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NEWSLETTER

of the International Society of Difference Equations

Volume 8 | Issue 1 | January 2023



<http://isdeds.com/>

A LETTER FROM THE PRESIDENT



Dear ISDE members,

Warmest thoughts and best wishes for a wonderful holiday and a happy new year. May the holiday season fill your and your family's hearts with happiness and joy.

It is my pleasure to invite you to participate in the following society's conferences that will be held in the summer of 2023.

ICDEA 2023, the 28th International Conference on Difference Equations and Applications, will be held on 17-21 July, 2023 at **Phitsanulok, Thailand**

<http://icdea2023.psu.ac.th/>

Financial support for ICDEA 2023 participants is provided by the society. The application form for support may be found in the link

<http://icdea2023.psru.ac.th/Authors.php>

The annual meeting of the society will be held during ICDEA 2023, where the Aulbach prize and the best JDEA prize will be announced.

There will be another conference PODE (Progress on Difference Equations) which will be held on May 29-31, 2023 at **Milan, Italy**

<https://formazionecontinua.unicatt.it/formazione-international-conference-progress-on-difference-equations---pode-2023-e123mi00591-01>

For registration, please go to the link

<https://iscrizionionline.unicatt.it/s/events/sub?subId=a107S000004GIEh>

The society is governed by a board of directors consisting of 9 members that is elected in odd years (every two years). The board elects the president and the vice president for a two-year term. The next election will be in April 2023.

Updated information about ISDE and its activities can be found on the ISDE homepage at

<http://isdeds.com/>

You may use the login and password received via email to access ISDE Membership Directory and to make sure that the information entered is correct. If you need to make any changes to your account such as changing the email address, please send an email to me: selaydi@trinity.edu.

If your photo is not posted with your name, please send your photo to Dr. Kwessi (ekwessi@trinity.edu) to be posted on the ISDE website.

Best Wishes,
Saber Elaydi
President, ISDE

San Antonio, December 24, 2022



FOREWORD



Dear ISDE members,

The present Newsletter of the International Society of Difference Equations brings together information regarding the society events that took place during the past two years: ICDEA 2021, ICDEA 2022 and ECIT 2022, as well as about the forthcoming conferences: PODE 2023 and ICDEA 2023. In addition, a special section is dedicated to the prestigious Bernd Aulbach Prize awarded in 2021.

This newsletter has been created in a special context and represents the result of a teamwork: the section devoted to the history of ICDEA has been written jointly with Saber Elaydi, the part regarding the past ISDE conferences has been prepared jointly with Laura Gardini, Senada Kalabušić and Sorin Olaru, the Laudation for the Bernd Aulbach Prize has been provided by Azmy Ackleh and the information about the upcoming conferences is based on the materials received from Davide Radi and Wirot Tikjha. I would like to express my special thanks to all of them for this collaboration. Furthermore, we are grateful to the colleagues who gave us photos for this newsletter and to all those who contributed to its accomplishment.

I hope you will enjoy reading this newsletter and that you will attend the future conferences and events of the society. Moreover, I hope we shall meet in person somewhere soon!

With my best wishes,
Adina Luminița Sasu

Timișoara, January 2023



ICDEA

INTERNATIONAL CONFERENCE
ON DIFFERENCE EQUATIONS
AND APPLICATIONS

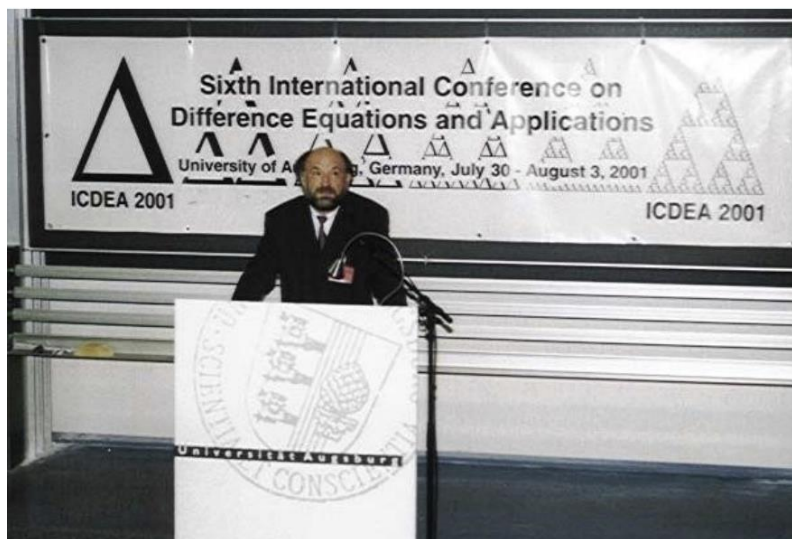
ICDEA – SHORT HISTORY

The [International Conference on Difference Equations and Applications](#) (ICDEA) is the official conference of the [International Society of Difference Equations](#).

