

39th International Symposium on Distributed Computing

DISC 2025, October 27–31, 2025, Berlin, Germany

Edited by

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Editors

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■ Contents

Preface	
<i>Dariusz R. Kowalski</i>	0:xi
Organization	
.....	0:xiii
Awards and Highlights	
.....	0:xvii
2025 Principles of Distributed Computing Doctoral Dissertation Awards	
.....	0:xix
2025 Edsger W. Dijkstra Prize in Distributed Computing	
.....	0:xxi

Regular Papers

ABEL: Perfect Asynchronous Byzantine Extension from List-Decoding	
<i>Ittai Abraham and Gilad Asharov</i>	1:1–1:20
On the Efficiency of Dynamic Transaction Scheduling in Blockchain Sharding	
<i>Ramesh Adhikari, Costas Busch, and Miroslav Popovic</i>	2:1–2:23
An Almost-Logarithmic Lower Bound for Leader Election with Bounded Value Contention	
<i>Dan Alistarh, Faith Ellen, and Alexander Fedorov</i>	3:1–3:16
pod: An Optimal-Latency, Censorship-Free, and Accountable Generalized Consensus Layer	
<i>Orestis Alpos, Bernardo David, Jakov Mitrovski, Odysseas Sofkitis, and Dionysis Zindros</i>	4:1–4:24
DAG It Off: Latency Prefers No Common Coins	
<i>Ignacio Amores-Sesar, Viktor Grøndal, Adam Holmgård, and Mads Ottendal</i>	5:1–5:17
Hierarchical Consensus: Scalability Through Optimism and Weak Liveness	
<i>Pedro Antonino, Antoine Durand, and A. W. Roscoe</i>	6:1–6:20
On the Shape Containment Problem Within the Amoebot Model with Reconfigurable Circuits	
<i>Matthias Artmann, Andreas Padalkin, and Christian Scheideler</i>	7:1–7:22
Auditable Shared Objects: From Registers to Synchronization Primitives	
<i>Hagit Attiya, Antonio Fernández Anta, Alessia Milani, Alexandre Rapetti, and Corentin Travers</i>	8:1–8:22
Distributed Download from an External Data Source in Byzantine Majority Settings	
<i>John Augustine, Soumyottam Chatterjee, Valerie King, Manish Kumar, Shachar Meir, and David Peleg</i>	9:1–9:22

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Amnesiac Flooding: Easy to Break, Hard to Escape <i>Henry Austin, Maximilien Gadouleau, George B. Mertzios, and Amitabh Trehan</i>	10:1–10:23
New Limits on Distributed Quantum Advantage: Dequantizing Linear Programs <i>Alkida Balliu, Corinna Coupette, Antonio Cruciani, Francesco d’Amore, Massimo Equi, Henrik Lievonen, Augusto Modanese, Dennis Olivetti, and Jukka Suomela</i>	11:1–11:22
Distributed Computation with Local Advice <i>Alkida Balliu, Sebastian Brandt, Fabian Kuhn, Krzysztof Nowicki, Dennis Olivetti, Eva Rotenberg, and Jukka Suomela</i>	12:1–12:19
Towards Fully Automatic Distributed Lower Bounds <i>Alkida Balliu, Sebastian Brandt, Fabian Kuhn, Dennis Olivetti, and Joonatan Saarhelo</i>	13:1–13:19
Energy-Efficient Maximal Independent Sets in Radio Networks <i>Dominick Banasik, Varsha Dani, Fabien Dufoulon, Aayush Gupta, Thomas P. Hayes, and Gopal Pandurangan</i>	14:1–14:24
Asynchronous Latency and Fast Atomic Snapshot <i>João Paulo Bezerra, Luciano Freitas, Petr Kuznetsov, and Matthieu Rambaud</i> ...	15:1–15:22
Perpetual Exploration in Anonymous Synchronous Networks with a Byzantine Black Hole <i>Adri Bhattacharya, Pritam Goswami, Evangelos Bampas, and Partha Sarathi Mandal</i>	16:1–16:17
Deterministic Synchronous Self-Stabilizing BFS Construction with Constant Space Complexity <i>Lélia Blin, Franck Petit, and Sébastien Tixeuil</i>	17:1–17:15
Complexity Landscape for Local Certification <i>Nicolas Bousquet, Laurent Feuilloley, and Sébastien Zeitoun</i>	18:1–18:21
Robust Predicate and Function Computation in Continuous Chemical Reaction Networks <i>Kim Calabrese, David Doty, and Mina Latifi</i>	19:1–19:23
Two for One, One for All: Deterministic LDC-Based Robust Computation in Congested Clique <i>Keren Censor-Hillel, Orr Fischer, Ran Gelles, and Pedro Soto</i>	20:1–20:19
Content-Oblivious Leader Election in 2-Edge-Connected Networks <i>Jérémie Chalopin, Yi-Jun Chang, Lyuting Chen, Giuseppe A. Di Luna, and Haoran Zhou</i>	21:1–21:22
The Complexity Landscape of Dynamic Distributed Subgraph Finding <i>Yi-Jun Chang, Lyuting Chen, Yanyu Chen, Gopinath Mishra, and Mingyang Yang</i>	22:1–22:20
Boosting Payment Channel Network Liquidity with Topology Optimization and Transaction Selection <i>Krishnendu Chatterjee, Jan Matyáš Křišťan, Stefan Schmid, Jakub Svoboda, and Michelle Yeo</i>	23:1–23:22

