

## Curriculum Vitae

Nom : Artur Avila Cordeiro de Melo.

Date et lieu de naissance : 29 juin 1979 - Rio de Janeiro - RJ - Brésil.

Nationalité : Brésilienne, Française.

Adresses : UP7D, Bâtiment Sophie Germain, Case 7012, 75205 PARIS Cedex 13, France.

Instituto Nacional de Matemática Pura e Aplicada, IMPA, Estrada Dona Castorina, 110, Rio de Janeiro, 22460-320, Brazil.

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**Doctorat** : IMPA, 2001. Jury : W. de Melo (directeur de thèse), M. Viana, J. Palis, J.-C. Yoccoz, J. Milnor.

### Postes actuels :

Depuis 2008. Directeur de recherche au CNRS.

De 2008 à 2009. En détachement.

Depuis 2009. Affecté à l'Institut de Mathématiques de Jussieu-Paris Rive Gauche (UMR 7586, CNRS, Université Paris Diderot, UPMC).

Depuis 2009. Chercheur (Cátedra Armínio Fraga) à l'IMPA, CNRS UMI 2294.

### Postes antérieurs :

De 2001 à 2003. Maître de Conférence Associé au Collège de France.

De 2003 à 2008. Chargé de recherche au CNRS.

De 2003 à 2006. Affecté au Laboratoire de Probabilités et Modèles Aléatoires (UMR 7599, CNRS, Université Paris Diderot, UPMC).

De 2006 à 2008. En détachement.

De 2006 à 2009. Bourse du Clay Mathematics Institute, affecté à l'IMPA, CNRS UMI 2294.

### Prix et distinctions

Médaille d'or à l'Olympiade Internationale de Mathématiques, Canada, 1995.

Cours Peccot au Collège de France, 2005.

Conférence invitée au Congrès International de Physique Mathématique, 2006.

Médaille de Bronze du CNRS, 2006.

Prix Salem, 2006.

Wolff Memorial Lectures à Caltech, 2008.

Conférence invitée au Congrès Européen de Mathématiques, 2008.

Prix de la EMS, 2008.

Grand Prix Jacques Herbrand de l'Académie des Sciences, 2009.

Porter Lectures à Rice, 2010.

Conférence plénière au Congrès International des Mathématiciens, 2010.

Blyth Lectures à Toronto, 2011.

Prix Michael Brin, 2011.

IAMP Early Career Award, 2012.

Prêmio da SBM, 2013.

TWAS Prize, 2013.

Bellow Lectures à Northwestern, 2014.

Médaille Fields, 2014.

### Service

Comités de rédaction : Ergodic Theory and Dynamical Systems, Mathematical Proceedings of the Cambridge Philosophical Society, Publications Mathématiques de l'IHES, Duke Mathematical Journal. ERC Starting Grant (5 années, à partir du 01/12/2010).

Membre local des comités de sélection à Paris 7 en 2011 (deux postes de MdC), 2012 (un poste de professeur) et 2013 (un poste de MdC).

#### **Encadrements prédoctoral, doctoral et post-doctoral**

Encadrement de stage de master 2 : Xu Disheng (ENS, 2012), Martin Leguil (Polytechnique, 2013), Zhiyuan Zhang (ENS, 2013).

Thèses : Maria João Resende (IMPA, 2009, en codirection avec Marcelo Viana, actuellement en poste à Universidade Federal Fluminense), Zhenghe Zhang (Northwestern University, 2014, en codirection avec Amie Wilkinson).

Thèses en cours : Xu Disheng (IMJ-PRG), Martin Leguil (IMJ-PRG), Zhiyuan Zhang (IMJ-PRG), Xiaochuan Liu (IMPA), Adriana Sanchez (IMPA).

Post-doctorants ERC à l'IMJ : David Aulicino, Vincent Delecroix, Sasha Skripchenko, Nikolaos Karaliolos (en cours), Qi Zhou (en cours).