ICDEA aims to bring together researchers and scientists from around the world, to present, discuss and offer solutions in the fields of difference equations, discrete dynamical systems, and their applications to various sciences.

The first international conference on difference equations and applications (ICDEA 1) was held in 1994 at Trinity University in San Antonio, Texas. This was the first conference ever dedicated exclusively to difference equations and discrete dynamical systems.

The next ICDEAs substantially contributed to the development of this conference and were held in Veszprém (Hungary) in 1995, Taipei (Taiwan) in 1997, Poznan (Poland) in 1998, Temuco (Chile) in 2000, Augsburg (Germany) in 2001. The impact of the ICDEA conferences has grown considerably since 2001, when the [International Society of Difference Equations](#) (ISDE) was founded at ICDEA 6.



Prof. Dr. Bernd Aulbach, the first ISDE President

The landmark ICDEA 6 in Augsburg was followed in the years to come by an important number of successful meetings held in Changsha (China) in 2002, Brno (Czech Republic) in 2003, Los Angeles (USA) in 2004, München (Germany) in 2005, Kyoto (Japan) in 2006, [Lisbon \(Portugal\)](#) in 2007, Istanbul (Turkey) in 2008, [Estoril \(Portugal\)](#) in 2009, [Riga \(Latvia\)](#) in 2010, Trois-Rivières (Quebec, Canada) in 2011, [Barcelona \(Spain\)](#) in 2012, Muscat (Oman) in 2013, Wuhan (China) in 2014, [Bialystok \(Poland\)](#) in 2015, [Osaka \(Japan\)](#) in 2016, [Timisoara \(Romania\)](#) in 2017, [Dresden \(Germany\)](#) in 2018, [London \(UK\)](#) in 2019.

Starting with [ICDEA 23](#) held at West University of Timisoara in Romania, the logo of the conference and its banner created on that occasion were adopted for the following ICDEAs and became official.

[ICDEA 26](#) was held in Sarajevo (Bosnia and Herzegovina) in 2021 and [ICDEA 27](#) was held in Paris-Saclay - Gif-sur-Yvette (France) in 2022. These two conferences will be presented later in the newsletter.

The annual General Assembly meeting of ISDE is held during every ICDEA. In this meeting, ISDE president announces the winner(s) of the Best Paper published in the official journal of the society: [Journal of Difference Equations and Applications](#) and in odd-numbered years, the winner of the prestigious [Bernd Aulbach Prize](#).

Since its inception 30 years ago, ICDEA meetings have been a forum for important discussions and presentations that attracted a significant number of leading mathematicians worldwide. Thus, ICDEA considerably contributed to the progress in the areas of difference equations and discrete dynamical systems. The success of the ICDEA meetings is also reflected in the increasing number of the society membership; in early January 2023 ISDE had 1015 members from 81 countries.

The guidelines for ICDEA proposals and the Regulations can be found on the ISDE website:

- [Guidelines for ICDEA Proposals](#)
- [ICDEA Regulations](#)

Following the instructions given at the links above, prospective organizers are welcome to submit their proposals to hold an ICDEA meeting to ISDE President.



ICDEA 2021

26th INTERNATIONAL CONFERENCE ON DIFFERENCE EQUATIONS AND APPLICATIONS

26 – 30 July, 2021, Sarajevo

MOVED VIRTUAL

ICDEA 2021

The [26th International Conference on Difference Equations and Applications](#) was held virtually in the period 26-30 July 2021 in Sarajevo, Bosnia and Herzegovina. The conference was organized by University of Sarajevo, Department of Mathematics and Mathematical Society of Sarajevo Canton, under the auspices of the International Society of Difference Equations. The conference hosted 258 registered participants from 46 countries and it was the first virtual conference in the society's history.

The organizers coordinated by Professor [Senada Kalabušić](#) - the Chair of the Organizing Committee and the members of the Scientific Committee led by Professor [Mustafa Kulenović](#) - the Chair of the Scientific Committee are warmly congratulated for this very successful event.



Photos from the **Opening Ceremony** of ICDEA 2021

Special thanks go to the conference committees for all the work they have done.

Organizing Committee

[Senada Kalabušić](#), University of Sarajevo - **Chair**

[Esmir Pilav](#), University of Sarajevo

[Zehra Nurkanović](#), University of Tuzla

[Mehmed Nurkanović](#), University of Tuzla

[Zenani Šabanac](#), University of Sarajevo

[Aleksandra Kostić](#), University of Sarajevo

[Nedim Bušatlija](#), University of Sarajevo

[Emin Bešo](#), University of Sarajevo

[Naida Mujić](#), University of Sarajevo

[Džana Drino](#), University of Sarajevo

Scientific Committee

[Mustafa Kulenović](#), University of Rhode Island, USA - **Chair**

[Stephen Baigent](#), University College London, United Kingdom

[Elena Braverman](#), University of Calgary, Canada

[Senada Kalabušić](#), University of Sarajevo, Bosnia and Herzegovina

[Mihály Pituk](#), University of Pannonia, Hungary

[Alexandra Rodkina](#), University of the West Indies, Jamaica

[Stefan Siegmund](#), Technische Universität Dresden, Germany



[Senada Kalabušić](#)

and

a photo from ICDEA 2021 (right)