Validity in Network-Agnostic Byzantine Agreement <i>Andrei Constantinescu, Marc Dufay, Diana Ghinea, and Roger Wattenhofer</i>	24:1–24:23
Model-Agnostic Approximation of Constrained Forest Problems <i>Corinna Coupette, Alipasha Montaseri, and Christoph Lenzen</i>	25:1–25:24
Towards Constant Time Multi-Call Rumor Spreading on Small-Set Expanders <i>Emilio Cruciani, Sebastian Forster, and Tijn de Vos</i>	26:1–26:25
On the h -Majority Dynamics with Many Opinions <i>Francesco d’Amore, Niccolò D’Archivio, George Giakkoupis, and Emanuele Natale</i>	27:1–27:24
Byzantine Consensus in the Random Asynchronous Model <i>George Danezis, Jovan Komatovic, Lefteris Kokoris-Kogias, Alberto Sonnino, and Igor Zablotchi</i>	28:1–28:22
Strong Linearizability Without Compare&Swap: The Case of Bags <i>Faith Ellen and Gal Sela</i>	29:1–29:19
Team Formation and Applications <i>Yuval Emek, Shay Kutten, Ido Rafael, and Gadi Taubenfeld</i>	30:1–30:25
Lower Bounds for k -Set Agreement in Fault-Prone Networks <i>Pierre Fraigniaud, Minh Hang Nguyen, Ami Paz, Ulrich Schmid, and Hugo Rincon-Galeana</i>	31:1–31:22
Coordination Through Stochastic Channels <i>Pierre Fraigniaud, Boaz Patt-Shamir, and Sergio Rajsbaum</i>	32:1–32:19
Approach of Agents with Restricted Fuel Tanks <i>Adam Ganczorz, Tomasz Jurdzinski, Andrzej Pelc, and Grzegorz Stachowiak</i>	33:1–33:22
New Distributed Interactive Proofs for Planarity: A Matter of Left and Right <i>Yuval Gil and Merav Parter</i>	34:1–34:23
PIPQ: Strict Insert-Optimized Concurrent Priority Queue <i>Olivia Grimes, Ahmed Hassan, Panagiota Fatourou, and Roberto Palmieri</i>	35:1–35:23
LMQ-Sketch: Lagom Multi-Query Sketch for High-Rate Online Analytics <i>Martin Hilgendorf and Marina Papatriantafylou</i>	36:1–36:24
Towards Optimal Distributed Edge Coloring with Fewer Colors <i>Manuel Jakob, Yannic Maus, and Florian Schager</i>	37:1–37:26
Compact Routing Schemes in Undirected and Directed Graphs <i>Avi Katria and Liam Roditty</i>	38:1–38:19
TEE Is Not a Healer: Rollback-Resistant Reliable Storage <i>Sadegh Keshavarzi, Gregory Chockler, and Alexey Gotsman</i>	39:1–39:18
On the Randomized Locality of Matching Problems in Regular Graphs <i>Seri Khoury, Manish Purohit, Aaron Schild, and Joshua R. Wang</i>	40:1–40:20
Natural Calamities Demand More Rescuers: Exploring Connectivity Time Dynamic Graphs <i>Ashish Saxena and Kaushik Mondal</i>	41:1–41:23

