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Part 2/3:

Recognition,

Management of Scientific Activities, and a Few Research Grants in the Recent Past

- Previous part (1/3): CV, biography, and a view of my job in my scientific domain.
- Next part (3/3): Past and present research activities, and list of publications.

To make the reading of each part as independent as possible from the other parts, a few short paragraphs appear in several parts.

Contents

1	Recognition	1
2	Miscellaneous (in French)	6
3	Scientific management activities	6
4	Research grants in the recent past	9
4.1	European Marie Curie project TRANSFORM	9
4.2	Project DISPLEXITY (French national research agency ANR)	9
4.3	Franco-Hong Kong project CO2Dim	10
4.4	Franco-German project DISCMAT	10
4.5	Project DESCARTES (French national research agency ANR)	11
4.6	Project ByBLoS (French national research agency ANR)	12

1 Recognition

International recognition

- ▷ 2019: ACM Sigops France “*Outstanding Career*” Award.
- ▷ 2018: IEEE *Award for Outstanding Technical Achievement*.
- ▷ 2015: elected member of *Academia Europaea*.
- ▷ 2015 SIROCCO Prize for *Innovation in Distributed Computing*.
- ▷ Distinguished Chair Professor at Hong Kong Polytechnic university.

Numerical impact factors

- ▷ h-index : 61 (Google Scholar), i10-index : 304 (Google Scholar).
- ▷ Number of citations: 14141 (Google Scholar).
- ▷ 8 awards in top conferences: 8 (3 ICDCS, DISC, 2 SSS, Europar, PODC).
- ▷ Author of 12 books (9 in English, 3 in French) and 540 refereed articles (journal and conferences).
- ▷ Number of co-authors (as counted by DBLP): 183.

An international “ranking”

A distributed computing-oriented article titled “The Theoretic Center of Computer Science” that appeared in the December 2007 issue of *ACM Sigact News* (Vol. 38, No. 4) ranked my name in the top 10 of the most *central* authors of the *Principles of Distributed Computing* area, in its “all-time” ranking.

My algorithms in textbooks

Some of my algorithms (e.g., message causal ordering, checkpointing, termination detection, randomized consensus, total order message delivery) and references to my books appear in textbooks written by experts in the domain. Among others, there are the following.

- Attiya H. and Welch J., *Distributed computing: fundamentals, simulations and advanced topics*, (2d Edition), *Wiley-Interscience*, 414 pages, 2004.
- Barbosa V.C., *An introduction to distributed algorithms*. *MIT Press*, 365 pages, 1996.
- Cachin Ch., Guerraoui R., and Rodrigues L., *Introduction to reliable and secure distributed programming*. *Springer*, 367 pages, 2011.
- Garg V., *Elements of distributed computing*. *Wiley-Interscience*, 423 pages, 2002.
- Ksemkalyani A. and Singhal M., *Distributed computing: principles, algorithms, and systems*. *Cambridge University Press*, 738 pages, 2008.
- Lynch N., *Distributed algorithms*. *Morgan Kaufmann Pub.*, 872 pages, 1996.
- Taubenfeld G., *Synchronization algorithms and concurrent programming*. *Pearson Education/Prentice Hall*, 423 pages, 2006.

At the national level

- ▷ “Senior member” of the *Institut Universitaire de France*.
- ▷ Member of the Scientific Board of the Computing Science Institute (INS2I) of the French CNRS (national research center): 2011-2015.
- ▷ Member of the Executive Board of the SIF: *Société Informatique de France* (French Computing Science Society) during the period 2013-2020.
- ▷ Member of the Scientific Board of the SIF since 2013.
- ▷ Expert-member of the “pôle numérique” of the French Academia of Technology.
- ▷ Talks at *Collège de France* on distributed computing :
 - Parallélisme asynchrone et calcul réparti (2010, (invitation from Gérard Berry).

- Un Borobo m'a dit ... (quelques réflexions sur l'informatique et le calcul réparti) (2019, invitation from Rachid Guerraoui).

Member of the editorial board of the following journals

- ▷ IEEE Transactions on Parallel and Distributed Systems (2006-2011).
- ▷ IEEE Transactions on Computers (2010-2015).
- ▷ Journal of Parallel and Distributed Computing (2005-2017).
- ▷ Journal of Computer Systems Science and Engineering (since 1998).
- ▷ Foundations of Computing and Decision Sciences (since 1995).

Professorship positions at PolyU, Hong Kong

- ▷ *Adjunct* Professor (2013-2016), Polytechnic University (PolyU).
- ▷ *Distinguished Chair* Professor in Distributed Algorithms (2017-2020), Polytechnic University (PolyU).

IEEE TC on distributed computing

- ▷ European representative in the IEEE technical committee on Distributed Computing.

