Arnaud de Mesmay

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Born on December 21st, 1988
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Employment and Education

2019-Present *LIGM*, Université Gustave Eiffel : Permanent researcher (Chargé de recherche Classe Normale) at CNRS.

2015-2019 *Gipsa-Lab*, Grenoble : Permanent researcher (Chargé de recherche Classe Normale) at CNRS.

2014-2015 *IST Austria*, Vienna : Post-doc in the group of Uli Wagner, with an ISTFELLOW fellowship (Marie Curie COFUND).

2011-2014 *École normale supérieure* (ENS), Paris : PhD thesis : "Topics in Low Dimensional Computational Topology"under the supervision of Éric Colin de Verdière. Date of defense : July 7, 2014.

- Awarded with the best mention *Très honorable avec félicitations du jury*.
- Reviewers :
  — Frédéric Chazal (CS, INRIA Saclay - Île de France)
  — Jeff Erickson (CS, University of Illinois at Urbana-Champaign, USA)
  — Eric Sedgwick (CS, DePaul University, USA)
- Examiners :
  — Cyril Gavoille (CS, Université de Bordeaux)
  — Pierre Pansu (Math, Université Paris-Sud)
  — Jorge Ramìrez-Alfonsìn (Math, Université Montpellier 2)
  — Monique Teillaud (CS, INRIA Sophia-Antipolis - Méditerranée)

2010-2011 *École normale supérieure* (ENS), Paris : *Parisian Masters of Research in Computer Science (MPRI)*, awarded with the best mention, ranked first.

2009-2010 *École normale supérieure* (ENS), Paris : *Masters in Mathematical Logic and Foundations of Computer Science*, University Paris VII, awarded with the best mention.

2007-2009 *École normale supérieure* (ENS), Paris : Undergraduate studies in Mathematics and Computer Science (L3, M1) and *Agrégation* (ranked 5th)).

2005 French *Baccalauréat* and German *Abitur*.

Awards

2019 *Best paper award*, International Symposium on Computational Geometry (SoCG), with Vincent Cohen-Addad, Éric Colin de Verdière and Dániel Marx (single award from 60 accepted papers and 166 submissions)

PUBLICATIONS

Articles in refereed journals

— [J14] *Constructing monotone homotopies and sweepouts*, with Erin W. Chambers, Gregory R. Chambers, Tim Ophelders and R. Rotman. Accepted for publication at Journal of Differential Geometry.
— [J13] *Almost Tight Lower Bounds for Hard Cutting Problems in Embedded Graphs*, with Vincent Cohen-Addad, Éric Colin de Verdière and Dániel Marx. Journal of the ACM, to appear.
— [J12] *The unbearable hardness of unknotting*, with Yo'av Rieck, Eric Sedgwick and Martin Tancer. Advances in Mathematics, Volume 381, 2021.
— [J11] *A Near-Linear Approximation Scheme for Multicuts of Embedded Graphs with a Fixed Number of Terminals*, with Vincent Cohen-Addad and Éric Colin de Verdière. SIAM Journal of Computing, Volume 50, Nr. 1, 1–31, 2021.
— [J10] *Link Crossing Number is NP-Hard*, with Marcus Schaefer and Eric Sedgwick. Journal of Knot Theory and Ramifications, Volume 29, Nr. 06, 2020.
— [J9] *Embeddability in* $\mathbb{R}^3$ *is NP-hard*, with Yo'av Rieck, Eric Sedgwick and Martin Tancer. Journal of the ACM, Volume 67, Nr. 4, 2020.
— [J8] *On the tree-width of knot diagrams*, with Jessica Purcell, Saul Schleimer and Eric Sedgwick. Journal of Computational Geometry, Volume 10, Nr. 1, 164–180, 2019.
— [J7] *Nœuds, mouvements de Reidemeister et algorithmes (d'après Lackenby)*, in French. Séminaire Bourbaki, Astérisque, Volume 407, Société Mathématique Française, 27–52, 2019.
— [J6] *Finding non-orientable surfaces in 3-manifolds*, with Benjamin A. Burton and Uli Wagner. Discrete and Computational Geometry, Volume 58, Issue 4, 871–888, 2017.
— [J5] *Shortest path embeddings of graphs on surfaces*, with Alfredo Hubard, Vojtěch Kaluža and Martin Tancer. Discrete and Computational Geometry, Volume 58, Issue 4, 921–945, 2017.
— [J4] *On the Complexity of Immersed Normal Surfaces*, with Benjamin Burton and Éric Colin de Verdière. Geometry & Topology, Volume 20, 1061-1083, 2016.
— [J3] *Discrete systolic inequalities and decompositions of triangulated surfaces*, with Éric Colin de Verdière and Alfredo Hubard. Discrete and Computational Geometry, April 2015, Volume 53, Issue 3, pp 587–620.
— [J2] *Testing graph isotopy on surfaces*, with Éric Colin de Verdière. Discrete and Computational Geometry, January 2014, Volume 51, Issue 1, Pages 171–206.
— [J1] *Dimension reduction for finite trees in* ℓ_1, with James R. Lee and Mohammad Moharrami. Discrete and Computational Geometry, December 2013, Volume 50, Issue 4, Pages 977–1032.

