manuel Valdivia” by J. Horváth, gave a report on his books and articles up to 1990. Since then Valdivia had gone on to publish many important results, some of them in joint work with the President of the Belgian Mathematical Society, Professor Jean Schmets. Hence it was natural to ask Schmets to report on the recent work of Valdivia at the meeting in Valencia. Schmets accepted; his article “The mathematical works of Manuel VALDIVIA, II” is the first one in the present Proceedings volume.

Soon it became clear that the International Functional Analysis Meeting in Valencia in 2000 would be much bigger and broader in scope than the one in Peñíscola. In addition to the special talk of Jean Schmets, there were 16 Plenary Lectures of 50 minutes, by well-known specialists from 8 countries, as originally planned. However, the organizers had not anticipated in the beginning that there would be more than 300 participants in the end. And so many abstracts were submitted that, only a few weeks before the meeting, it was finally decided to group the 176 parallel talks of 25 minutes in 10 Special Sessions and to let each Special Session have its own organizers. In addition, 24 posters were presented in three Poster Sessions.

We take the opportunity to thank the people of the Atlas Mathematical Conference Abstracts (AMCA) server at York University, Canada, and here especially Elliott Pearl, for providing an excellent service for the submission of the abstracts of the participants via WWW and for the preparation of the booklet. Announcements of the meeting and several

circular letters were distributed by e-mail and by Internet. The homepages of the meeting, with much pertinent information and many useful links, were designed and maintained in the Department of Mathematics and Computer Science at the University of Paderborn by Dr. Silke Holtmanns to whom special thanks are due.

We thank various sponsors, in particular the Universidad Politécnica de Valencia, for contributing money and the facilities for the meeting. Among other things, these contributions made it possible to waive the conference fee and to offer free accommodation and lunches in Valencia to 29 participants from Eastern Europe, from countries of the former Soviet Union, as well as from countries of the Third World. More than twice as many mathematicians had applied for such grants, and the selection process was painful for the Scientific Committee since a much larger number of them would have deserved grants. – Finally, this may be the right point to also thank the members of the Scientific Committee and of various other committees and the organizers of the Special Sessions for their efficient help. (A list of the sponsors, of all the committees, of all Special Sessions and their organizers, the schedule of the meeting, as well as the schedules of the Special Sessions, can be found in the editorial part of this book.)

The organization took much more time and energy than expected. The arrival day was hectic. The week of the meeting turned out to be one of the hottest of the summer of 2000 in Valencia. On Monday, the highest temperature was 39 degrees, and even after midnight there remained 31 degrees. The air condition cooled down the main lecture hall in the Rectorado so much that some participants ended up with a cold. On the other hand, some of the smaller lecture rooms for the Special Sessions did not have any air condition at all, and the speakers (and the audience) suffered from the heat. Fortunately enough, Wednesday afternoon was not as hot as Monday, or else the excursion to Xàtiva would have ended in a virtual disaster. (Temperatures in Xàtiva during the summer are usually five degrees higher than in Valencia.) In fact, both excursions to Xàtiva and to the Hemisferic and Science Museum (on Friday) turned out fine. The participants will remember the Castillo of Xàtiva with its beautiful scenic views, the picturesque center of this town, and the spectacular new buildings of the City of Arts and Sciences in Valencia.

But for the success of a meeting in mathematics, it is mathematics which is by far the most important thing, and in this respect the meeting was very successful indeed. Many interesting lectures and posters were presented during the meeting, and it was reported on plenty of deep and important theorems: the mathematics was first-rate. It remains to thank the speakers for their excellent, well-prepared and inspiring talks, the chairpersons for their help, and the audience for persistent interest and stimulating discussions.

All the Plenary Speakers had been invited, and all the other participants had the opportunity, to submit an article to this Proceedings volume. The original deadline was November 30, 2000, but the last paper published here, by one of the Plenary Speakers, arrived at Paderborn only in early March 2001. Part of the Scientific Committee also served as editors of the book. 12 contributions by Plenary Speakers and 37 articles by other participants were submitted and refereed. We thank the referees very much; some of them took their job very seriously. Many comments and criticisms were made which definitely helped to improve several articles, sometimes not only in the exposition or by

removing misprints. 17 articles had to be rejected, revisions of some of which, according to the remarks of referees, would actually have been publishable in a good mathematical journal. The editors regret the limitations of space (the book was supposed to have about 400 pages) and time. Still, the original deadline for the submission of the final manuscript to Elsevier (March 1, 2001) was exceeded by more than two months. We thank Ms. Dudeck for compiling the editorial part of the book in Paderborn.