Birthday celebration

- ▷ The distributed computing community has celebrated my 60th birthday with a symposium that was part the international conference DISC 2009, which was held in Spain, september 2009. (The corresponding articles are recorded in the DISC'09 proceedings, Springer LNCS 5805, pages 3-5.)
- ▷ Locally, my University department organized a Colloquium to celebrate my 60th birthday in May 2009. Among others, the invited speakers included Leslie Lamport (triple winner of the Dijkstra award, and Turing Award 2013), Maurice Herlihy (winner of the Dijkstra award and the Godel Award), and Rachid Guerraoui (European ERC Grant Laureate).

“Innovation in Distributed Computing” award

- ▷ Winner of the 2015 “Innovation in Distributed Computing” award (also called SIROCCO award) that I will formally receive at the 2015 SIROCCO conference. I am awarded this prize in distributed computing for my work on the condition-based approach to solve the consensus problem, and my work on message communication patterns related to message causal ordering and distributed checkpointing.
- ▷ The Prize for “Innovation in Distributed Computing” is an award presented annually at the *International Colloquium on Structural Information and Communication Complexity* (SIROCCO) to an individual who have made a major contribution to understanding “the relationships between information and efficiency in decentralized computing”, which is the main area of interest for this conference, whose typical topics are distributed computing, communication networks, game theory, parallel computing, social networks, mobile computing, autonomous robots, peer to peer systems, and communication complexity. The SIROCCO proceedings are published by Springer in its LNCS series.
- ▷ As expressed in the call for nominations, the aim of this award is *to recognize inventors of new ideas that were unorthodox and outside the mainstream at the time of their introduction*. To be eligible for this award: (1) The original contribution must have appeared in a publication at least five years before the year of the award, and (2) one of the articles related to this contribution must have appeared in the proceedings of SIROCCO. The award was presented for the first time in 2009. The previous winners are (in chronological order) Nicola Santoro, David Peleg, Jean-Claude Bermond, Roger Wattenhofer, Andrzej Pelc, and Pierre Fraigniaud.

IEEE Award in distributed computing

In 2018, I was the recipient of the *IEEE Outstanding Technical Achievement in Distributed Computing*

Award. The award ceremony took place during the banquet of the 38th IEEE ICDCS conference in Vienna (July 2018). <https://team.inria.fr/wide/award-for-michel-raynal/>

French Chapter of the ACM

In 2019, I was the recipient of the *ACM Outstanding Career Award*. The award ceremony took place in Lyon during the banquet of the 38th Symposium on Reliable Distributed Systems (November 2019). <https://team.inria.fr/wide/award-for-michel-raynal-2/>

Informatics Europe

▷ The *Informatics Europe* society asked me to chair its first *Best Curriculum Praticce Award*, which was devoted to “Parallelism and Concurrency” (2011). (The award was 30K Euros funded by Intel Co.)

Recommendation letters

▷ I have written lots of recommendation letters (more than 60) for Green Card (USA), tenure position or promotion to the rank of full professor. USA, UK, Canada, China, Germany and Israel are a subset of the corresponding countries for the professor positions.

▷ I am regularly solicited to write recommendation letters to support applications to ACM or IEEE Fellowship. I have also written support letters for applications to the Turing award. I was a member of the Dijkstra Award in 2005.

Book Series Editorship

▷ Since 2017, Editor of the *Synthesis Lectures on Distributed Computing Theory*, published by Morgan & Claypool Pub., <http://www.morganclaypool.com/toc/dct/1/1> (Founding Editor: Nancy Lynch, MIT).

Book prefaces

I have been solicited to write book prefaces. This concerns the book “Elements of Distributed Computing” by Vijay Garg (UT Austin), published by Wiley & Sons (2004), and the book “Do-All Computing in Distributed Systems: Cooperation in the Presence of Adversity” by Chryssis Georgiou (University of Cyprus) and Alex Shvartsman (MIT and University of Connecticut), published by Springer (2008).

Steering committee member

▷ ACM PODC and DISC are considered as the top conferences specialized in the theory and the principles of distributed computing. IEEE ICDCS is considered as one the best from a more applied point of view.

- Vice-chair (2000-2002) and then chair (2002-2004) of the steering committee of DISC (Symposium on DIStributed Computing).
- Member of the steering committee of SIROCCO (Colloquium on Structural InfoRmatiON and Communication Complexity)¹: 2005-2008.
- ACM PODC (Symposium on Principles of Distributed Computing): “member at large” for a three year term, elected during the plenary meeting at PODC 2006.

▷ Currently member of the SC of:

- IEEE ICDCS (Int’l Conference on Distributed Computing Systems), SC member since 2006 (I was the conference chair of ICDCS 2006).
- ICDCN (Int’l Conference on Distributed Computing and Networking), since 2004. ICDCN is becoming a premier distributed computing venue in Asia.
- NETYS (Int’l Conference on Networked systems), since 2013. NETYS is a new conference whose aim is to become a premier distributed computing venue in Africa.