KUDZU: Fast and Simple High-Throughput BFT <i>Victor Shoup, Jakub Sliwinski, and Yann Vonlanthen</i>	42:1–42:19
Weight Reduction in Distributed Protocols: New Algorithms and Analysis <i>Anatoliy Zinovyev</i>	43:1–43:24

Brief Announcements

Brief Announcement: Incrementally Verifiable Distributed Computation <i>Eden Aldema Tshuva and Rotem Oshman</i>	44:1–44:7
Brief Announcement: DAGs for the Masses <i>Michael Anoprenko, Andrei Tonkikh, Alexander Spiegelman, and Petr Kuznetsov</i> .	45:1–45:7
Brief Announcement: Communication Patterns for Optimal Resilience <i>Hagit Attiya, Itay Flam, and Jennifer L. Welch</i>	46:1–46:7
Brief Announcement: Highly Dynamic and Fully Distributed Data Structures <i>John Augustine, Antonio Cruciani, and Iqra Altaf Gillani</i>	47:1–47:7
Brief Announcement: Distributed Download from an External Data Source in Asynchronous Faulty Settings <i>John Augustine, Soumyottam Chatterjee, Valerie King, Manish Kumar, Shachar Meir, and David Peleg</i>	48:1–48:7
Brief Announcement: Synchronization in Anonymous Networks Under Arbitrary Dynamics <i>Rida Bazzi, Anya Chaturvedi, Andréa W. Richa, and Peter Vargas</i>	49:1–49:8
Brief Announcement: Weaker Assumptions for Asymmetric Trust <i>Christian Cachin and Juan Villacis</i>	50:1–50:7
Brief Announcement: Non-Uniform Content-Oblivious Leader Election on Oriented Asynchronous Rings <i>Jérémie Chalopin, Yi-Jun Chang, Lyuting Chen, Giuseppe A. Di Luna, and Haoran Zhou</i>	51:1–51:7
Brief Announcement: From Few to Many Faults: Adaptive Byzantine Agreement with Optimal Communication <i>Andrei Constantinescu, Marc Dufay, Anton Paramonov, and Roger Wattenhofer</i> .	52:1–52:8
Brief Announcement: Maintaining a Bounded Degree Expander in Dynamic Peer-To-Peer Networks <i>Antonio Cruciani</i>	53:1–53:7
Brief Announcement: Faster CONGEST Approximation Algorithms for Maximum Weighted Independent Set in Sparse Graphs <i>Salwa Faour and Fabian Kuhn</i>	54:1–54:7
Brief Announcement: Concurrent Double-Ended Priority Queues <i>Panagiota Fatourou, Eric Ruppert, and Ioannis Xiradakis</i>	55:1–55:7

Brief Announcement: Universal Dancing by Luminous Robots Under Sequential Schedulers <i>Caterina Feletti, Paola Flocchini, Debasish Pattanayak, Giuseppe Prencipe, and Nicola Santoro</i>	56:1–56:7
Brief Announcement: The Virtue of Self-Consistency <i>Fabian Frei and Koichi Wada</i>	57:1–57:7
Brief Announcement: Optimal-Length Labeling Schemes for Fast Deterministic Communication in Radio Networks <i>Adam Ganczorz, Tomasz Jurdzinski, and Andrzej Pelc</i>	58:1–58:8
Brief Announcement: Carry the Tail in Consensus Protocols <i>Suyash Gupta, Dakai Kang, Dahlia Malkhi, and Mohammad Sadoghi</i>	59:1–59:7
Brief Announcement: Distributed Sparsest Cut via Eigenvalue Estimation <i>Yannic Maus and Tijn de Vos</i>	60:1–60:7
Brief Announcement: Asynchronous Approximate Agreement with Quadratic Communication <i>Mose Mizrahi Erbes and Roger Wattenhofer</i>	61:1–61:7
Brief Announcement: Time, Fences and the Ordering of Events in TSO <i>Raïssa Nataf and Yoram Moses</i>	62:1–62:7
Brief Announcement: Optimal Dispersion Under Asynchrony <i>Debasish Pattanayak, Ajay D. Kshemkalyani, Manish Kumar, Anisur Rahaman Molla, and Gokarna Sharma</i>	63:1–63:7
Brief Announcement: Proximal Byzantine Agreement: Improved Accuracy for Fault-Tolerant Replicated Datastreams <i>Roy Shadmon and Owen Arden</i>	64:1–64:8
Brief Announcement: Congested Clique Counting for Local Gibbs Distributions <i>Joshua Z. Sobel</i>	65:1–65:7
Brief Announcement: Single-Round Broadcast: Impossibility, Feasibility, and More <i>Zhelei Zhou, Bingsheng Zhang, Hong-Sheng Zhou, and Kui Ren</i>	66:1–66:7