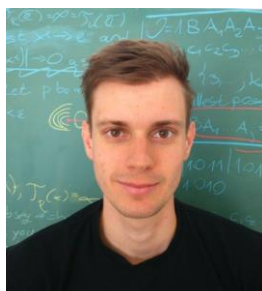
At this conference, the **Plenary speakers** were



John Appleby
Dublin City
University, Ireland



**Francisco
Balibrea Gallego**
Universidad de
Murcia, Spain



Jernej Činč
University of Vienna,
Austria and
IT4Innovations,
Ostrava, Czech
Republic



**Jim Michael
Cushing**
The University of
Arizona, USA



Saber Elaydi
Trinity University,
USA



Peter E. Kloeden
University of
Tubingen,
Germany



René Lozi
Université de Nice
Sophia-Antipolis,
France



Nina Snigireva
University College
Dublin, Ireland



Lubomir Snoha
Matej Bel
University, Banská
Bistrica, Slovakia



Walter Van Assche
Department of
Mathematics, KUL
Louvain, Belgium



Gail Wolkowicz
Department of
Mathematics and
Statistics,
McMaster
University,
Canada



James A. Yorke
University of
Maryland,
Maryland, USA



Jianshe Yu
Center of Applied
Mathematics,
College of
Mathematics and
Information
Sciences,
Guangzhou, China



Weinian Zhang
School of
Mathematics,
Sichuan University,
China

ICDEA 2021 hosted the following [special sessions](#):



Invertible and Noninvertible Maps: Theory and Applications

Organizers: **Laura Gardini & Iryna Sushko**, Department of Economics, Society, Politics (DESP) University of Urbino, Italy/ Institute of Mathematics National Academy of Sciences of Ukraine and Kyiv School of Economics, Ukraine



Global Dynamics of Monotone Discrete Dynamical Systems

Organizer: **Mustafa R. S. Kulenović**, University of Rhode Island, USA



Topological and Low-Dimensional Dynamics

Organizer: **Lubomír Snoha**, Matej Bel University, Banská Bystrica, Slovakia



Population Dynamics and Related Topics

Organizers: **Gail S. K. Wolkowicz & Jim Michael Cushing**, Department of Mathematics and Statistics, McMaster University, Canada/ The University of Arizona



Nonlinear Difference Equations and their Applications in Biological Dynamics

Organizers: **Jianshe Yu, Jia Li & Bo Zheng**, Center for Applied Mathematics, Guangzhou University, China



Photos from ICDEA 2021

Prizes awarded during ICDEA 2021

The [JDEA Best Paper Prize in 2021](#) has been awarded to two articles:

- Krzysztof Leśniak, Nina Snigireva and Filip Strobil, [Weakly contractive iterated function systems and beyond: a manual](#), Journal of Difference Equations and Applications, [Special issue on the occasion of the 82nd birthday of Oleksandr M. Sharkovsky](#) issue 8 vol. 26 (2020), 1114-1173.

- Ana Anušić, Henk Bruin and Jernej Činč, [Topological properties of Lorenz maps derived from unimodal map](#), Journal of Difference Equations and Applications, [Special issue on the occasion of the 82nd birthday of Oleksandr M. Sharkovsky](#) issue 8 vol. 26 (2020), 1174-1191

The [Bernd Aulbach Prize](#) is the most prestigious award of the International Society of Difference Equations and is awarded biennially for significant contributions to the areas of difference equations and/or discrete dynamical systems.

In 2021, the Bernd Aulbach Prize was awarded to [Professor Jim Michael Cushing](#) from The University of Arizona, USA, for outstanding contributions in the fields of difference equations and structured population dynamics. A detailed presentation of his most important achievements is given in pages 19-21 below.

The proceedings of the conference

- ❖ The Proceedings of the ICDEA 2021 entitled "[Advances in Discrete Dynamical Systems, Difference Equations and Applications](#)", Editors: Saber Elaydi, Mustafa Kulenović and Senada Kalabušić, will appear in 2023 in a special volume of the series [Springer Proceedings in Mathematics & Statistics](#):

<https://link.springer.com/book/9783031252242>

In addition, please see [ICDEA 2021 Proceedings](#)

More details and information about the conference can be found on its website:

<https://icdea2021.pmf.unsa.ba/>





ICDEA
2022

27TH INTERNATIONAL CONFERENCE ON DIFFERENCE EQUATIONS AND APPLICATIONS

JULY 18 – JULY 22, PARIS-SACLAY, FRANCE

ICDEA 2022

The [27th International Conference on Difference Equations and Applications](#) was held in the period July 18 - 22, 2022, at CentraleSupélec in Gif-sur-Yvette in Paris region. The conference was organized in hybrid mode, by CentraleSupélec, within the University Paris-Saclay, under the auspices of the International Society of Difference Equations. The conference hosted 207 registered participants from 41 countries. The organizers coordinated by Professor [Sorin Olaru](#) - the Chair of the Organizing Committee and the members of the Scientific Committee led by Professor [Jim Michael Cushing](#) - the Chair of the Scientific Committee are warmly congratulated for this very successful event.