¹The proceedings of both DISC and SIROCCO are published in the Springer LNCS series.

PhD committees

- ▷ Since 1980, I have been a member of more than 200 PhD committees (mainly in France).
- ▷ Numerous PhD committees in France: Amiens, Besançon, Bordeaux, Brest, Caen, Grenoble, Lille, Montpellier, Nancy, Orléans, Paris 5, Paris 6, Paris 7, Paris 11, Rennes, Toulouse.
- ▷ I have been an external examiner for PhD in the following countries: Algeria (Alger, Oran), UK (Newcastle upon Tyne: 1995, 2005, Cambridge 2006), Australia (Australian National University, Canberra, 1996), Belgium, Cameroun (Université de Yaoundé), Canada (Concordia University 1996 et 2000, Université de Montréal), Spain (Madrid, 2004), Ireland (Trinity College, 1996), Italy (Rome, 1998, 2006, 2011), Norway (Tromsø University), Netherlands, Portugal (INESC 1996, Universidade de Lisboa 2014), Switzerland (EPFL, 1992, 1995, 2005), Tunisia (ENSI, Tunis, 1999), and USA (Atlanta Georgia Tech 1999, Kansas State University, University of Texas at Austin, 1996), University of Puebla (Mexico, 2009), Germany (Technical University of Berlin, 2015), Morocco (ENSIAS Rabat, 2015), Poznań University (Poland, 2017), Calgary (Canada, 2018).

International expertise

Since more than 20 years, I have written many reviews for projects submitted to the European community, NSF (USA), FCAR (Québec, Canada), IAS (Australian Institute for Advanced Research), VR (Swedish Research Council), the funding research agency of Austria, the Natural Sciences and Engineering Research Council of Canada (NSERC), and CONICYT (Chili).

Recognition of foreign researchers by my university

- ▷ I nominated Leslie Lamport (Microsoft, 2003), David Harel (Weizmann Institute of Science, Israel, 2005), and Gregor von Bochmann (University of Ottawa, 2012), who received the “Doctor Honoris Causa” title from my University.

International collaboration

- ▷ I have co-authored articles with 183 co-authors (as cited by DBLP) all over the World. Those include:
 - Israel: Yehuda Afek (Tel Aviv university), Roy Friedman, Yoram Moses, Shmuel Zaks (The Technion, Haifa, Israel), Gadi Taubenfeld (Herzliya), Shlomi Dolev (Ben Gourion Univ. , Israel).
 - Europe: Ozalp Babaoğlu (Università di Bologna, Italy), Roberto Baldoni and Francisco Quaglia (Università La Sapienza, Roma, Italy), Jerzy Brezinsky (University of Poznan, Poland), Paul Ezilchelvan (University of Newcastle, UK), Antonio Fernandez (University del Rey Juan Carlos, Madrid, Spain), Cristof Fetzer (Dresden University, Germany), José Ramon Gonzalez de Mendivil (University of Pamplona, Spain), Rachid Guerraoui and André Schiper (EPFL, Switzerland), Mikel Larrea (University of the Basque Country, Spain), Luis Rodrigues and Paulo Verissimo (Lisbon, Portugal),
 - US and Canada: Divy Agrawal and Amr El Abbadi (Santa Barbara), Mustaque Ahamad (Georgia Tech), Ajoy Datta (University of Las Vegas), Vijay Garg (Austin, TX), Eli Gafni (UCLA), Ajay Ksemkalyani (University of Chicago), Masaaki Mizuno (Kansas State University), Gil Neiger (Intel, Portland, Oregon), Rob Netzer (when he was at Brown university), Maurice Herlihy (Brown University), Ravi Prakash (University of TX, Richardson), Mukesh Singhal (Kentucky university), Sam Toueg (University of Toronto), K. Vidyasankar (University of Newfoundland, Canada).
 - Latin and South America: Sergio Rajsbaum and Armando Castañeda (UNAM Mexico), Fabiola Greve and Raimundo Macedo (Federal university of Salvador de Bahia, Brazil), Francisco Brasileiro (Campina Grande, Brazil).
 - Asia: Makoto Takizawa (Tokyo Denki University), Yoshifumi Manabe (NTT, Tokyo), Jiannong Cao (Hong-Kong Polytechnic University), Weigang Wu (Sun Yat-Sen University, Guangzhou, China), Weiping Zhu (Wuhan University, China).

▷ I obtained with most of the previous researchers [bi-national grants](#) which allowed us to visit each other and produce new results. The corresponding countries are Israel, USA (NSF agreement with CNRS or INRIA), Italy, Portugal, Brazil, Mexico, Japan and Hong-Kong.