Articles in proceedings of flagship conferences

— [C16] *Algorithms for Contractibility of Compressed Curves on 3-Manifold Boundaries*, with Erin W. Chambers, Francis Lazarus and Salman Parsa. Proceedings of the 37th International Symposium on Computational Geometry (SOCG), 2021. Invited to special issue of Discrete & Computational Geometry.
— [C15] *Tightening Curves on Surfaces Monotonically with Applications*, with Hsien-Chih Chang. Proceedings of the Thirty-First Annual ACM-Symposium on Discrete Algorithms (SODA), 2020. Invited to special issue of the ACM Transactions on Algorithms.
— [C14] *Homotopy Height, Grid-Major height and Graph-Drawing Height*, with Therese Biedl, Erin Wolf Chambers, David Eppstein and Tim Ophelders. Graph Drawing (GD), 2019.
— [C13] *Almost Tight Lower Bounds for Hard Cutting Problems in Embedded Graphs*, with Vincent Cohen-Addad, Éric Colin de Verdière and Dániel Marx. Proceedings of the 35th International Symposium on Computational Geometry (SOCG), 2019. **Best Paper Award**. Conference version of [J13].
— [C12] *The unbearable hardness of unknotting*, with Yo'av Rieck, Eric Sedgwick and Martin Tancer. Proceedings of the 35th International Symposium on Computational Geometry (SOCG), 2019. Conference version of [J12].
— [C11] *Minimizing Intersections of Curves on Surfaces via Local Moves*, with Hsien-Chih Chang, Jeff Erickson, David Letscher, Saul Schleimer, Eric Sedgwick, Dylan Thurston and Stephan Tillmann. Proceedings of the Twenty-Ninth Annual ACM-SIAM Symposium on Discrete Algorithms (SODA), 2018.
— [C10] *The Bane of Low-Dimensionality Clustering*, with Vincent Cohen-Addad, Eva Rotenberg and Alan

Roytman. Proceedings of the Twenty-Ninth Annual ACM-SIAM Symposium on Discrete Algorithms (SODA), 2018.

— [C9] *On the complexity of optimal homotopies*, with Erin Wolf Chambers and Tim Ophelders. Proceedings of the Twenty-Ninth Annual ACM-SIAM Symposium on Discrete Algorithms (SODA), 2018.

— [C8] *Embeddability in R^3 is NP-hard*, with Yo'av Rieck, Eric Sedgwick and Martin Tancer. Proceedings of the Twenty-Ninth Annual ACM-SIAM Symposium on Discrete Algorithms (SODA), 2018. Conference version of [J9].

— [C7] *A Near-Linear Approximation Scheme for Multicuts of Embedded Graphs with a Fixed Number of Terminals*, with Vincent Cohen-Addad and Éric Colin de Verdière. Proceedings of the Twenty-Ninth Annual ACM-SIAM Symposium on Discrete Algorithms (SODA), 2018. Conference version of [J11].

— [C6] *Finding non-orientable surfaces in 3-manifolds*, with Benjamin A. Burton and Uli Wagner. Proceedings of the 32nd International Symposium on Computational Geometry (SOCG), 2016. Conference version of [J6].

— [C5] *Shortest path embeddings of graphs on surfaces*, with Alfredo Hubard, Vojtěch Kaluža and Martin Tancer. Proceedings of the 32nd International Symposium on Computational Geometry (SOCG), 2016. Conference version of [J5].

— [C4] *A fixed parameter tractable approximation scheme for the optimal cut graph of a surface*, with Vincent Viallat Cohen-Addad. Proceedings of the 23rd Annual European Symposium on Algorithms (ESA), 2015.

— [C3] *Discrete systolic inequalities and decompositions of triangulated surfaces*, with Éric Colin de Verdière and Alfredo Hubard. Proceedings of the 30th Annual Symposium on Computational Geometry (SOCG), ACM, pages 335–344, 2014. Conference version of [J3].

— [C2] *Testing graph isotopy on surfaces*, with Éric Colin de Verdière. Proceedings of the Twenty-Eigth Annual Symposium on Computational Geometry (SOCG), ACM, pages 141–150, 2012. Conference version of [J2].

— [C1] *Dimension reduction for finite trees in ℓ_1*, with James R. Lee and Mohammad Moharrami. Proceedings of the Twenty-Third Annual ACM-SIAM Symposium on Discrete Algorithms (SODA), pages 43-50, 2012. Conference version of [J1].