#### **Participations comme conférencier invité**

- (1) Meeting of the American Mathematical Society, Washington DC, 01/2000.
- (2) International Conference on Dynamical Systems, Porto, 05/2000.
- (3) International Conference on Dynamical Systems (Jacob Palis 60 Fest), Rio de Janeiro, 07/2000.
- (4) First Latin American Congress of Mathematics, Rio de Janeiro, 08/2000.
- (5) Special Session on Complex Dynamics and Ergodic Theory, Warwick, 01/2001.
- (6) Dynamical Odyssey, Luminy, 02/2001.
- (7) Recent Trends in Dynamics II, Porto, 05/2001.
- (8) School and Workshop on Dynamical Systems, Trieste, 08/2001.
- (9) Research Trimester on Dynamical Systems, Pisa, 04/2002.
- (10) Recent Trends in Dynamics III, Porto, 05/2002.
- (11) New Directions in Dynamical Systems (ICM satellite conference), Kyoto, 08/2002.
- (12) Dynamical methods in differential equations, Medina del Campo, 09/2002.
- (13) Congrès franco-brésilien en l'honneur d'Harold Rosenberg : Géométrie, feuilletages et systèmes dynamiques, Abbaye de La Bussière, 09/2002.
- (14) Real and Complex One-dimensional Dynamics, Warwick, 12/2002.
- (15) Geometría compleja y sistemas dinámicos (Alberto Fest), Cuernavaca, 01/2003.
- (16) Holomorphic Dynamics, Warwick, 04/2003.
- (17) Recent Trends in Dynamics 2003, Porto, 07/2003.
- (18) Dynamische Systeme, Oberwolfach, 07/2003.
- (19) Geometric Aspects of Dynamical Systems, Warwick, 07/2003.
- (20) Combinatorial Methods in Complex Dynamics, Warwick, 04/2004.
- (21) Multidimensional non-uniformly hyperbolic dynamical systems, CIRM, Luminy, 05/2004.
- (22) Dynamical Systems : from Algebraic to Topological Dynamics, MPIM, Bonn, 07/2004.
- (23) Premier congrès Canada-France des sciences mathématiques, Toulouse, 07/2004.
- (24) Summer School and Conference on Dynamical Systems, ICTP, Trieste, 07/2004.
- (25) Qmath 9, Giens, 09/2004.
- (26) Nonlinear Dynamics, Ergodic Theory and Renormalization, Lorentz center, Leiden, 09/2004.
- (27) Conformal Dynamics, Hyperbolic Geometry, and Continued Fractions, Luminy, 06/2005.

- (28) Colloquium in Dynamical Systems and Smooth Ergodic Theory, Bordeaux, 06/2005.
- (29) 25 Colóquio Brasileiro de Matemática (sessão de sistemas dinâmicos), Rio de Janeiro, 07/2005.
- (30) International Conference on Dynamical Systems, Angra dos Reis, 08/2005.
- (31) Renormalization in dynamical systems workshop, Fields institute, Toronto, 12/2005.
- (32) Partially hyperbolic dynamics, laminations, and Teichmüller flow Workshop, Fields institute, Toronto, 01/2006.
- (33) Complex dynamics and geometry, Luminy, 06/2006.
- (34) Young Researchers Symposium, Rio de Janeiro, 08/2006 (session plénière).
- (35) International Congress on Mathematical Physics, Rio de Janeiro, 08/2006 (session des systèmes dynamiques).
- (36) 26 Colóquio Brasileiro de Matemática, Rio de Janeiro, 08/2007 (session plénière).
- (37) Maryland (Brin 60 Fest), 03/2008.
- (38) Teichmüller flow, Roscoff, 06/2008.
- (39) School and workshop on dynamical systems, Trieste, 07/2008.
- (40) 5th European Congress of Mathematics , 07/2008.
- (41) Indo-Brazilian, IMPA, Rio, 07/2008.
- (42) Annual meeting of the German Mathematical Society, Erlangen, 09/2008.
- (43) Low dimensional dynamics, Oberwolfach, 10/2008.
- (44) Maryland, 04/2009.
- (45) Advances in low dimensional dynamics, Stony Brook, 06/2009.
- (46) Luminy (Sibony 60 Fest), 06/2009.
- (47) Luminy (Masur 60 Fest), 06/2009.
- (48) Dynamical Systems, Oberwolfach, 07/2009.
- (49) UMALCA Congress (plenary), Santiago, 09/2009.
- (50) French-Brazilian, Brazilian Academy of Sciences, Rio, 09/2009.
- (51) Progress in Dynamics (Katok 65 Fest), IHP, Paris, 11/2009.
- (52) Yasha Eliashberg's Honoris Causa, ENS Lyon, 12/2009.
- (53) International Congress in Dynamical Systems, Búzios, 02/2010.
- (54) International Congress of Mathematicians (plenary), Hyderabad, 08/2010.
- (55) Chaotic structures at Fields (Sinai 75), Toronto, 02/2011.
- (56) Dynamical systems and classical mechanics (Arnold memorial), Edinburgh, 10/2011.
- (57) Semi-annual workshop in dynamical systems and related topics, State College, 10/2011.
- (58) Clay Research Conference, Oxford, 06/2012.
- (59) First Palis-Balzan International Symposium on Dynamical Systems, 06/2012.
- (60) International Conference on Mathematical Physics (prize talk), Aalborg, 08/2012.
- (61) Abel Symposium, Oslo, 08/2012.
- (62) Dynamical Systems : 100 years after Poincaré, Gijón, 09/2012.
- (63) Dynamique et EDP (Eliasson 60), Luminy, 11/2012.
- (64) Advanced School and Workshop in Real and Complex Dynamics, Trieste, 05/2013.