Invited talks/keynote speeches since 2000

▷ 6th Int'l Conference EUROPAR, Munich, 2000. *Logical instantaneity and causal order*: Springer LNCS 1900, pp. 13-20. Europar is considered as the first European venue for parallelism.

▷ 6th Int'l Workshop on Distributed Computing (this IWDC workshop is now the ICDCN conference), Kolkata (India), 2004: *The notion of veto number for distributed agreement problems*. Springer LNCS 3326, pp. 315-325.

▷ Int'l workshop on Dynamic Distributed Systems (satellite workshop of IEEE ICDCS), Lisbon, 2006: *From static distributed systems to dynamic systems*.

▷ 10th Int'l Conference on Principles of Distributed Systems, Bordeaux, 2006 (OPODIS'06). *In search of the holy grail: looking for the weakest failure detector for wait-free set agreement*: Springer LNCS 4305, pp. 1-17. (The other invited speakers were Amir Pnueli and Butler Lampson, both winner of the Turing award).

▷ 6th Int'l IEEE Symposium on Network Computing and Applications, Boston, 2006 (NCA'06). *Eventual leader service in unreliable asynchronous systems: why? How?* IEEE Computer Press, pp. 11-21.

▷ 21th Int'l Symposium on Distributed Computing, Cyprus, 2007 (DISC'07): *A subjective visit to selected topics in distributed computing*, Springer LNCS 4731, pp. 5-6. (The other invited speaker was David Peleg from the Weizmann Institute).

▷ 22th Int'l IEEE Conference on Advanced Information Networking and Applications (AINA'08), Okinawa, Japan, 2008: *Synchronization is coming back, but is it the same?* IEEE Computer Press, pp. 1-10.

▷ Workshop on Theoretical Aspects of Dynamic Distributed Systems (TADDS'09) in conjunction with DISC 2009. Elche (Spain), 2009: *How to implement a shared memory in a dynamic system? Which are the constraints?*

▷ Talk on distributed computability titled "From Turing to the clouds" given at the "Alan Turing Year" conference, University of Mexico, November 2012.

▷ *A look at distributed recursion*. Talk given at the LADA (Languages for Distributed Algorithms) Workshop, Satellite workshop of 33th ACM POPL (Principles of Programming Languages) conference, 2012.

▷ *Concurrency-related distributed recursion*. Talk given at the 15th Int'l Symposium on Stabilization, Safety, and Security of Distributed Systems (SSS'13), Springer LNCS 8255, 2013.

▷ *What can be computed in a distributed system?* Talk given at the Workshop "From Programs to Systems: The Systems Perspective in Computing" in honor of Turing Award Winner Professor Joseph Sifakis, Springer LNCS 8415, 2014.

▷ *From Turing to the clouds (on the computability power of distributed systems)*. Talk given at the 21th Int'l Colloquium on Structural Information and Communication Complexity (SIROCCO'14), LNCS 8576, pp. xiii-xiv, 2014.

▷ *Concurrent systems: hybrid object implementations and abortable objects*. Invited talk. 21th Int'l European Parallel Computing Conference (EUROPAR'15), Springer LNCS 9233, pp. 3-15, 2015.

▷ *Communication patterns and input patterns in distributed computing*. Invited talk. 22th Int'l Colloquium on Structural Information and Communication Complexity (SIROCCO'15), Springer LNCS 9439, pp. 1-15, 2015.

▷ *A look at basics of distributed computing*. Invited tutorial. Proc. 36th IEEE Int'l Conference on Distributed Computing (ICDCS'16), IEEE Press, pp. 2-11, 2016.

▷ *Theory and practice of dependability for message-passing distributed systems: the case of Byzantine failures*. 7th Latin-American Symposium on Dependable Computing (LADC 2016). Cali (Colombia).

▷ *t-Resilient Immediate Snapshot is Impossible*. Banff International Research, (On Invitation) Work-

shop 16w152 on “Complexity and Analysis of Distributed Algorithms”, Oaxaca, Mexico (November 2016).

▷ *Distributed universal constructions: a guided tour*. CNRS Spring school on Theoretical Computing, Porquerolles (France, May 2017), and Summer school on Concurrent Systems, St-Petersburg (Russia, July 2027).

▷ *A Simple Broadcast Algorithm for Recurrent Dynamic Systems*. 2d DISC Satellite Workshop on Computing in Dynamic Networks (Vienna, Austria, October 2017).

▷ *A Pleasant Stroll Through the Land of Distributed Machines, Computation, and Universality*. 8th Conference on Machines, Computations and Universality (Fontainebleau, France, June 2018).

▷ *Communication and Agreement in Byzantine Asynchronous Systems*. 38th IEEE International Conference on Distributed Computing Systems (ICDCS-18), Vienna, Austria, July 2018).

▷ *The notion of universality in fault-tolerant message-passing distributed systems*. 37th IEEE International Conference on Reliable Distributed Systems (SRDS-19), Lyon, France, 2019).