As a glance at the table of contents shows, the present Proceedings volume contains 32 articles on various interesting areas of present-day functional analysis and its applications: Banach spaces and their geometry, operator ideals, Banach and operator algebras, operator and spectral theory, Fréchet spaces and algebras, function and sequence spaces. The reports we received from the (sometimes very prominent) referees confirmed our impression that the authors have taken much care with their articles and that many of the papers present important results and methods in active fields of research. Several survey type articles (at the beginning and the end of the book) will be very useful for mathematicians who wants to learn “what’s going on” in some particular field of research. We hope, and are quite confident, that this collection of papers, dedicated to Professor Manuel Valdivia on the occasion of his 70th birthday, with best wishes for the future, will prove helpful, valuable and inspiring for anybody interested in functional analysis and related fields.

Paderborn/Valencia/Liège, May 2001

Klaus D. Bierstedt, José Bonet, Manuel Maestre, Jean Schmets

INTERNATIONAL FUNCTIONAL ANALYSIS MEETING
on the Occasion of the 70th Birthday of Professor M. Valdivia
Valencia, Spain, 3 - 7 July 2000
(a Satellite Conference to the Third European Congress of
Mathematics in Barcelona)

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The Local Committee would like to extend special thanks to the following colleagues of the Universidad Politécnic who have been very helpful with the organization of the meeting:

- Alberto Conejero,
- David Jornet,
- Félix Martínez Giménez,
- María José Rivera,
- Enrique Sánchez.

Bust of Don Manuel Valdivia



Bust of Don Manuel Valdivia, a gift of his friends, unveiled during the Opening Ceremony
Sculptor: Danuta Pustkowska, wife of V. Montesinos, graduate in History of Art (Université de Liège, Belgium) and graduate in Fine Arts (Universidad Politécnica de Valencia)

INTERNATIONAL FUNCTIONAL ANALYSIS MEETING
on the Occasion of the 70th Birthday of Professor M. Valdivia
Valencia, Spain, 3 - 7 July 2000

SCHEDULE

Monday, July 3

- 9.30 E. Effros, On the local structure of non-commutative L_1 -spaces
 Chair: R. Payá
- 10.30 D. Vogt, The space of real analytic functions has no basis
 Chair: K. D. Bierstedt
- 11.30 Coffee break
- 12.00 - **Opening Ceremony, including:**
- 13.30 J. Schmets, The recent mathematical work of Manuel Valdivia
- 14.00 Lunch
- 15.30 J. D. M. Wright, Wild factors linked to generic dynamics
 Chair: D. Garling
- 16.30 Coffee break
- 17.00 - Special sessions [1]
- 20.30
- 18.00 - Poster session [1]
- 20.00

Tuesday, July 4

- 9.00 J. Lindenstrauss, Affine approximation of Lipschitz mappings
 between some classes of infinite dimensional Banach spaces
 Chair: A. Lazar
- 10.00 N. J. Kalton, Applications of Banach space theory to sectorial
 operators
 Chair: L. Drewnowski
- 11.00 Coffee break
- 11.30 - Special sessions [2]
- 13.30
- 14.00 Lunch
- 15.30 A. Defant, Almost everywhere convergence of series in
 non-commutative L_p -spaces
 Chair: M. Maestre
- 16.30 Coffee break
- 17.00 - Special sessions [3]
- 20.30

Wednesday, July 5

- 9.00 H. G. Dales, Derivations from Banach algebras
Chair: J. Schmets
- 10.00 N. Tomczak-Jaegermann, Geometry, linear structure and
random phenomena in finite-dimensional normed spaces
Chair: C. Finet
- 11.00 Coffee break
- 11.30 K. Seip, Analysis at the Nyquist rate
Chair: J. Cerdà
- 12.30 T. W. Gamelin, Homomorphisms of uniform algebras
Chair: K. Floret
- 14.00 Lunch
- 16.00 Excursion by bus to Xàtiva
- 21.00 Dinner at Xàtiva

