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LAUDATION TO
Professor Erzsébet Csuhaj-Varjú
on her seventieth birthday

by György Vaszil (Debrecen, Hungary)

Introduction

Erzsébet Csuhaj-Varjú is professor emeritus at the Faculty of Informatics of the Eötvös Loránd University in Budapest. She is an internationally renowned researcher of computer science, an active and respected member of the national and international scientific community.

She graduated with a masters degree in mathematics at the Kossuth Lajos University in Debrecen in 1977, where she received a university doctorate in computer science in 1981. She obtained her CSc degree ("candidate of mathematics", PhD equivalent) in 1993 and became a doctor of the Hungarian Academy of Sciences in 2003. She also has a habilitation in computer science at the Eötvös Loránd University.

Between 1977 and 1979 she was a research fellowship holder at the Department of General Linguistics of the Kossuth Lajos University, then from 1979 to 2011 she worked in various positions at the Computer and Automation Research Institute of the Hungarian Academy of Sciences (MTA SZTAKI). She was head of a research group from 1997.

She was a full professor at the Eötvös Loránd University between 2008 and 2024 (part time until 2012), being head of the Department of Algorithms and Their Applications from 2012 until 2020. She is a founding member and core member of the Doctoral School of Informatics, and she was the head of the Doctoral School and the chair of the Council of the Doctoral School between 2014 and 2024. She was the chair of the Habilitation Committee of the Faculty of Informatics and a member of the University Habilitation Committee from 2014 to 2023.

She held several positions in different scientific bodies at the Hungarian Academy of Sciences. At the Section of Mathematics, she was vice chair, later chair of the Committee on Information Sciences and a member of the Doctoral Committee, holding these positions for two and three consecutive terms. She

was a member of the General Assembly of the Academy for two terms, and also a member of the Mathematics Committee of the Bolyai János Research Scholarship Advisory Board.

Concerning other institutions, she was a member of the College of Natural Sciences of the Hungarian Scientific Research Fund (OTKA), an external member of the Habilitation Committee on Engineering and Technology of the University of Debrecen, and academic staff member of the Doctoral School of Informatics of the University of Szeged.

In addition to her teaching and supervising activities, she also played a prominent role in talent management. She was the professional leader of the successful EFOP 3.6.3-VEKOP16-2017-00002 project which was ran by a consortium of Eötvös Loránd University, the University of Debrecen, the Pázmány Péter Catholic University, and the University of Szeged for four years to support research programs and workshops for students of the participating institutions.

Within the framework of the Erasmus program, she created opportunities for teachers and students in Hungary and abroad to gain experience in an international environment. The most important cooperating partners include the Brno University of Technology, the University of Paris Est Créteil, and the University of Potsdam.

She was a committee member and opponent of PhD and habilitation theses at universities in Hungary and abroad, such as the universities of Turku, Madrid, Seville, Tarragona, Prague, and Leiden. Among the PhD students she supervised at the Eötvös Loránd University, Judit Csima became an associate professor at the Budapest University of Technology (BME), and György Vaszil is a full professor at the University of Debrecen.

Erzsébet Csuhaj-Varjú is member of the editorial boards of several scientific journals, most important are the International Journal of Foundations of Computer Science (World Scientific) and the Journal of Membrane Computing (Springer). She has participated in the program committees of more than 120 international conferences and workshops, co-chaired and organized, among others, Descriptional Complexity of Formal Systems (DCFS) 2003, Fundamentals of Computational Theory (FCT) 2007, Automata and Formal Languages (AFL) 2008, Conference on Membrane Computing (CMC) 2012, Computability in Europe (CiE) 2014, and Mathematical Foundations of Computer Science (MFCS) 2014. She has been member of the steering committees of four international conference series, Descriptional Complexity of Formal Systems (DCFS), Machines, Computations and Universality (MCU), Conference on Membrane Computing (CMC), and Automata and Formal Languages (AFL).

She was the Hungarian representative of the European Molecular Computing Consortium (ECMC), and lead or participated in several national and international research projects and research consortia.

She has given more than 100 talks at international conferences and workshops as a contributing or invited speaker, and gave lectures, tutorials, or advanced courses at several research centers and universities of Europe.

The main research interests of Erzsébet Csuhaj-Varjú include the theory and applications of formal languages and automata, unconventional computation (primarily bio-inspired models of computation), and distributed systems (formal models of multi-agent systems). She has published 257 scientific papers on these subjects, 131 of which are journal articles, and 1591 independent citations to these publications are documented in the MTMT publication database. Her research work is carried out in extensive international collaboration, her co-authors include such eminent scientists as Arto Salomaa, Gheorghe Păun, Jürgen Dassow, Oscar Ibarra, or Lila Kari. The number of her co-authors in the DBLP publication database is 64. The full list of her publications can be found at https://m2.mtmt.hu/api/author/10000400

Her achievements have been recognized with several awards: the so-called "Institute Award" of MTA SZTAKI in 1994, 1995, 1998, 2001, 2004, 2008, and the "Best Supervisor" award of this institution in 2000. The University of Debrecen awarded her the "Medal of the Faculty of Informatics" in 2019, the Eötvös Loránd University the "Pro Universitate Medal" in 2021, and the Faculty of Informatics the "Pro Facultate Informatica Medal" in 2022.