▷ *What is Informatics? What is distributed computing about?* Departement of Mathematics, UNAM, Mexico (2019). <https://www.youtube.com/watch?v=jV7H8pKrxPo>

▷ *What is Informatics? What is distributed computing about?* Keynote speech, LIG Grenoble (October 2020). <https://www.liglab.fr/en/events/keynote-speeches/michel-raynal-what-is-informatics-what-is-distributed-computing-about>

2 Miscellaneous (in French)

Articles “grand public”

▷ *Architecture, matériel et réseaux*. Dans *L'état des sciences et des techniques, Collection L'Etat du Monde*, Ed. La Découverte, Paris (1991).

▷ *Protocoles et fiabilité*. Numéro 80, Le Courrier du CNRS (1993).

▷ *L'informatique, science et technique*, numéro 171 (2015), Revue électronique de l'EPI (Enseignement Public et Informatique).

▷ *Le mythe improbable d'un monde sans panne*, Journal Le Monde, numéro 23170, page 26, 10 juillet 2019, en collaboration avec Gérard Roucairol.

Articles de vulgarisation

▷ *Un regard sur les apports de Leslie Lamport à travers le prix Dijkstra*, numéro 5 du bulletin 1024 de la SIF (Société Informatique de France), pages 61-65, mars 2015.

▷ *À propos de calcul réparti : un de mes algorithmes préférés*, numéro 16 du bulletin 1024 de la SIF, pages 3-13, octobre 2020.

Points de vue

▷ *Réflexions désordonnées*, numéro 9 du bulletin 1024 de la SIF, pages 115-122, novembre 2016.

▷ *Entretien avec Michel Raynal*, réalisé par Benjamin Thierry, numéro 13 du bulletin 1024 de la SIF, pages 57-65, avril 2019.

3 Scientific management activities

Reviewer for journals and books

▷ I regularly review papers submitted to international journals. These journals include: Journal of the ACM (JACM), Information and Computation, Distributed Computing, ACM Transactions on Computer Systems (ACM TOCS), ACM Transactions on Programming Languages and Systems (ACM TOPLAS), ACM Transactions on Database Systems (ACM TODS), Journal of Algorithms, Journal of Systems and

Software (JSS), Journal of Computer and System Science (JCSS), Information Processing Letters (IPL), Parallel Processing Letters (PPL), IEEE Transactions on Computers (IEEE TC), IEEE Transactions on Parallel and Distributed Systems (IEEE TPDS), IEEE Transactions on Knowledge and Data Engineering (IEEE TKDE), IEEE Transactions on Software Engineering (IEEE TSE), IEEE Transactions on Dependable and Secure Computing (IEEE TDSC), Science of Computer Programming (SCP), Theoretical Computer Science (TCS), Theory of Computing Systems (TCS), The Computer Journal.

▷ I am regularly asked to review book proposals by Wiley & Sons, Springer, and Kluwer Academic Press.

▷ Member of the committee for selection of the *Principles of Distributed Computing Dissertation Award* (2017). This award was created in 2012 by the PODC (ACM) and DISC (EATCS) conferences community to acknowledge and promote outstanding research by doctoral (PhD) students on the principles of Distributed Computing.

PC chair, PC member, organizing committee member of the int’l conferences PODC, DISC, ICDCS, SIROCCO, and NETYS

▷ ACM PODC: PC member 2001, 2004, 2006, 2013, 2014, 2015.

SC member during 2006-2009.

I have been solicited several times to chair the PC of PODC (2005, 2012, and 2015) but I had to decline due to health (hearing) problems.

▷ The workshop on Distributed Algorithm (WDAG) became the int’l symposium on Distributed Computing (DISC) in 1996. PODC and DISC are recognized as the top conferences in the theory of distributed computing. Thanks to Jan van Leuween, I was involved in WDAG-DISC since its second edition, 1987. Since then, in one way or another, I spent lot of time and energy to have DISC a world leader conference.

PC chair: 1989 (Springer LNCS 312), 1995 (Springer LNCS 972).

PC member: 1987, 1990, 1993, 1996, 2006, 2008, 2013.

SC member: 2000-2004. SC Chair: 2002-2004.

▷ Birthday Article “*DISC at its 20th anniversary*” in *Proc. 21th Int’l Symposium on Distributed Computing (DISC’07)*, Springer LNCS 4731, pp. 501-504, 2007 (with S. Zaks –the Technion–, S. Toueg –Toronto University–).

▷ The Dijkstra Award was created by ACM PODC in 2000 for outstanding papers on the principles of distributed computing, whose significance and impact on the theory and/or practice of distributed computing has been evident for at least a decade. When I was chair of the DISC steering committee I (with the help of A. Schwarzmann) obtained that DISC becomes sponsored by EATCS, and that the Dijkstra Award becomes an ACM PODC/EATCS DISC award presented alternately at PODC (even years) and DISC (odd years).