Preface

This volume is dedicated to the 39th International Symposium on Distributed Computing (DISC 2025), which was held in October 27 – 31, 2025, in Berlin, Germany. More details can be found on the conference web page: <https://www.disc-conference.org/wp/disc2025/>

DISC Conference Overview

The International Symposium on Distributed Computing (DISC) is an international forum on the theory, design, analysis, implementation and application of distributed systems and networks. It is organized in cooperation with the European Association for Theoretical Computer Science (EATCS). The symposium was established 40 years ago, in 1985, as a biannual International Workshop on Distributed Algorithms on Graphs (WDAG).

Statistics

DISC 2025 received 141 regular submissions and 7 brief announcement submissions. The program was selected by a program committee consisting of 42 members. The program committee was assisted by 123 external reviewers. The committee used a relaxed form of double-blind reviewing, where the submissions themselves were anonymous, but authors were permitted to disseminate their work by uploading to online repositories or by giving talks. Each submission was evaluated by at least three reviewers, and final decisions were made during 3 weeks of online discussions, taking into account the rebuttals. At the end, 43 submissions were accepted as regular papers, and 23 were accepted as brief announcements, of which 2 were submitted in this form and 21 are short versions of regular submissions.

Awards

This volume also includes, in dedicated chapters

- the citations for the best paper and best student paper awards at DISC 2025, as well as the list of highlighted papers,
- the citations for the Best Dissertation Awards, which were presented at PODC 2025,
- the citation for the 2025 Edsger W. Dijkstra Prize in Distributed Computing, which was presented at DISC 2025.

Keynote Talks

The keynote talks at DISC 2025 were given by François Le Gall (Nagoya University, Japan), Moni Naor (Weizmann Institute of Science, Israel – on behalf of the winners of the 2025 Dijkstra Prize), and Ittai Abraham (Intel Labs, Israel).

Acknowledgements

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October 2025

Dariusz R. Kowalski
DISC 2025 Program Chair

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DISC is organized in cooperation with the European Association for Theoretical Computer Science (EATCS).

■ Awards and Highlights

The Program Committee of DISC 2025 has selected the following paper to receive the **DISC 2025 Best Paper Award**:

Complexity landscape for local certification

by Nicolas Bousquet, Laurent Feuilloley, and Sébastien Zeitoun.

One of the most intensively studied topics in distributed graph algorithms in recent years has been to determine the complexity landscape of LCL problems, culminating in an almost complete classification of the asymptotic *time* complexities that LCL problems can exhibit, on both general (bounded-degree) graphs and more restricted graph classes such as paths or trees. The work awarded the DISC 2025 best paper award initiates the study of a distributed *space* complexity landscape, more precisely, the landscape of certificate space complexity in local certification. Besides opening the door to a possibly similarly fruitful line of research as for the aforementioned time complexity landscape, the paper comes with a variety of insightful and surprising results, charting considerable parts of the unknown landscape regimes in different settings. These results range from complexity gap results, showing that no graph property exhibits an optimal certificate space complexity contained in the respectively considered gap, to existence results proving that, for certain space complexities, the properties exhibiting such space complexities exist. The proofs of these results are obtained via an automata-theoretic approach that features a number of novel and clean ideas and differs significantly from the usage of automata theory in the study of the time complexity of LCL problems. The paper also provides several interesting open questions, highlighting the potential this line of research has to offer.

The Program Committee of DISC 2025 has selected the following papers to share the **DISC 2025 Best Student Paper Award**:

Content-Oblivious Leader Election in 2-Edge-Connected Networks

by Jérémie Chalopin, Yi-Jun Chang, Lyuting Chen, Giuseppe A. Di Luna, and Haoran Zhou
and

pod: An Optimal-Latency, Censorship-Free, and Accountable Generalized Consensus Layer

by Orestis Alpos, Bernardo David, Jakov Mitrovski, Odysseas Sofikitis, and Dionysis Zindros.

Lyuting Chen and Haoran Zhou (first paper) and Jakov Mitrovski (second paper) are the student co-authors receiving the shared award.