- (65) Second Palis-Balzan International Symposium on Dynamical Systems, Paris, 06/2013.
- (66) First European-Nordic Congress of Mathematicians, Lund, 06/2013.
- (67) Workshop on Combinatorics, Number Theory and Dynamical Systems, IMPA, 08/2013.
- (68) Workshop on Low-Dimensional Dynamics - Dynamics Beyond Uniform Hyperbolicity, IMPA, 11/2013.
- (69) Journées de Géométrie et Dynamique, Bordeaux, 2013.
- (70) International Conference on Dynamical Systems, IMPA, 2013.

#### **Séjours de courte durée**

- (1) State University of New York at Stony Brook, 04/1999.
- (2) State University of New York at Stony Brook, 01/2000-02/2000.
- (3) State University of New York at Stony Brook, 11/2000.
- (4) Royal Institute of Technology (KTH), Stockholm, 09/2001.
- (5) State University of New York at Stony Brook, 11/2001-12/2001.
- (6) University of Toronto, 01/2003-02/2003.
- (7) Caltech, 03/2004.
- (8) University of Toronto, 10/2004.
- (9) Scuola Normale Superiore, Pisa, 01/2005-02/2005.
- (10) IMPA, Rio de Janeiro, 08/2005.
- (11) Fields institute, Toronto, 12/2005.
- (12) CMAF, Lisboa, 05/2007.
- (13) Caltech, 02/2008.
- (14) Paris 6, 06/2008.
- (15) Paris 6, 09-10/2008.
- (16) Mittag-Leffler, 05/2010.
- (17) Hausdorff Institute, 06/2010.
- (18) Fields Institute, 01/2011-03/2011.

#### **Articles**

##### **Publiés**

- (1) On the dynamics of the renormalization operator.  
A. Avila, M. Martens, W. de Melo. Dans "Global Analysis of Dynamical Systems : Festschrift dedicated to Floris Takens for his 60th birthday", Ed. H.Broer, B. Krauskopf, G. Vegter, Institute of Physics Publishing, Bristol and Philadelphia, 2001, pp. 449–460.
- (2) Bifurcations d'applications unimodales.  
A. Avila. C. R. Acad. Sci. Paris, Ser. I 334 (2002), 483-488.
- (3) Infinitesimal perturbations of rational maps.  
A. Avila. Nonlinearity 15 (2002), 695-704.
- (4) A formula with applications to the theory of Lyapunov exponents.  
A. Avila, J. Bochi. Israel Journal of Mathematics 131 (2002), 125-137.
- (5) Statistical properties of unimodal maps : smooth families with negative Schwarzian derivative.  
A. Avila, C. G. Moreira. Astérisque 286 (2003), 81-118.