In 2021, the Hungarian Academy of Sciences awarded a shared Academy Award to Erzsébet Csuhaj-Varjú and György Vaszil for their work and successful cooperation in the field of formal languages, automata, and unconventional computation.

A short outline of her main research interests and results

In the course of her career, Erzsébet Csuhaj-Varjú initiated and carried out important work in several scientific directions and research areas in the theory of formal languages, automata, and bio-inspired computation. These results contributed to the conceptual development of the fields and gained the attention of the international research community.

She played a decisive role in the introduction and the development of the theory of grammar systems, she is a co-author of the fundamental monograph on the topic [4] published in 1994 with Jürgen Dassow, Jozef Kelemen and Gheorghe Păun.

Inspired by the characteristics of the blackboard model of problem-solving systems, she introduced the concept of a cooperating/distributed grammar system (CD grammar system) with Jürgen Dassow in [3]. The model provided the opportunity to develop formal language theoretical equivalents of cooperative/distributed systems and to syntactically model their characteris-

tic features. The results also highlighted the importance and the limitations of cooperation in the generation of formal languages. After this first model, the theory of grammar systems was extended to include further topics which made it possible to model multi-agent systems with formal language theoretic tools, and to discuss the generation/recognition of formal languages as a result of the interaction of linguistic agents, i.e. grammars or automata. She also achieved significant results in other subfields and participated in the launch of new concepts, in [5, 7] for example.

She developed the concept of networks of language processors [2], which is a framework for networks of grammars (rewriting systems) in a general sense. The first variant of the model was published with Arto Salomaa on networks consisting of Lindenmayer systems [9]. The concept inspired the emergence of several new topics, including the theory of networks of evolutionary processors.

In a paper on test tube systems based on splicing (a special case of networks of language processor) co-authored with Lila Kari and Gheorghe Păun [6], they were the first to show the existence of a Turing machine equivalent, programmable computational model based on operations that mimic the recombinant behavior of DNA strands.

Erzsébet Csuhaj-Varjú has also achieved significant results in several areas of P systems, or membrane systems, computational models inspired by the structure and functioning of living cells and tissues. In a publication with György Vaszil [10], combining the characteristics of classical finite automata and a membrane system variant using communication rules only, they introduced the concept of P automaton and investigated its computational power. Since its introduction, the concept of the P automaton has developed into an independent subfield of membrane computing [8]. She also obtained important results in cooperation with Sergey Verlan on generalized communicating P systems [11], and developed the field of P colonies with Lucie Ciencialová and Ludek Cienciala, see the survey [1]

References

[1] **L. Ciencialová, E. Csuhaj-Varjú, L. Cienciala, P. Sosík,** P colonies. *Journal of Membrane Computing*, **1(3)** (2019), 178–197.

[2] **E. Csuhaj-Varjú,** Networks of language processors. In: *Current Trends in Theoretical Computer Science. Entering the 21st Century.* Ed. by G. Păun, G. Rozenberg and A. Salomaa. World Scientific Publishing Co., Singapore, 2001, 771–790.

[3] **E. Csuhaj-Varjú and J. Dassow,** On cooperating/distributed grammar systems. *Journal of Information Processing and Cybernetics EIK*, **26** (1990), 49–63.

[4] **E. Csuhaj-Varjú, J. Dassow, J. Kelemen and Gh. Păun,** *Grammar Systems: A Grammatical Approach to Distribution and Cooperation*, Gordon and Breach Science Publishers, Topics in Computer Mathematics 5, Yverdon, 1994.

[5] **E. Csuhaj-Varjú, J. Dassow and Gy. Vaszil,** Variants of competence-based derivations in CD grammar systems, *International Journal of Foundations of Computer Science* **21(4)** (2010), 549–569.

[6] **E. Csuhaj-Varjú, L. Kari and Gh. Păun,** Test tube distributed systems based on splicing, *Computers and Artificial Intelligence*, **15(2)** (1996), 211–232.

[7] **E. Csuhaj-Varjú, J. Kelemen, A. Kelemenová, Gh. Păun,** Eco-grammar systems: A grammatical framework for studying life-like interaction, *Artificial Life*, **3(1)** (1997), 1–28.

[8] **E. Csuhaj-Varjú, M. Oswald and Gy. Vaszil,** P automata, in: *The Oxford Handbook of Membrane Computing, Chapter 6*, Ed. by Gh. Păun, G. Rozenberg and A. Salomaa, Oxford University Press, 2010, 144–167.

[9] **E. Csuhaj-Varjú and A. Salomaa,** Networks of parallel language processors, in: *New Trends in Formal Languages. Control, Cooperation, and Combinatorics*, Ed. by Gh. Păun and A. Salomaa. Lecture Notes in Computer Science 1218, Springer Verlag, Berlin - Heidelberg, 1997, 299–318.

[10] **E. Csuhaj-Varjú and Gy. Vaszil,** P automata or purely communicating accepting P systems, in: *Membrane Computing 2002 (WMC 2002)*. Ed. by Gh. Păun et al., Lecture Notes in Computer Science 2597, Springer, Berlin, 2003, 219–233.

[11] **E. Csuhaj-Varjú, S. Verlan,** On generalized communicating P systems with minimal interaction rules, *Theoretical Computer Science*, **412(1-2)** (2011), 124–135.