The paper “*Content-Oblivious Leader Election in 2-Edge-Connected Networks*” makes two fundamental contributions to the design of content-oblivious leader election algorithms over asynchronous networks. The first result is a (non-uniform) deterministic leader election algorithm for general 2-edge-connected graphs, thereby enabling the simulation of arbitrary distributed algorithms without a preselected leader in this model. The second result is a uniform, quiescently terminating deterministic leader election algorithm for unoriented rings, showing that this task is possible even when the ring is unoriented and without requiring additional knowledge. These two results represent a significant advancement in understanding leader election algorithms in content-oblivious asynchronous networks, conjectured to be impossible in the general case (i.e., for uniform algorithms over any 2-edge-connected graph).



The paper “*pod: An Optimal-Latency, Censorship-Free, and Accountable Generalized Consensus Layer*” introduces Pod, a novel consensus primitive designed to achieve optimal latency, specifically targeting one network round-trip for transaction confirmation. Unlike traditional consensus protocols that depend on inter-replica communication and total-order guarantees, Pod emphasizes low latency, censorship resistance, and accountability. A key safety guarantee is the past-perfection property, which gives clients a stable view of the past: once a round becomes past-perfect, no new confirmed transactions can appear before it. Thus, pod trades off traditional agreement properties in favor of optimal latency, while maintaining sufficient security guarantees to support distributed tasks that do not require total order – such as auctions and payment systems.

The Program Committee has also decided to **highlight** the following papers, selected across major areas of DISC’s scope:

- “Team Formation and Applications”, by Yuval Emek, Shay Kutten, Ido Rafael, and Gadi Taubenfeld
- “Approach of Agents with Restricted Fuel Tanks”, by Adam Ganczorz, Tomasz Jurdzinski, Andrzej Pelc, and Grzegorz Stachowiak
- “Two for One, One for All: Deterministic LDC-based Robust Computation in Congested Clique”, by Keren Censor-Hillel, Orr Fischer, Ran Gelles, and Pedro Soto
- “Validity in Network-Agnostic Byzantine Agreement”, by Andrei Constantinescu, Marc Dufay, Diana Ghinea, and Roger Wattenhofer
- “Distributed Download from an External Data Source in Byzantine Majority Settings”, by John Augustine, Soumyottam Chatterjee, Valerie King, Manish Kumar, Shachar Meir, and David Peleg
- “Strong Linearizability without Compare&Swap: The Case of Bags”, by Faith Ellen and Gal Sela
- “Towards Optimal Distributed Edge Coloring with Fewer Colors”, by Manuel Jakob, Yannic Maus, and Florian Schager
- “On the Randomized Locality of Matching Problems in Regular Graphs”, by Seri Khoury, Manish Purohit, Aaron Schild, and Joshua R. Wang
- “Distributed Computation with Local Advice”, by Alkida Balliu, Sebastian Brandt, Fabian Kuhn, Krzysztof Nowicki, Dennis Olivetti, Eva Rotenberg, and Jukka Suomela.

■ 2025 Principles of Distributed Computing Doctoral Dissertation Awards

The committee for the 2025 Principles of Distributed Computing Doctoral Dissertation Award has decided to share the award between two recipients:

Dr. Christoph Grunau, for his dissertation
“Sampling with Certainty in Distributed and Parallel Computations”

Dr. Vaclav Rozhon, for his dissertation
“Local Complexity: New Results and Bridges to Other Fields”

Dr. Grunau and Dr. Rozhon both completed their Doctor of Sciences degrees at ETH Zürich under the supervision of Mohsen Ghaffari and Angelika Steger.

Dr. Grunau’s dissertation describes a local rounding mechanism for transforming many randomized distributed graph algorithms into deterministic algorithms with very little loss in efficiency, using only local information. This gives very efficient deterministic algorithms in the LOCAL model for such fundamental problems as maximal independent set, maximal matching, and graph coloring, resolving numerous long-standing open problems. In the context of parallel algorithms, the dissertation provides a parallel mechanism for derandomizing parallel algorithms that rely on Chernoff-like bounds, giving a deterministic parallel algorithm for set balancing that for the first time achieves work bounds close to those long known for sequential algorithms.

