Patrice ABRY - Curriculum Vitae

Personal Information

- Status: Born June 16, 1966, in Bourg-en-Bresse, France. French Nationality. Married, 1 child
- Country: France (residence and professional activity)
- Languages: *French* (mother language), *English* (fluent), *Spanish* (intermediate), *German* (school)
- URL: perso.ens-lyon.fr/patrice.abry/

Career and Positions

- 2010-present: CNRS, Directeur de Recherche (Research Director), first class
- 2004-present: Head of SISYPH research team, Physics Laboratory, Ecole Normale Supérieure Lyon
- 2005-2010: CNRS, Directeur de Recherche (Research Director), second class,
- 1999-2005: CNRS, Chargé de Recherche (Research Associate), first class,
- 1995-1999: CNRS, Chargé de Recherche (Research Associate), second class,
- 1991-1995: *Professeur agrégé* (highest teaching degree for High School in French educational system)

Education and Diploma

- 2001: **Habilitation à Diriger les Recherches** (HDR) Lyon I Univ., ENS Lyon
  ultimate French university degree, requested to officially serve as PhD advisor
- 1994: **PhD** – (*très honorable/cum laude*, jury congratulations - highest grade in French system) Lyon I Univ.
  published as a book (French)
- 1991: **Diplôme d'Etudes Approfondies** (DEA) Lyon I University
- 1989: **Agrégation** in Physical Sciences
- 1986-90: **Normalien Student** Ecole Normale Supérieure (ENS) de Cachan

Honors and Awards

- 2016: Best Paper Award, *European Signal Processing Conference.* (EURASIP), Budapest
  Joint Work on Multifractal Bayesian Inference, with H. Wendt, S. Combrexelle, J.-Y. Tourneret, S. Mac Laughlin.
- 2016: Visiting Professor Invitation, *National Institute of Informatics, Tokyo, Japan* (2 weeks)
- 2015: Visiting Professor Invitation, *National Institute of Informatics, Tokyo, Japan* (2 weeks)
- 2014: Visiting Professor Invitation, *National Institute of Informatics, Tokyo, Japan* (2 weeks)
- 2013: Best Paper Award, *IEEE Int. Sympos. Computer-Based Medical Syst.* (CBMS), Porto, Portugal
- 2011: IEEE Fellow, elected
  "contributions to the theory of fractal and multifractal analysis in signal and image processing"
- 2007: Invited Lecture at the French Academy of Sciences:
  Advances in Information Sciences, presented by their authors .pdf
- 2007: Young Research Team Award, *Del Duca Foundation, French Academy of Sciences, Institut de France*
- 2005: Appreciated Reviewer Distinction, *IEEE Transactions on Signal Processing*
- 2000: EURASIP (EURopean Association for SIgnal Processing) Best Paper Award, 2000
- 1994: Best PhD Thesis in Automatic and Signal Processing for Years 1993 and 1994, granted jointly by CNRS (National Council for Scientific Research), AFCET (French Association for Automatic) and the French Ministry of Education, Research and Technology

Scientific Productions

- **Patent:** *Real-Time Estimation of Long Range Dependent Parameters*, AU1998PP01692 (05.02.1999)
  Inventors: D. Veitch, M. Roughan, P. Abry. *Promotors:* Ericsson Australia Pty. Ltd, Royal Melbourne Institute of Technology Melbourne, VIC3000 (AU); National Council for Scientific Research (CNRS, FR)
- **Sharewares:** (Exhaustive list and downloadable MATLAB toolboxes here)
  Wavelet based analysis of scaling phenomena
  Wavelet Leader Multifractal Analysis
  Fractal Connectivity
  Synthesis of multivariate time series
  Products of random matrices for time series synthesis
  Critical Moment Estimator
- **Scientific Publications:** (exhaustive list)
  H-factors 22 / 24 / 43 — Total Citations 1947 / 2785 / 7965 (ISI / Scopus / GoogleScholar: 31.07.2016)
  1 book as author (in French, 1997)
  2 books as editor (in French, 2002, and English, 2009)
  3 scientific mediation articles: *La Recherche* (03/2005 and 12/2011), *Proc. IEEE* (05/2002)
  80 research articles in international journals (peer reviewed)
  22 research articles as book chapters (peer reviewed)
  131 research articles in the proceeding of international conferences (peer reviewed)

– **Software Protection:**
  – **Sketch Multiresolution Traffic Analysis** (*Analyse du trafic par sketch-multirésolution*) (13/08/2007) registered at French Software Protection Agency (*Agence pour la Protection des Programmes*) by CNRS and ENS Lyon. *Inventors:* P. Abry, P. Borgnat, G. Dewaele.