During the week 18-22 July, same location, the [18th Workshop on Control Applications of Optimization](#) was held. The participants to ICDEA 2022 had the opportunity to connect and hold discussions with the participants of this important event of the [International Federation of Automatic Control](#).

Special thanks go to the conference committees for all the work they have done.

Organizing Committee

- [Sorin Olaru](#), CentraleSupélec - L2S, France - **General Chair**
- [Alessio Iovine](#), CNRS - L2S, France - **Co-Chair**
- [Carlos Dorea](#), Federal University of Rio Grande de Norte, Brazil
- [Guilherme Mazanti](#), INRIA, France
- [Florentina Nicolau](#), ENSEA, France
- [Laurent Pfeiffer](#), INRIA, France
- [Serban Sabau](#), Stevens Institute of Technology, USA
- [Adnane Saoud](#), CentraleSupélec, France
- [Florin Stoican](#), Politehnica University, Romania
- [Junbo Tan](#), Tsinghua University, China
- [Cristina Vlad](#), CentraleSupélec, France

Scientific Committee

- [Jim Michael Cushing](#), University of Arizona, USA – **Chair**
- [Antoine Girard](#), CNRS - L2S - University Paris-Saclay, France
- [René Lozi](#), Université Côte d'Azur, France
- [Sorin Olaru](#), CentraleSupélec - L2S - University Paris-Saclay, France
- [Adina Luminița Sasu](#), West University of Timisoara, Romania
- [Jianshe Yu](#), Guangzhou University, China



[Sorin Olaru](#)

and a group photo from ICDEA
2022 (right)



At ICDEA 2022, the **Plenary speakers** were



Azmy S. Ackleh

University of Louisiana,
USA



Gian Italo Bischì

Università di Urbino Carlo
Bo, Italy



Franco Blanchini

University of Udine,
Italy



Paul Glendinning

University of
Manchester, UK



Suzanne Lenhart

University of
Tennessee, USA



Silviu-Iulian Niculescu

CNRS, France



Dorothée Normand-Cyrot

CNRS, France



Piotr Oprocha

AGH University of
Science and
Technology, Poland



Hinke Osinga

Auckland University,
New Zealand



Carsten Schneider

Johannes Kepler University
Austria



Ekehard Schöll

Technische Universität
Berlin, Germany



Erik I. Verriest

Georgia Tech, USA

There was also an **invited industrial talk**



Patrick Panciatici

Scientific Advisor at RTE (French TSO)

How to effectively evaluate the stability of large power systems, including short-term stochastic behaviors

ICDEA 2022 hosted the following **special sessions**:



Bifurcation in Invertible and Noninvertible Maps: Theory and Applications

Organizers: **Laura Gardini, Gian Italo Bischi & Iryna Sushko**

Department of Economics, Society, Politics, University of Urbino, Italy /
Institute of Mathematics National Academy of Sciences of Ukraine



Stochastic and Non-Autonomous Difference Systems

Organizers: **Elena Braverman & Conall Kelly**

Department of Mathematics and Statistics, University of Calgary, Canada /
School of Mathematical Sciences, University College Cork, Ireland



Difference Equations and their Applications in Biology

Organizers: **Azmy S. Ackleh & Amy Veprauskas**

Department of Mathematics, University of Louisiana at Lafayette, United States



Qualitative Behaviour of Nonautonomous Discrete Dynamical Systems

Organizers: **Davor Dragičević, Adina Luminița Sasu & Weinian Zhang**

Faculty of Mathematics, University of Rijeka, Croatia /
Department of Mathematics, West University of Timisoara, Romania & Academy of Romanian Scientists, Bucharest, Romania /
School of Mathematics, Sichuan University, Chengdu, Sichuan, PR China



New Trends in Dynamic Geometry

Organizers: **Dorin Andrica & Ovidiu Bagdasar**

Faculty of Mathematics and Computer Science, Babeș-Bolyai University, Romania /
School of Computing and Engineering, University of Derby, United Kingdom

Organizers: Sandra Carillo, Galina Filipuk & Federico Zullo

Dipartimento Scienze di Base e Applicate per l'Ingegneria, Sapienza Università di Roma, Roma, Italy & INFN, Sezione Roma 1, Italy /

Institute of Mathematics, University of Warsaw, ul. Banacha 2, 02-097 Warsaw, Poland /

DICATAM, Università di Brescia, Brescia, Italy & INFN, Sezione Milano-Bicocca, Italy

Prizes awarded during ICDEA 2022

The JDEA Best Paper Prize in 2022 has been awarded to the article:

- Paul Glendinning & Sasha Glendinning, Smooth conjugacy of difference equations derived from elliptic curves, Journal of Difference Equations and Applications, volume 27, issue 10 (2021), 1419-1433

The rich social program at ICDEA 2022 included a visit to the Synchrotron Soleil, a half-day tour to Versailles and the banquet dinner on a boat cruise on the river Seine.