▷ IEEE ICDCS. The IEEE Int’l Conference on Distributed Computing Systems was created in 1981. I have been involved in ICDCS since the very beginning (as one of my very first papers was at the first ICDCS).

PC member: 1990, 1993, 1995, 1998, 2000, 2004, 2007, 2009.

Chair of the track “Distributed Algorithms and Methods”: 1994.

Chair of the track “Distributed Synchronization”: 1999.

Chair of the track “Formal models and theory”: 2005.

Chair of the track “Theoretical foundations”: 2008.

Program chair: 2002. Conference chair: 2006. Workshop co-chair: 2002, 2010.

Int’l liaison chair: 2003, 2009, 2013. Award committee chair: 2004. Tutorial chair: 2010.

▷ SIROCCO. This conference is on complexity and the interplay between communication and computation. Its proceedings are published in the Springer LNCS series.

PC co-chair (with Andrzej Pelc): 2005. PC member: 2007.

Guest co-editor (with Andrzej Pelc and David Peleg) of a special issue of TCS (Theoretical Computer Science) devoted to Communication Complexity (Vol. 384, 2007). This issue includes the revised and improved versions of the best papers of SIROCCO 2005.

▷ NETYS. This is a new conference on Networked Systems. Its proceedings are published in the Springer LNCS series. PC member in 2013, 2015, 2016, and 2017. Program chair in 2014.

Other conferences I have been involved in more than 180 program committees of int’l conferences, workshops, summer/winter schools. Here only a subset of them is listed.

▷ PC co-chair, 23rd IEEE International Conference on Parallel and Distributed Systems (ICPADS). Shenzhen (China), December 2017.

▷ ICDCN (Int’l Conf. on Distributed Computing and Networking). PC member: 2005, 2008. PC chair: 2013. A special issue of TCS published in 2015.

▷ IEEE DSN (Int’l Conf. on Dependable Systems and Networks). PC : 2000, 2001, 2002, 2004.

▷ IEEE SRDS (Symposium on Reliable Distributed Systems). PC: 1996, 1998, 2001, 2002, 2003, 2005. Award chair: 2014.

▷ OPODIS (Int’l Symposium on Principles of Distributed Systems). PC 2006 and 2015. Program chair: 2009.

▷ IEEE FTDCS (Int’l workshop on Future Trends of Distributed Computing Systems). PC: 1995. Program Chair: 1995, 2003.

▷ IEEE SPDP (Symposium on Parallel and Distributed Systems). PC: 1993, 1995.

▷ IEEE IPDPS satellite workshop on Fault-tolerance in Parallel and Distributed Systems. PC: 1996, 1997, 1999, 2000, 2002, 2004.

▷ IEEE ICA3P2 (Int’l Conference on Algorithms and Architecture for Parallel Processing). PC: 1995, 1997, 2002, 2007.

▷ IEEE ISORC (Int’l Symposium on Object-oriented Real-time Distributed Computing).

Conference chair: 2002. Program chair: 1999. PC: 2003, 2006.

▷ IEEE PRDC (Pacific Rim Dependable Computing).

PC: 2002, 2004, 2006. Int’l liaison chair: 2005.

▷ IEEE NCA (Int’l Symposium. on Network Computing and Applications). PC: 2001, 2003, 2004, 2006.

▷ PaCT (Int’l Conference on Parallel Computing Technologies). PC: 2001, 2003, 2005, 2007, 2009. (This conference is organized in Russia every two years.)

▷ EUROPAR (European Conference on Parallelism). PC: 1999, 2001.

▷ LADC (Latin-American Conference on Dependable Computing). PC: 2004, 2005, 2009.

▷ IEEE AINA (Int’l Conference on Advanced Information Networking and Applications). PC: 2003, 2004, 2006. Int’l liaison co-chair: 2005.

▷ MFSC (Int’l Symposium on Mathematical Foundations of Computer Science), PC: 2009.

▷ COCOA Annual Int’l Conference on Combinatorial Optimization and Applications, PC: 2009.

4 Research grants in the recent past

4.1 European Marie Curie project TRANSFORM

This European project involved EPFL (Lausanne, Switzerland), TU Berlin (Germany), The Technion (Haifa, Israel), FORTH Heraklion (Greece), and IRISA (Rennes, France). It was founded in the context of the “Marie Curie” research projects of the 7th Framework Programme of the European Community.

Title Theoretical Foundations of Transactional Memory. Acronym: TRANSFORM.

Duration November 2009 - October 2013.

Amount Total: 2 000 000 Euros. For IRISA: 425 300 Euros.