Other reviewed publications

— [O2] *Mouvements locaux et algorithmique des nœuds*, in French. La Gazette des Mathématiciens, Société Mathématique Française, Octobre 2018, Nr. 158, pp. 33-41. Shortened version of [J7].

— [O1] De la carte au territoire ? with Éric Colin de Verdière. *Images des Mathématiques*, CNRS, 2014. Vulgarization article around *Testing graph isotopy on surfaces*.

Manuscripts

— [M4] *Distributed coloring and the local structure of unit-disk graphs* with Louis Esperet and Sébastien Julliot. ArXiv preprint.

— [M3] *Hard diagrams of the unknot*, with Benjamin A. Burton, Hsien-Chih Chang, Maarten Löffler, Clément Maria, Saul Schleimer, Eric Sedgwick and Jonathan Spreer. ArXiv preprint.

— [M2] *Repairing Metrics and Ultrametrics*, with Vincent Cohen-Addad, Chenglin Fan and Euiwoong Lee, submitted.

— [M1] *Lecture Notes on Computational Topology*, with Francis Lazarus.

PRESENTATIONS

International venues

- Computational Geometry, Dagstuhl, Germany, online (2021).
- Lost in Translation Surfaces, Université du Luxembourg, Luxembourg (2020).
- Computation in Low-Dimensional Geometry and Topology, Dagstuhl, Germany (2019).
- Canadian Discrete and Algorithmic Mathematics Conference (CanaDAM), Vancouver, Canada (2019).
- Symposium on Computational Geometry, Portland, USA (2019).

- Computational Geometry, Dagstuhl, Germany (2019).
- International Symposium on Mathematical Programming (ISMP), Bordeaux, France (2018).
- ACM-SIAM Symposium on Discrete Algorithms, New Orleans, USA (2018).
- Computation in Geometric Topology, Warwick, UK (2017).
- Foundations of Computational Mathematics, Barcelona, Spain (2017).
- Symposium on Computational Geometry, Boston, USA (2016).
- Computational Geometric and Algebraic Topology, Oberwolfach, Germany (2015).
- European Symposium on Algorithms, Patras, Greece (2015).
- ACM Symposium on Computational Geometry, Kyoto, Japan (2014).
- European Workshop on Computation Geometry, Ein Gedi, Israel (2014).
- ACM Symposium on Computational Geometry, Chapel Hill, North Carolina, USA (2012).
- Summer school on Analysis and Geometry in the Theory of Computation, Bloomington, Indiana, USA (2009).

Conferences in France

- SoS Seminar, Nancy, Luxembourg, online (2021).
- Journées de Combinatoire de Bordeaux, Bordeaux (2020).
- Summer School in Geometric and Algebraic Combinatorics, Paris (2019).
- Journées de Géométrie Algorithmique, La Bresse (2019).
- Workshop in Geometric Analysis, Paris (2018).
- Séminaire Flajolet, Paris (2018).
- Astonishing Workshop, Nancy (2017).
- Journées ANR GATO, Paris (2017).
- Conférence SIGMA, Luminy (2017).
- Séminaire Bourbaki, Paris (2016).
- Journées Graphes et surfaces, Grenoble (2016).
- Journées de Géométrie Algorithmique, Cargèse (2015).
- Journée du GDR-IM, Bordeaux (2015).
- Journées de Géométrie Algorithmique, Luminy (2013).
- Journées Complexité et Algorithmes, Université Paris 7 (2013).
- École Jeunes Chercheurs en Informatique Mathématique, Université de Perpignan (2013).
- Journées de Géométrie Algorithmique, Cluny (2012).

Invited talks at Math or CS Seminars

- Combinatorics and Complexity seminar, UCLA, online (2021).
- Graphs and Optimization seminar, LABRI, online (2021).
- Séminaire DATASHAPE, INRIA, online (2021).
- Conseil Scientifique du Labex Bezout, Université Paris Est, France (2020).
- Séminaire d'algorithmique, LIGM, Université Paris Est, France (2019).
- Algorithms Seminar, Bergen, Norway (2019).
- Séminaire de Topologie, Institut Fourier, Grenoble, France (2019).
- Topology Seminar, University of Arkansas, Fayetteville (2018).
- EADS Seminar, University of Copenhagen, Denmark (2017).
- Séminaire de Géométrie Algorithmique, Collège de France, Paris, France (2017).
- Geometry and Topology Seminar, IST Austria, Austria (2017).
- DATASHAPE Seminar, INRIA Sophia-Antipolis, France (2016).
- Discrete Mathematics seminar, Charles University, Prague, Czech republic (2016).
- Séminaire de Théorie spectrale et Géométrie, Institut Fourier, Grenoble, France (2016).
- Computational and Combinatorial Geometry Seminar, Institut Henri Poincaré, France (2015).
- GT Combi du LIX, Ecole Polytechnique, Palaiseau, France (2015).
- Images et Signal Seminar, Gipsa-Lab, Grenoble, France (2015).
- Geometry and Topology Seminar, IST Austria, Austria (2014).