Thursday, July 6

- 9.00 R. Meise, Solution operators for linear partial differential
operators
Chair: J. Bonet
- 10.00 J. H. Shapiro, The numerical range of a composition operator
Chair: R. M. Timoney
- 11.00 Coffee break
- 11.30 - Special sessions [4]
13.30
- 14.00 Lunch
- 15.30 J. Eschmeier, Invariant subspaces for commuting contractions
Chair: M. Langenbruch
- 16.30 Coffee break
- 17.00 - Special sessions [5]
20.30
- 18.00 - Poster session [II]
20.00

Friday, July 7

- 9.00 A. Pełczyński, Sobolev spaces as Banach spaces
Chair: H. Jarchow
- 10.00 Coffee break
- 10.30 - 13.30 Special sessions [6]
- 11.00 - 13.00 Poster session [III]
- 14.00 Lunch
- 15.30 P. Wojtaszczyk, Greedy and quasi-greedy bases in Banach spaces
Chair: W. Lusky
- 16.30 Coffee break
- 17.00 - 18.00 G. Godefroy, The Szlenk index and its applications
Chair: M. Valdivia
- 18.30 - 19.30 Excursion by bus to Hemisferic and Science Museum

Saturday, July 8

- 11.00 - 13.30 **Closing Ceremony**



Professors D. García, K. Floret, M. Valdivia after the Closing Ceremony

LIST OF THE SPECIAL SESSIONS
with the Session Organizers

- **Geometry and Structure of Banach spaces**
H. Jarchow, V. Montesinos
- **Weak topologies in Banach spaces, renormings**
V. Zizler, B. Cascales
- **Operator algebras, operator spaces**
E. Sánchez
- **Operator theory, spectral theory, Banach algebras**
W. Zelazko, P. Paúl
- **Chaotic behaviour of operators and universality**
K. G. Grosse-Erdmann, A. Peris
- **Non-linear functional analysis**
M. Poppenberg, M. J. Rivera
- **Fréchet spaces, with applications to complex analysis
and (linear) partial differential operators**
P. Domański, C. Fernández
- **Function spaces and their duals**
J. Cerdà, A. Galbis
- **Topological vector spaces, duality theory**
J. Schmets, M. López Pellicer
- **Holomorphy, polynomials (in infinite dimensions)**
R. Aron, D. García.

General Schedule of the Special Sessions

Monday, 17 - 20.30 h	(number of talks in each Special Session: 7)
Weak topologies in Banach spaces, renormings	(talks 1 - 7)
Function spaces and their duals	(talks 1 - 7)
Operator algebras, operator spaces	(talks 1 - 7)
Topological vector spaces, duality theory	(talks 1 - 7)
Holomorphy, polynomials	(talks 1 - 7)
Poster Session I (18 - 20 h)	

Tuesday 11.30 - 13.30 h (number of talks in each Special Session: 4) and 17.00 - 20.20 h (7 talks)	
Geometry and structure of Banach spaces	(talks 1 - 11)
Operator theory, spectral theory, Banach algebras	(talks 1 - 11)
Function spaces and their duals	(talks 8 - 18)
Topological vector spaces, duality theory / Fréchet spaces and applications	(talk 8) (talks 1 - 10, end)
Weak topologies in Banach spaces, renormings / Topological vector spaces, duality theory	(talks 8 - 15, end) (talks 9 - 11)

Thursday, 11.30 - 13.30 h (number of talks in each Special Session: 4) and 17.00 - 20.30 h (7 talks)	
Geometry and structure of Banach spaces	(talks 12 - 22)
Operator theory, spectral theory, Banach algebras	(talks 12 - 22)
Function spaces and their duals / Topological vector spaces, duality theory	(talks 19 - 28, end) (talk 12)
Holomorphy, polynomials	(talks 8 - 18)
Chaotic behaviour of operators and universality	(talks 1 - 9, end)
Poster Session II (18 - 20 h)	