- (6) Regular or stochastic dynamics in real analytic families of unimodal maps.  
A. Avila, M. Lyubich, W. de Melo. *Inventiones Mathematicae* 154 (2003), 451-550.
- (7) Robust transitivity and topological mixing for  $C^1$ -flows.  
F. Abdenur, A. Avila, J. Bochi. *Proceedings of the AMS* 132 (2004), 699-705.
- (8) Bifurcations of unimodal maps.  
A. Avila, C. G. Moreira. Dans *Dynamical Systems. Part II : Topological Geometrical and Ergodic Properties of Dynamics*. Pubblicazioni della Classe di Scienze, Scuola Normale Superiore, Pisa. Centro di Ricerca Matematica "Ennio De Giorgi" : Proceedings, 2003, pp. 1-22.
- (9) Convergence of an exact quantization scheme.  
A. Avila. *Communications in Mathematical Physics* 249 (2004), 305-318.
- (10) Quasisymmetric robustness of the Collet-Eckmann condition in the quadratic family.  
A. Avila, C. G. Moreira. *Bulletin of the Brazilian Mathematical Society* 35 (2004), 291-331.
- (11) Siegel disks with smooth boundaries.  
A. Avila, X. Buff, A. Chéritat. *Acta Mathematica* 193 (2004), 1-30.
- (12) Statistical properties of unimodal maps : the quadratic family.  
A. Avila, C. G. Moreira. *Annals of Mathematics* 161 (2005), 831-881.
- (13) Statistical properties of unimodal maps : physical measures, periodic orbits and pathological laminations.  
A. Avila, C. G. Moreira. *Pub. Math. IHÉS* 101 (2005), 1-67.
- (14) Generic singular spectrum for ergodic Schrödinger operators.  
A. Avila, D. Damanik. *Duke Mathematical Journal* 130 (2005), 393-400.
- (15) Phase-Parameter relation and sharp statistical properties for general families of unimodal maps.  
A. Avila, C. G. Moreira. *Contemporary Mathematics* 389 (2005), 1-42.
- (16) Dynamics in the moduli space of Abelian differentials.  
A. Avila, M. Viana. *Portugaliae Mathematica* 62 (2005), 531-547.
- (17) Smoothness of solenoidal attractors.  
A. Avila, S. Göuezél, M. Tsujii. *Discrete and Continuous Dynamical Systems* 15 (2006), 21-35.
- (18) Examples of Feigenbaum Julias sets with small Hausdorff dimension.  
A. Avila, M. Lyubich. Dans "Dynamics on the Riemann Sphere. A Bodil Branner Festschrift", Ed. Poul G. Hjorth, Carsten Lunde Petersen, European Mathematical Society (EMS), Zürich, pp. 71-87, 2006.
- (19) Solving the ten martini problem.  
A. Avila, S. Jitomirskaya. *Lecture Notes in Physics* 690 (2006), 5-16.
- (20) A generic  $C^1$  map has no absolutely continuous invariant measure.  
A. Avila, J. Bochi. *Nonlinearity* 19 (2006), 2917-2925.
- (21) Reducibility or non-uniform hyperbolicity for quasiperiodic Schrödinger cocycles.  
A. Avila, R. Krikorian. *Annals of Mathematics* 164 (2006), 911-940.
- (22) Exponential mixing for the Teichmüller flow.  
A. Avila, S. Gouezél, J.-C. Yoccoz. *Pub. Math. IHÉS* 104 (2006), 143-211.
- (23) Weak mixing for interval exchange transformations and translation flows.  
A. Avila, G. Forni. *Annals of Mathematics* 165 (2007), 637-664.