Scientific content Major chip manufacturers have shifted their focus from trying to speed up individual processors into putting several processors on the same chip. They are now talking about potentially doubling efficiency on a $2x$ core, quadrupling on a $4x$ core and so forth. Yet multi-core is useless without concurrent programming. The constructors are now calling for a new software revolution: the concurrency revolution. This might look at first glance surprising for concurrency is almost as old as computing and tons of concurrent programming models and languages were invented. In fact, what the revolution is about is way more than concurrency alone: it is about concurrency for the masses.

The current parallel programming approach of employing locks is widely considered to be too difficult for any but a few experts. Therefore, a new paradigm of concurrent programming is needed to take advantage of the new regime of multicore computers. Transactional Memory (TM) is a new programming paradigm which is considered by most researchers as the future of parallel programming. Not surprisingly, a lot of work is being devoted to the implementation of TM systems, in hardware or solely in software. What might be surprising is the little effort devoted so far to devising a sound theoretical framework to reason about the TM abstraction. To understand properly TM systems, as well as be able to assess them and improve them, a rigorous theoretical study of the approach, its challenges and its benefits is badly needed. This is the challenging research goal undertaken by this research project.

4.2 Project DISPLEXITY (French national research agency ANR)

National project involving the following labs: IRIF (Paris), Prof. Pierre Fraigniaud, Labri (Bordeaux) Prof. Cyril Gavoille, and IRISA (me).

Title Distributed Computing: complexity and computability. Acronym: DISPLEXITY.

Duration January 2012 - June 2016.

Amount Total: 733 500 Euros. For IRISA: 226 500 Euros.

Scientific content Distributed computation keep raising new questions concerning computability and complexity. For instance, as far as fault-tolerant distributed computing is concerned, impossibility results do not depend on the computational power of the processes, demonstrating a form of undecidability which is significantly different from the one encountered in sequential computing. In the same way, as far as network computing is concerned, the impossibility of solving certain tasks locally does not depend on the computational power of the individual processes. The main goal of DISPLEXITY is to establish the scientific foundations for building up a consistent theory of computability and complexity for distributed computing. One difficulty to be faced by DISPLEXITY is to reconcile the different sub-communities corresponding to a variety of classes of distributed computing models. The current distributed computing community may indeed be viewed as two not necessarily disjoint sub-communities, one focusing on the impact of temporal issues, while the other focusing on the impact of spatial issues. The different working frameworks tackled by these two communities induce different objectives: computability is the main concern of the former, while complexity is the main concern of the latter. Within DISPLEXITY, the reconciliation between the two communities will be achieved by focusing on

the same class of problems, those for which the distributed outputs are interpreted as a single binary output: yes or no. Those are known as the yes/no-problems. The strength of DISPLEXITY is to gather specialists of the two main streams of distributed computing. Hence, DISPLEXITY will take advantage of the experience gained over the last decade by both communities concerning the challenges to be faced when building up a complexity theory encompassing more than a fragment of the field. In order to reach its objectives, DISPLEXITY aims at achieving the following tasks:

- Formalizing yes/no-problems (decision problems) in the context of distributed computing. Such problems are expected to play an analogous role in the field of distributed computing as that played by decision problems in the context of sequential computing.

-Formalizing decision problems (yes/no-problems) in the context of distributed computing. Such problems are expected to play an analogous role in the field of distributed computing as that played by decision problems in the context of sequential computing. -Revisiting the various explicit (e.g., failure-detectors) or implicit (e.g., a priori information) notions of oracles used in the context of distributed computing allowing us to express them in terms of decidability/complexity classes based on oracles.

-Identifying the impact of non-determinism on complexity in distributed computing. In particular, DISPLEXITY aims at a better understanding of the apparent lack of impact of non-determinism in the context of fault-tolerant computing, to be contrasted with the apparent huge impact of non-determinism in the context of network computing. Also, it is foreseen that non-determinism will enable the comparison of complexity classes defined in the context of fault-tolerance with complexity classes defined in the context of network computing.

4.3 Franco-Hong Kong project CO2Dim

Binational Franco-Hong Kong project involving the Department of computing of Polytechnic University, HK (Prof. Jianniong Cao), the Department of Informatics of the University of Franche-Comté, France, (Prof. Julien Bourgeois), and IRISA (me). Project founded by the RGC agency on the Hong Kong side and the ANR agency on the French side.

Title Coordination and Computation in distributed intelligent MEMS. Acronym: CO2Dim.

Duration March 2013 - August 2016.

Amount (French side) Total: 240 000 Euros. For IRISA: 65 000 Euros.