- Séminaire Complexité et Algorithmes du LIAFA, Paris, France (2014).
- Geometry Processing, Shapes and Images Workgroup, Saclay, France (2014).
- Pure Mathematics Seminar, University of Queensland, Australia (2012).

GRANTS

2020-2024 Participant of the *MINMAX* project, funded by ANR. PI : Stéphane Sabourau.

2020-2022 Participant of the *SoS* project, funded by ANR. PI : Monique Teillaud.

2018 PI of the *COMP3D* project, funded by INS2I.

2018-2022 Participant of the *FOCAL* project, funded by ANR. PI : Vincent Cohen-Addad.

2017-2018 Participant of the *EMBEDS2* Czech-French collaboration, funded by a PHC Barrandes. PIs : Xavier Goaoc and Martin Tancer.

2016-2021 Participant of the *GATO* project, funded by ANR. PI : Francis Lazarus.

TEACHING

2020-2021 Algorithms and combinatorics of geometric graphs. Masters course at MPRI, co-taught with Vincent Pilaud, 12 hours.
`https://wikimpri.dptinfo.ens-cachan.fr/doku.php?id=cours:c-2-38-1`

2019-2021 Algorithms course, exercise and practical sessions, 48 hours, ESIPE, first year.

2016-2018 Masters course in *Computational Topology* at ENS Lyon, co-taught with Francis Lazarus, 12 hours.
`https://pagesperso.g-scop.grenoble-inp.fr/~lazarusf/Enseignement/compuTopo.html`

2011-2014 Teaching assistant (192h) at the University Paris VII (Denis Diderot). Courses : Introduction to programming, Data types and objects, Automata.

SUPERVISION

Post-graduate :

2020-2023 Niloufar Fuladi (M2 and PhD), co-advised with Éric Colin de Verdière and Alfredo Hubard.

2020-2023 Jean Chartier (PhD), co-advised with Laurent Hauswirth and Stéphane Sabourau.

2019-2020 Chenglin Fan (Post-doc), co-advised with Vincent Cohen-Addad.

Undergraduate :

2021	M2 internship of Corentin Lunel (ENS Lyon).
2020	M2 internship of Niloufar Fuladi (Université Gustave Eiffel), co-advised with Alfredo Hubard.
2018	Corentin Lunel (L3,ENS Lyon).
2017	Quentin Lisack (ENSIMAG), Victor Wang (MIT/Princeton), co-advised with Francis Lazarus.
2016	Nicolas Pinson (L3, ENS Lyon), Hugo Manet (L3, ENS), co-advised with Francis Lazarus.
2015	Bernhard Kragl (IST Austria rotation), co-advised with Uli Wagner.

SERVICE

— *Committees* : Member of the scientific board of GT CoA. Co-organizer of the Discrete and Computational Geometry Seminar in Paris (with Alfredo Hubard and Arnau Padrol).
— *Program Committees* : SOCG 2017, WADS 2019, EuroCG 2020.
— *Organization of Scientific Events* : Co-organizer (with Ulrich Bauer and Uli Wagner) of the 9th annual Minisymposium on Computational Topology (Buffalo, USA, online). Co-organizer (with Francis Lazarus and Boris Thibert) of the French Computational Geometry Days, 2020, CIRM, Luminy, France.
— *Conference Reviews* : External reviewer for SOCG 2013, 2014, 2016, 2018, 2020 (x2) and 2021 (x2), MFCS 2014, ICALP 2015, ITCS 2021, IPCO 2021, SODA 2016, 2018, 2019, 2020 (x2) and 2021, GD 2016, ESA 2016, 2017, 2019 and 2021, EuroGraphics 2020, SIGGRAPH 2018, STACS 2018, 2019 and 2021, STOC 2018 (x2), FOCS 2018, JCDCGGG 2019.
— *Journal reviews* : Reviewer for Journal of the ACM, Discrete and Computational Geometry (x3), Geometriae Dedicata (x2), Journal of Applied and Computational Topology, Journal of Computational Geometry (x2), Discrete Mathematics and Theoretical Computer Science, Discrete Mathematics, Algebraic and Geometric Topology, as well as for MathSciNet and the special issue Journey Through Discrete Mathematics, A Tribute to Jiri Matousek.
— *Grant reviews* : Outside reviewer for an ANR Grant and a Labex project.

LONG VISITS

2013	2-months visit to Nati Linial in Jerusalem, Israel at the Hebrew University.
2012	18-days visit to Benjamin Burton in Brisbane, Australia at the University of Queensland.
2010	5-months internship with James R. Lee in Seattle, USA at the University of Washington.