- (24) Simplicity of Lyapunov spectra : proof of the Zorich-Kontsevich conjecture.  
A. Avila, M. Viana. *Acta Mathematica* 198 (2007), 1-56.
- (25) Generic expanding maps without absolutely continuous invariant  $\sigma$ -finite measure.  
A. Avila, J. Bochi. *Mathematical Research Letters* 14 (2007), 721-730.
- (26) Simplicity of Lyapunov spectra : a sufficient criterion.  
A. Avila, M. Viana. *Portugaliae Mathematica* 64 (2007), 311-376.
- (27) A uniform dichotomy for generic  $SL(2, \mathbb{R})$  cocycles over a minimal base.  
A. Avila, J. Bochi. *Bulletin de la Société Mathématique de France* 135 (2007), 407-417.
- (28) Exponential decay of correlations for the Rauzy-Veech-Zorich renormalization map.  
A. Avila, A. Bufetov. *Fields Institute Communications* 51 (2007), 203-211.
- (29) Hausdorff dimension and conformal measures of Feigenbaum Julia sets.  
A. Avila, M. Lyubich. *Journal of the American Mathematical Society* 21 (2008), 305-363.
- (30) Absolute continuity of the integrated density of states for the almost Mathieu operator with non-critical coupling.  
A. Avila, D. Damanik. *Inventiones Mathematicae* 172 (2008), 439-453.
- (31) Cantor Spectrum for Schrödinger Operators with Potentials arising from Generalized Skew-shifts.  
A. Avila, J. Bochi, D. Damanik. *Duke Mathematical Journal* 146 (2009), 253-280.
- (32) On the spectrum and Lyapunov exponent of limit periodic Schrödinger operators.  
A. Avila. *Communications in Mathematical Physics* 288 (2009), 907-918.
- (33) The ten martini problem.  
A. Avila, S. Jitomirskaya. *Annals of Mathematics* 170 (2009), 303-342.
- (34) Combinatorial rigidity for unicritical polynomials.  
A. Avila, J. Kahn, M. Lyubich, W. Shen. *Annals of Mathematics* 170 (2009), 783-797.
- (35) Nonuniform center bunching and the genericity of ergodicity among  $C^1$  partially hyperbolic symplectomorphisms.  
A. Avila, J. Bochi, A. Wilkinson. *Annales Scientifiques de l'Ecole Normale Supérieure* 42 (2009), 931-979.
- (36) Almost localization and almost reducibility.  
A. Avila, S. Jitomirskaya. *Journal of the European Mathematical Society* 12 (2010), 93-131.
- (37) Uniform exponential growth for some  $SL(2, \mathbb{R})$  matrix products.  
A. Avila, T. Roblin. *Journal of Modern Dynamics* 3 (2009), 549-554.
- (38) Density of positive Lyapunov exponents for quasiperiodic  $SL(2, \mathbb{R})$  cocycles in arbitrary dimension.  
A. Avila. *Journal of Modern Dynamics* 3 (2009), 629-634.
- (39) Bulk universality and clock spacing of zeros for ergodic Jacobi matrices with a.c. spectrum.  
A. Avila, Y. Last, B. Simon. *Analysis & PDE* 3 (2010), 81-118.
- (40) Extremal Lyapunov exponents : an invariance principle and applications.  
A. Avila, M. Viana. *Inventiones Mathematicae* 181 (2010), 115-174.
- (41) Uniformly hyperbolic finite-valued  $SL(2, \mathbb{R})$  cocycles.  
A. Avila, J. Bochi, J.-C. Yoccoz. *Commentarii Mathematici Helvetici* 85 (2010), 813-884.
- (42) On the regularization of conservative maps.  
A. Avila. *Acta Mathematica* 205 (2010), 5-18.