Dr. Rozhon’s dissertation describes numerous deep results for the LOCAL model. These include an improved version of the author’s breakthrough polylogarithmic-time deterministic algorithm for network decomposition; speedup theorems that provide the final step in completely classifying locally-checkable labeling problems on trees and grids; and a surprising connection between local problems on regular trees and the field of descriptive combinatorics. The dissertation is also noteworthy for its detailed and comprehensive survey of recent progress in the LOCAL model both the author and others.

The committee has also chosen to give an Honorable Mention to

Sean Garnet Ovens, for his dissertation
“The Space Complexity of Asynchronous Algorithms from Bounded Size Base Objects”

Dr. Ovens completed his Doctor of Philosophy degree at the University of Toronto under the supervision of Faith Ellen.

In his dissertation, he describes a new combinatorial technique for proving lower bounds on the space complexity of shared-memory objects implemented from base objects of bounded size. This gives nearly-tight lower bounds on the space complexity of a large class of snapshot-like objects and, in conjunction with a novel valency argument, provides strong lower bounds on the space complexity of obstruction-free consensus implemented from bounded-size swap objects. The final chapter of the dissertation contains a detailed analysis of the space complexity of k -set agreement using unbounded-size swap objects, proving new upper and lower bounds for this problem.

39th International Symposium on Distributed Computing (DISC 2025).
Editor: Dariusz R. Kowalski



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0:xx 2025 Principles of Distributed Computing Doctoral Dissertation Awards

The 2025 Principles of Distributed Computing Doctoral Dissertation Award Committee:

Dan Alistarh, IST Austria

James Aspnes (chair), Yale University

Pierre Fraigniaud, IRIF, Université Paris Cité, CNRS

Cyril Gavoille, Université de Bordeaux

Danny Hendler, Ben-Gurion University

Petr Kuznetsov, INFRES, Telecom Paris, Institut Polytechnique de Paris

■ 2025 Edsger W. Dijkstra Prize in Distributed Computing

The Edsger W. Dijkstra Prize in Distributed Computing is awarded for outstanding papers on the principles of distributed computing, whose significance and impact on the theory or practice of distributed computing have been evident for at least a decade. It is sponsored jointly by the ACM Symposium on Principles of Distributed Computing (PODC) and the EATCS Symposium on Distributed Computing (DISC). The prize is presented annually, with the presentation taking place alternately at PODC and DISC.

The committee decided to award the 2025 Edsger W. Dijkstra Prize in Distributed Computing to

Moni Naor and Larry Stockmeyer (1948–2004)

for their paper:

“What Can Be Computer Locally?”

SIAM Journal on Computing, volume 24, issue 6, pages 1259–1277, 1995

Proc. of the 25th Annual ACM Symp. on Theory of Computing (STOC), 1993

This is arguably one of the most influential papers in the area of distributed graph algorithms; it is the foundation on which our modern understanding of distributed computational complexity and especially locality of graph problems is largely built. While a lot of early work on distributed graph algorithms and locality studied specific individual problems, Naor and Stockmeyer took the first step towards systematically studying distributed computational complexity of entire problem families. To this end, the paper defines the family of locally checkable labeling problems (LCLs). The family of LCLs as defined by Naor and Stockmeyer is broad enough to capture many distributed graph problems of interest, but it is also narrow enough so that it is possible to prove strong theorems that apply to all LCL problems.

In their paper, Naor and Stockmeyer initiated the study of what distributed complexity classes exist for LCL problems. In particular, they showed that there are nontrivial LCL problems with constant locality. They also initiated the the systematic study of meta-computational questions in this area. Further, the paper introduced the use of Ramsey-type arguments in the context of distributed algorithms, and it initiated the study of the role of randomness in distributed graph algorithms.

The work of Naor and Stockmeyer started a research program that is still very actively being pursued today, 30 years later. This is a paper that is deeply influencing what is happening in our research community, and its impact is rapidly finding its way to also other communities, including at least quantum information theory, measurable combinatorics, stochastic processes, neural networks, and game theory. The paper was a key historical milestone in the development of the field of distributed computing, and it is definitely one of the papers that also younger members of our research community should be familiar with.

The 2025 Edsger W. Dijkstra Prize in Distributed Computing Award Committee:

Hagit Attiya, Technion, Israel

Christian Cachin, U. of Bern, Switzerland

Dariusz R. Kowalski, Augusta University, USA

Fabian Kuhn (chair), U. of Freiburg, Germany

Yoram Moses, Technion, Israel

Paul Spirakis, U. of Liverpool, UK

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