- ❖ The Proceedings of the ICDEA 2022 will be edited as a special volume entitled “*Advances in Discrete Dynamical Systems, Difference Equations, and Applications*” within the series *Springer Proceedings in Mathematics & Statistics*, Editors: Sorin Olaru, Saber Elaydi, Jim Cushing and René Lozi – please see the link [ICDEA Proceedings](https://icdea2022.sciencesconf.org/)

More details and information about the conference can be found on its website:

<https://icdea2022.sciencesconf.org/>

ECIT2022

23rd European Conference
on Iteration Theory
June 13th-17th, 2022
Reichenau an der Rax, AUSTRIA



ECIT

The [23rd European Conference on Iteration Theory \(ECIT 2022\)](#) took place in Reichenau an der Rax (Austria) between Monday, 13th June 2022 and Friday, 17th June 2022. The conference was organized in association with the [International Society of Difference Equations](#). The main topic of this conference is iteration theory, but also, among the central topics are discrete dynamical systems and functional equations that arise in biology, physics, economics and engineering.

The members of the Scientific Committee coordinated by Professor [Laura Gardini](#) and the organizer Professor [Peter Raith](#) are warmly congratulated for this very nice event.



ECIT 2022 Group Photo

The conference was dedicated to the memory of [**Jaroslav Smítal**](#) who passed away on 9th March 2022.

Short history of ECIT: The first *European Conference on Iteration Theory (ECIT)* took place in 1973 in Toulouse (France). This pioneering event was continued by memorable editions organized as follows: 1977 in Graz (Austria), 1980 in Marburg (Germany), 1982 in Toulouse (France), 1984 in Lochau (Austria), 1987 in Caldes de Malavella (Spain), 1989 in Batschuns (Austria), 1991 in Lisboa (Portugal), 1992 in Batschuns (Austria), 1994 in Opava (Czechia), 1996 in Urbino (Italy), 1998 in Muszyna (Poland), 2000 in La Manga del Mar Menor (Spain), 2002 in Évora (Portugal), 2004 in Batschuns (Austria), 2006 in Gargnano (Italy), 2008 in Yalta (Ukraine), 2010 in Nant (France), 2012 in Ponta Delgada (Portugal), 2014 in Łagów (Poland), 2016 in Innsbruck (Austria) and 2018 in Murcia (Spain).

❖ The next ECIT conference is scheduled at the beginning of September 2024 in Lisbon (Portugal) and it will be organized by [Henrique Oliveira](#).

Selected photos from some past events: ECIT 2006, ECIT 2008, ECIT 2010 and ECIT 2012:



Special thanks go to the conference committees of **ECIT 2022** for all the work they have done.

Scientific Committee

- [Laura Gardini](#), DESP, University of Urbino, Italy – **coordinator**
- [Francisco Balibrea](#), University of Murcia, Spain
- [Wolfgang Förq-Rob](#), University of Innsbruck, Austria
- [Daniele Fournier-Prunaret](#), INSA, Toulouse, France
- [Armengol Gasull](#), University Autònoma of Barcelona, Catalonia, Spain
- [Witold Jarczyk](#), University of Zielona Góra, Poland
- [Henrique Oliveira](#), University of Lisbon, Portugal
- [Peter Raith](#), University of Vienna, Austria
- **Alexander Sharkovsky** (+), Kyïv, Ukraine/ National Academy of Sciences of Ukraine
- [Stefan Siegmund](#), University of Dresden, Germany
- [Marta Štefánková](#), Silesian University, Mathematical Institute in Opava, Czech Republic
- [Marek Cezary Zdun](#), Pedagogical University of Kraków, Poland

Honorary Members of the Scientific Committee

- [Christian Mira](#), University of Toulouse, France
- [Ludwig Reich](#), Graz, Austria / Austrian Academy of Sciences

In Memoriam +

- **Jaroslav Smítal**, Mathematics Institute in Opava, Czechia
- **György Targonski**, Germany

Local Organizing Committee

- [Peter Raith](#), University of Vienna, Austria
- [Harald Schwab](#), University of Vienna, Austria
- [Alan Hazivar](#), University of Vienna, Austria