- (43) Chaoticity of the Teichmüller flow.  
A. Avila. *Clay Mathematics Proceedings* 10 (2010), 321-338.
- (44) Parapuzzle of Multibrot sets and typical dynamics of unimodal maps.  
A. Avila, M. Lyubich, W. Shen. *Journal of the European Mathematical Society* 13 (2011), 27-56.
- (45) Hölder continuity of absolutely continuous spectral measures for one-frequency Schrödinger operators.  
A. Avila, S. Jitomirskaya. *Communications in Mathematical Physics* 301 (2011), 563-581.
- (46) Dynamics of renormalization operators.  
A. Avila. Dans "Proceedings of the International Congress of Mathematicians 2010. Volume 1." World Scientific Publishing, pp. 154-175.
- (47) Cohomological equations and invariant distributions for minimal circle diffeomorphisms.  
A. Avila, A. Kocsard. *Duke Mathematical Journal* 158 (2011), 501-536.
- (48) Density of positive Lyapunov exponents for  $SL(2, \mathbb{R})$  cocycles.  
A. Avila. *Journal of the American Mathematical Society* 24 (2011), 999-1014.
- (49) A KAM scheme for  $SL(2, \mathbb{R})$  cocycles with Liouvillean frequencies.  
A. Avila, B. Fayad, R. Krikorian. *Geometric and Functional Analysis* 21 (2011), 1001-1019.
- (50) Mixing for time-changes of Heisenberg nilflows.  
A. Avila, G. Forni, C. Ulcigrai. *Journal of Differential Geometry* 89 (2011), 369-410.
- (51) The full renormalization horseshoe for unimodal maps of higher degree : exponential contraction along hybrid classes.  
A. Avila, M. Lyubich. *Publications Mathématiques de l'IHÉS* 114 (2011), 171-223.
- (52) Nonuniform hyperbolicity, global dominated splittings and generic properties of volume-preserving diffeomorphisms.  
A. Avila, J. Bochi. *Transactions of the American Mathematical Society* 364 (2012), 2883-2907.
- (53) Opening gaps in the spectrum of strictly ergodic Schrödinger operators.  
A. Avila, J. Bochi, D. Damanik. *Journal of the European Mathematical Society* 14 (2012) 61-106.
- (54) Exponential Mixing for the Teichmüller flow in the Space of Quadratic Differentials.  
A. Avila, M.J. Resende. *Commentarii Mathematici Helvetici* 87 (2012), 589-638.
- (55) Small eigenvalues of the Laplacian for algebraic measures on moduli space, and mixing properties of the Teichmüller flow.  
A. Avila, S. Gouëzel. *Annals of Mathematics* 178 (2013), 385-442.
- (56)  $SL(2, \mathbb{R})$ -invariant probability measures on the moduli spaces of translation surfaces are regular.  
A. Avila, C. Matheus, J.-C. Yoccoz. *Geometric and Functional Analysis* 23 (2013), 1705-1729.
- (57) Holonomy invariance : rough regularity and applications to Lyapunov exponents.  
A. Avila, J. Santamaria, M. Viana. *Astérisque* 358 (2013), 13-74.
- (58) On rigidity of critical circle maps.  
A. Avila. *Bulletin of the Brazilian Mathematical Society* 44 (2013), 611-619.
- (59) Singular density of states measure for subshift and quasi-periodic Schrödinger operators.  
A. Avila, D. Damanik, Z. Zhang. *Communications in Mathematical Physics* 330 (2014), 469-498.

**Acceptés pour publication**

- (60) Recurrence for the wind-tree model.  
A. Avila, Pascal Hubert. A paraître dans : Annales de l'Institut Henri Poincaré-Analyse Non Linéaire.
- (61) Complex one-frequency cocycles.  
A. Avila, S. Jitomirskaya, C. Sadel. A paraître dans : Journal of the European Mathematical Society.
- (62) The visits to zero of a random walk driven by an irrational rotation.  
A. Avila, Dmitry Dolgopyat, Eduard Duriev, Omri Sarig. A paraître dans : Israel Journal of Mathematics.
- (63) Absolute continuity, Lyapunov exponents and rigidity I : geodesic flows.  
A. Avila, M. Viana, A. Wilkinson. A paraître dans : Journal of the European Mathematical Society.
- (64) On the Kotani-Last and Schrödinger conjectures.  
A. Avila. A paraître dans : Journal of the American Mathematical Society.
- (65) On manifolds supporting distributionally uniquely ergodic diffeomorphisms.  
A. Avila, B. Fayad, A. Kocsard. A paraître dans : Journal of Differential Geometry.

**Soumis pour publication**

- (66) Global theory of one-frequency Schrödinger operators I : stratified analyticity of the Lyapunov exponent and the boundary of nonuniform hyperbolicity.  
A. Avila.
- (67) Global theory of one-frequency Schrödinger operators II : acriticality and finiteness of phase-transitions for typical potentials. hyperbolicity.  
A. Avila.
- (68) Symplectic and isometric  $SL(2, \mathbb{R})$  invariant subbundles of the Hodge bundle.  
A. Avila, Alex Eskin, Martin Möller.
- (69) Weak mixing directions in non-arithmetic Veech surfaces.  
A. Avila, Vincent Delecroix.
- (70) Monotonic cocycles.  
A. Avila, R. Krikorian.

**Prépublications**

- (71) Smooth Siegel disks via semicontinuity : a remark on a proof of Buff and Cheritat.  
A. Avila.
- (72) The absolutely continuous spectrum of the almost Mathieu operator.  
A. Avila.
- (73) On point spectrum at critical coupling.  
A. Avila.
- (74) Distortion elements in  $\text{Diff}^\infty(\mathbb{R}/\mathbb{Z})$ .  
A. Avila.
- (75) Almost reducibility and absolute continuity I.  
A. Avila.
- (76) Statistical properties of quadratic polynomials with a neutral fixed point.  
A. Avila, D. Cheraghi.