Scientific content Over the last decades, MEMS (MicroElectroMechanical Systems) research has focused on the engineering process, but future challenges will consist in adding embedded intelligence to MEMS systems to obtain distributed intelligent MEMS. One intrinsic characteristic of MEMS is their ability to be mass-produced. This, however, poses scalability problems because a significant number of MEMS can be placed in a small volume. Managing this scalability requires paradigm-shifts both in hardware and software parts. Furthermore, the need for actuated synchronization, programming, communication and mobility management raises new challenges in both control and programming. Finally, MEMS are prone to faulty behaviors as they are mechanical systems and they are issued from a batch fabrication process. A new programming paradigm which can meet these challenges is therefore needed. This project proposes to develop CO2Dim, which stands for Coordination and Computation in Distributed Intelligent MEMS. CO2DIM is a new programming language based on a joint development of programming and control capabilities so that actuated synchronization can easily be programmed and can scale up to millions of units.

4.4 Franco-German project DISCMAT

Binational Franco-German project involving the Department of Mathematics of University of Bremen, Germany, (Prof. Dmitri Kozlov), the Department of Informatics of Telecom, Paris Tech (Prof. Petr

Kuznetsov), and IRISA (me). Project founded by the DFG agency on the German side and the ANR agency on the French side.

Title Mathematical methods in distributed computing. Acronym: DISCMAT.

Duration November 2014 - January 2018.

Amount (French side) Total: 401 500 Euros. For IRISA: 209 000 Euros.

Scientific content The goal of this interdisciplinary project is to develop new mathematical tools in the analysis of distributed systems and to improve our understanding of complexity and computability bounds in distributed computing.

Practically all computing systems, from fire alarms to Internet-scale services, are nowadays *distributed*: they consist of a number of computing units performing independent computations and communicating with each other to synchronize their activities. Our dependence on performance and reliability of the distributed computing becomes more and more imminent. Therefore, understanding fundamentals of distributed computing is of crucial importance.

The main complication here is the existing immense diversity of distributed applications, models of distributed computations, and performance metrics, combined with the lack of mathematical tools to handle this complexity. Recently, an impressive attempt to address this challenge was made: a number of long-standing open questions in distributed computability were resolved using some of the most advanced branches of modern mathematics, including the elements of combinatorial and algebraic topology. These encompass proving impossibility of solving the fundamental problems of agreement, and renaming. However, most of the existing applications of topology in distributed computing concern theoretical positive or negative results, i.e., proving that no solution to a given problem in a given model exists or proving the existence fact in a non-constructive way. With a few exceptions, there are no convincing examples of using advanced mathematical tools to design new efficient algorithms.

At a higher level, this proposal aims at better understanding of what can and what cannot be implemented in specific distributed environments. In particular, we intend to apply the power of modern mathematics in deriving new algorithms and tight lower bounds for distributed computing problems.

4.5 Project DESCARTES (French national research agency ANR)

National project involving the following labs: IRIF (Paris, Prof. Pierre Fraigniaud), Labri (Bordeaux, Prof. Cyril Gavoille), and IRISA (me).

Title Abstractions layers for distributed computing. Acronym: DESCARTES.

Duration October 2016 - September 2020.

Amount Total: 395 000 Euros. For IRISA: 115 000 Euros.

Scientific content Despite the practical interests of reusable frameworks for implementing specific distributed services, many of these frameworks still lack solid theoretical bases, and only provide partial solutions for a narrow range of services. We argue that this is mainly due to the lack of a generic framework that is able to unify the large body of fundamental knowledge on distributed computation that has been acquired over the last 40 years. The DESCARTES project aims at bridging this gap, by developing a systematic model of distributed computation that organizes the functionalities of a distributed computing system into reusable modular constructs assembled via well-defined mechanisms that maintain sound theoretical guarantees on the resulting system. DESCARTES arises from the strong belief that distributed computing is now mature enough to resolve the tension between the social needs for distributed computing systems, and the lack of a fundamentally sound and systematic way to realize these systems.

4.6 Project ByBloS (French national research agency ANR)

National project involving the following labs: IRISA (Rennes), LS2N (University of Nantes), and LIRIS (Insa Lyon). Scientific coordinator: Prof. François Taïni, IRISA.

Title Beyond blockchains: modular building blocks for large-scale trustless multi-users applications.
Acronym: ByBloS.

Duration October 2020 - September 2023.

Amount Total: 573 600 Euros.

Scientific content The rise of blockchains over the last decade has attracted growing attention from both academia and industry, leading to the development of several highly-visible systems and algorithms. These blockchain-based systems come, however, with many caveats in terms of performance and scalability, that are inherent to the total order that blockchain algorithms seek to achieve on their operations, which implies in turn a Byzantine-tolerant agreement. To overcome these limitations, the ByBloS project takes a step aside, and exploits the fact that many applications – including cryptocurrencies – do not require full Byzantine agreement, and can be implemented with much lighter, and hence more scalable and efficient, guarantees. We further argue that these novel Byzantine-tolerant applications have the potential to power large-scale multi-user online systems, and that, in addition to Byzantine Fault Tolerance, these systems may also provide strong privacy protection mechanisms, that are designed from the ground up to exploit implicit synergies with Byzantine mechanisms.