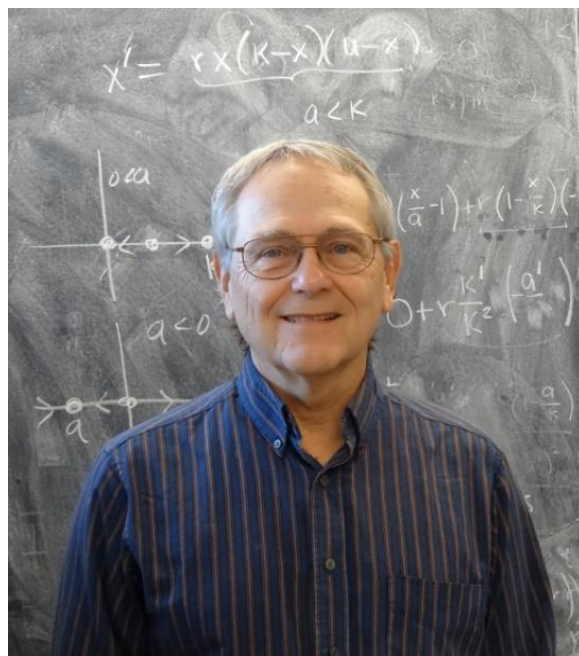
ECIT 2022 took place (for the first time) in hybrid form, while all the previous ECIT conferences have been organized only in presence. Some slides of the presentations are available on the conference website (with the courtesy of their authors):

<https://ps-mathematik.univie.ac.at/e/?event=ecit2022&page=presentation>

More details and information about this conference can be found on its website:

<https://ps-mathematik.univie.ac.at/e/index.php?event=ecit2022>

THE BERND AULBACH PRIZE 2021



Jim Michael CUSHING

the laureate of the **Bernd Aulbach Prize 2021**

Professor **Jim Michael Cushing** from Department of Mathematics, The University of Arizona, USA, is the winner of the Bernd Aulbach Prize 2021.

The prize was established in 2009 by ISDE to honor the memory of the founding member and first President of ISDE, the late Bernd Aulbach, who passed away in 2005. The [Bernd Aulbach Prize](#) is the most prestigious prize of the [International Society of Difference Equations](#) and it is awarded every two years for significant contributions to the areas of difference equations and/or discrete dynamical systems.

Professor Cushing's research in structured population dynamics spans more than 47 years and his contributions specifically to difference equations more than 27 years. He has published four books and more than 180 papers and his publications are highly cited. According to Google Scholar (accessed 1/9/2023), his work earned him more than 11,700 citations and an H-Index of 49. Thirteen (13) of his publications have been cited more than 200 times each. His research contributions have laid the foundation for much of the recent developments in the theory of difference equations applied to

structured population dynamics. It is because of his impact and major contributions to the field that Dr. Cushing was selected in 2013 to become a [*Fellow of the American Mathematical Society*](#).

Below, we discuss some of Professor Cushing's major contributions to difference equations and also cite some specific research contributions that have had and continue to have a large impact on the theory and application of difference equations.

Professor Cushing's contributions to difference equations are in the areas of asymptotic theory and bifurcation dynamics. Some of his first papers on nonlinear matrix population models appeared in the late 1980s and early 1990s. Three important papers, J. M. Cushing, "*Nonlinear matrix models and population dynamics*" (Natural Resource Modeling, 1988, 102 citations, Google Scholar, accessed 1/9/2023), J. M. Cushing, "*A strong ergodic theorem for nonlinear matrix models for the dynamics of structured populations*" (Natural Resource Modeling, 1989, 55 citations, Google Scholar, accessed 1/9/2023) and J. M. Cushing, Z. Yicang, "*The net reproductive number and stability in matrix population models*" (Natural Resource Modeling, 1994, 232 citations, Google Scholar, accessed 1/9/2023) set the stage for later work. In these papers, Professor Cushing generalized the strong ergodic theorem of demography in linear systems $X(t+1) = AX(t)$ to nonlinear systems of the form

$$X(t+1) = h(X(t))AX(t),$$

where A is nonnegative, irreducible and primitive and $h : \mathbb{R}^n \rightarrow (0,1]$, $h(0) = 1$, to show:

$$\lim_{t \rightarrow \infty} \frac{X(t)}{\|X(t)\|} = \eta$$

where η is the positive unit eigenvector associated with the dominant eigenvalue r of A . It was also shown that these conditions do not imply convergence of the total population size to $\|\eta\|$ (periodic behavior is possible). In the linear case, for the general age-structured population models, $X(t+1) = AX(t)$, Professor Cushing established an important relation between the population growth rate r and the basic reproduction number R_0 (defined in terms of the matrix of fertilities F and the matrix of transition probabilities, T , $A = F + T$):

$$r < (=, >) 1 \quad \text{iff} \quad R_0 < (=, >) 1.$$

In addition, an ordered relation between R_0 and r was established:

$$R_0 < 1 \quad \text{implies} \quad R_0 \leq r < 1 \quad \text{and} \quad R_0 > 1 \quad \text{implies} \quad 1 < r \leq R_0.$$

The value R_0 in demography has an important biological interpretation as the expected number of offspring per individual over its lifetime. The value of R_0 can be directly calculated from T and F . The importance of r and R_0 as bifurcation values was also established in the 1988 and 1989 papers, where the bifurcation behavior could be subcritical or supercritical. This early work with extensions and

numerous applications to more general nonlinear matrix equations, uniform persistence and periodic habitats are summarized in his 1998 book published by SIAM, “*An Introduction to Structured Population Dynamics*” (788 citations, Google Scholar, accessed 1/9/2023). This book serves as a standard reference in structured population dynamics.

Professor Cushing has extended this theory from difference equations to a variety of settings, significant in biology, including cannibalism, competition, Allee effects, semelparous populations and evolution. A significant application of this theory is Professor’s Cushing’s collaborative work on flour beetle populations, known as the LPA model, ($L = Larvae$, $P = Pupae$, $A = Adult$), a system of three difference equations. The book J. M. Cushing, R. F. Costantino, B. Dennis, R. A. Desharnais, S. M. Henson, “*Chaos in Ecology: Experimental Nonlinear Dynamics*” published by Elsevier in 2003 (306 citations, Google Scholar, accessed 1/9/2023) and his many publications related to the LPA model (e.g. R. F. Costantino, R. A. Desharnais, J. M. Cushing, B. Dennis, “*Chaotic dynamics in an insect population*”, Science, 1997; 503 Citations, Google Scholar accessed 1/9/2023) have had a significant impact on the scientific community.

One of Professor Cushing’s more recent endeavors is on evolutionary dynamics. Here we mention just a few of Professor Cushing’s contributions in this direction. The classical dynamic dichotomy for the discrete population models has been generalized to the evolutionary setting. Using game theory and based on a juvenile-adult population model, Professor Cushing demonstrates that cannibalism can be an evolutionarily stable strategy (ESS) (J. M. Cushing, S. M. Henson, J. L. Hayward, “*An evolutionary game theoretic model of cannibalism*”, Natural Resource Modeling, 2015). Motivated by the phenomenon of partial migration that exhibited by many populations in which some individuals migrate between habitats during their lifetime, but others do not, Professor Cushing applies an evolutionary game theory approach and concludes that partial migration can be attributed to negative density dependence alone (P. De Leenheer, A. Mohapatra, H. A. Ohms, D. A. Lytle, J. M. Cushing, “*The puzzle of partial migration: adaptive dynamics and evolutionary game theory perspectives*”, Journal of Theoretical Biology, 2017). Professor Cushing also establishes important findings of Allee effects in the evolutionary setting (J. M. Cushing, “*The evolutionary dynamics of a population model with a strong Allee effect*”, Mathematical Biosciences & Engineering, 2015).

Professor Cushing’s research contributions have advanced the theory of difference equations and have laid the foundation for much of the recent work in structured population dynamics.

In addition to his many research contributions, he is an active member of ISDE, serving as the President of ISDE from 2009-2013, as Vice President from 2014-2016, and on the Board of Directors from 2005-present.

Progress on Difference Equations - PODE 2023

International Conference

PODE 2023

[Progress on Difference Equations - PODE 2023](#) will be held at Università Cattolica del Sacro Cuore, Milan Campus, Milan, Italy, in the period 29th-31st May 2023. This is the 13th International Conference which follows those held each year since 2007 on the same topics. After 2017, the workshop PODE alternates each year with the [European Conference on Iteration Theory - ECIT](#) and therefore is being held every two years.



University photos

The conference in Milan aims to continue the tradition of previous PODE conferences. The first PODE was held at Laufen (Germany) 2007, and was followed by meetings at Laufen (Germany) 2008, Bedlewo (Poland) 2009, Xanthi (Greece) 2010, Dublin (Ireland) 2011, Richmond (Virginia, USA) 2012, Bialystok (Poland) 2013, Izmir (Turkey) 2014, Covilhã (Portugal) 2015, Riga (Latvia) 2016, Urbino (Italy) 2017 and Bragança (Portugal) 2019.

PODE 2023 is held under the auspices of the [International Society for Difference Equations](#), the [Association for Mathematics Applied to Social and Economic Sciences](#) (AMASES), the Italian Society for Chaos and Complexity (SICC), the Department of Mathematics for Economic, Financial and Actuarial Sciences (DiMSEFA) of the Università Cattolica del Sacro Cuore and the Department of Management of the Università di Torino.

The conference aims to be a forum for young and senior researchers to share their work and discuss the latest developments in the areas of difference equations, discrete dynamical systems, functional equations and their applications.

The committees of this conference are:

Organizing Committee:

- [Davide Radi](#), Department of Mathematics for Economic, Financial and Actuarial Sciences (DiMSEFA), Catholic University of Sacred Heart, Milan
- [Alessia Cafferata](#), Department of Management, University of Torino
- [Maria Cristina Uberti](#), Department of Management, University of Torino



Davide Radi,
Organizer PODE 2023



City view

Scientific Committee:

- [Gian Italo Bischi](#), University of Urbino Carlo Bo, Italy
- [Jim Cushing](#), University of Arizona, USA
- [Laura Gardini](#), University of Urbino Carlo Bo, Italy
- [Armengol Gasull](#), Universitat Autònoma de Barcelona, Spain
- [Malgosia Guzowska](#), University of Szczecin, Poland
- [Fabio Lamantia](#), Università della Calabria, Italy
- [Adina Luminița Sasu](#), West University of Timișoara, Romania
- [Henrique Oliveira](#), University of Lisbon, Portugal
- [Davide Radi](#), Catholic University of Sacred Heart, Italy

The participants are welcome to register to this important event via:

Registration Webpage: [Iscrizioni Online \(unicatt.it\)](https://unicatt.it/iscrizioni)

Special issue: A special issue entitled *Discrete time dynamic modelling in economics, finance and social sciences* will be published in the journal [Decisions in Economics and Finance](#), Guest Editors: Anastasiia Panchuk, Davide Radi, Iryna Sushko and Fabio Tramontana



City views

More details and information about the conference can be found on its website:

<https://formazionecontinua.unicatt.it/formazione-international-conference-progress-on-difference-equations---pode-2023-e123mi00591-01>



ICDEA
2023

28TH INTERNATIONAL CONFERENCE
ON DIFFERENCE EQUATIONS
AND APPLICATIONS
17 - 21 JULY 2023, PHITSANULOK, THAILAND



ICDEA 2023

The [28th International Conference on Difference Equations and Applications](#) will be held on 17-21 July 2023 in Phitsanulok, Thailand. The aim of the conference is to bring together both experts and novices in the theory and applications of difference equations and discrete dynamical systems. The conference is organized by Pibulsongkram Rajabhat University (PSRU) in Phitsanulok, Thailand, under the auspices of the [International Society of Difference Equations](#).

The conference will be held at the Wangjan campus of PSRU located in the heart of Phitsanulok. On this occasion, since the official color of the university is green, by exception, the logo and the banner of ICDEA have been colored by the organizer in that very special green color.

The committees of the conference are:

Scientific Committee

Chair: [Laura Gardini](#), University of Urbino, Italy

Members:

- [René Lozi](#), Université Côte d'Azur, France
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- Pakkapon Preechasilp, Pibulsongkram Rajabhat University, Thailand
- Manoj Siripitukdet, Naresuan University, Thailand
- Thanin Sitthiwirattam, Suan Dusit University, Thailand
- Suthep Suantai, Chiang Mai University, Thailand
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- Jittiporn Tangkhawiwetkul, Pibulsongkram Rajabhat University, Thailand
- Kasamsuk Ungchittrakool, Naresuan University, Thailand
- Rabian Wangkeeree, Naresuan University, Thailand



[Wirot Tikjha](#)

Organizer ICDEA 2023



City view

Plenary Speakers:



Tomasz Downarowicz

Wrocław University of
Science and
Technology, Poland



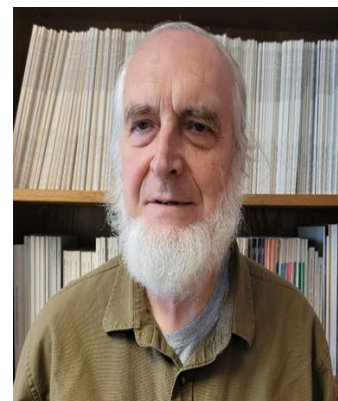
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National Research
University of Nizhni
Novgorod, Russia



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Indiana University-
Purdue University
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Miguel Sanjuan

King Juan Carlos
University, Spain



David Simpson

Massey University, New
Zealand



Iryna Sushko

National Academy of
Sciences of Ukraine,
Ukraine



Bo Zheng

Guangzhou University,
Guangzhou, China

The participants are welcome to register to this important event via:

❖ **Submission system:** <https://icedia2023.azurewebsites.net/>



Illustrative Photos



City view

More details and information about the conference can be found on its website:

<http://icdea2023.psu.ac.th/index.php>



ICDEA
2023

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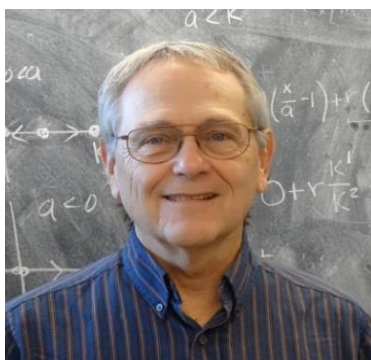
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GOALS OF THE SOCIETY



To promote difference equations and discrete dynamical systems, defined broadly, as one of the fundamental subjects in Mathematics.



To promote discrete models as models of premiere mathematical importance in the natural sciences, engineering, economics, etc.



To coordinate activities in the area of difference equations such as organizing conferences, annual meetings, workshops, special sessions, etc.



To lend support to researchers in difference equations from developing countries and those who need help by making available copies of research articles, lecture notes, technical reports and books.



To promote the publication of books, monographs, lecture notes and expository articles in the area of difference equations.