Teaching Activities

– **Statistical Signal Processing; Data Analysis** Physics Department, ENS Lyon
Contribution to creation of all courses on *Statistical Signal Processing* and *Data Analysis* currently given
3 courses of 12h (per year in last 10 years)

Mentoring: Supervision of Graduate Students and Postdoctoral Fellows

– **7 Post-Doctoral Researchers:** **R. Leonarduzzi** (Argentina, *Univariate Multifractal*,2015), **J. Spilka** (CZ, 2014, *Fetal HRV*), **G. Lozenguez** (F, 2013-14, *Bike-Share System*), **J. Hamonier** (F, 2013-14, *Multifractal Math.*), **V. Chudacek** (CZ, 2013, *Fetal HRV*), **H. Helgason** (Island, 2009-10, *Stat. Signal Proces.*), **B. Vedel** (F, 2008, *Multifractal Math.*)

– **9 PhD Students:** **E. Bautista** (Mexico, *Network and Graph*, 08/2019), **J. Frecon** (F, *Optimization*, 11/2016), **G. Michau** (France-Australia, *Network Transportation*, 07/2016), **R. Leonarduzzi** (Argentina, *Scale Invariance*,11/2014: now PostDoc in France), **A. Costard** (F, *Conditional dependences*, 11/2014: now in Industry), **F. Angeletti** (F, *Statistical Physics*, 2012: now PostDoc in South Africa), **H. Wendt** (Austria, *Multifractal*, 2008: now CNRS Research Associate, Toulouse University), **B. Lashermes** (F, *Hydrodynamic turbulence*, 2005: now High School teacher, by choice), **P. Chainais** (F, *Infinitely-divisible cascades*, 2001: now Associate Professor, Lille University).

Institutional Responsibilities

– 2014-present: Member of Ecole Normale Supérieure de Lyon Scientific Council (elected)
– 2004-present: Head of SIGNAL SYSTEM & PHYSICS research team, (18 people: 9 permanent, 9 PhDs and PostDocs, 300 kEuros/year),
– 2004-present: Member of the Physics Dept. Lab. Council
– 2006-present: Member of HDR (Habilitation à Diriger les Recherches) jury: 6
– 1998-present: Member of PhD jury: 26 — 20 in France, 6 abroad (Belgium, Switzerland, Portugal, India, Argentina)

Commissions of Trust and Administration of International Research

– 2016-today: Elected at CoNRS (CNRS National Evaluation Committee - Major French Scientific Commitee)
– 2015-today: Theoretical and Methodological Trends in Signal Processing (TMTSP) EURASIP committee (elected)
– 2014-today: Member of the IEEE-SPS Signal Processing Theory and Method (SPTM) committee (elected)
– 2011 Scientific Advisor (*Chargé de Mission*) for the head of CNRS, France
– 2004-2010 Associate Editor for *IEEE Transactions on Signal Processing*
– 2005-2010 Associate Editor for *EURASIP Signal Processing*
– 2004-2010 Member of the IEEE-SPS Signal Processing Theory and Method (SPTM) committee (elected)
– 2001-2007 Expert-Evaluator for the European Commission, Research Directorates General - ISTC

Organizer of International Conferences and Guest Editor

Conference Chairman:
– GRETSI (Lyon, F, 2015) *500 participants*, .www
– Multifractal Analysis: From Theory to Applications and Back (BIRS, Banff, Canada, 2014) *50 participants*, .www
– Complexity in Physics (Lyon, F, 2009) *120 participants*, .www

Conference Organizing Committee: IEEE Statistical Signal Processing (Madison, WI, USA, 2007)

Conference Program Committee: IEEE ICASSP (2014-2019, 2004-2010), GRETSI (French-speaking Signal Proc. Conf., 2005-2017); EUSIPCO (2006); SPIE Wavelet Applications in Industrial Processing (2003-2007); Self-Similarity and Applications (2002-2006)

Guest Editor: – *IEEE Signal Proc. Mag.*, Special Issue "Signal Processing for Art Investigation" (2014) .www
– *Signal Proc.*, Special Issue "Image Processing for Digital Art Work" (2013) .www

Conference Special Sessions: SSP'16, EUSIPCO'15, ASILOMAR'14, EMBC Minisymposium *Complexity in Biomedical Signals* (Japan, 2013) .www; GRETSI, *Sensor Networks* (F, 2009); GRETSI, *Signal Processing and Internet Traffic* (Belgium, 2005)

Reviewer: Internat. Journals (Math./Statistics, Signal/Image Processing, Applications (Internet, Biomedicals,...)) and major Internat. Conferences (ICASSP, SSP, EUSIPCO, EMBC, GRETSI)

Invited Lectures

3 General Audience Lectures: i) "*Fetal heart Rate and Machine Learning*", Academy Savoie, .www (F, 2016)
ii) Conferences "*Fractales*", Cité des Sciences et de l'Industrie, Paris, France .www (F, 2008)
iii) "Advances in Information Sciences by their authors", French Academy of Sciences .pdf (F, 2007)

5 Keynote Lectures: i) 8th International Workshop on BioSignal Interpretation (BSI) .www (Japan, 2016)
ii) VI Latin American Conference on Biomedical Engineering (CLAIB) .www (ARG, 2014)
iii) XIV Reunión de Trabajo en Procesamiento de la Información y Control (RPIC) .www (ARG, 2011)
iv) Asian Internet Engineering Conference (AINTEC) .www (Thailand, 2009)
v) 4th Workshop on Traffic Monitoring and Analysis .www (Spain, 2009)

1 Tutorial Lecture: IEEE Int. Conf. Acoust. Speech Sig. Proc. (3h, high selection, hot topics) .pdf (CZ, 2011)

10 Invited Lectures in Special Sessions: i) 1st Signal processing and Monitoring in labour Workshop (ENS-Lyon, France, 2015, .www); ii) Scale-free Dynamics and Networks in Neurosciences (CRM, Montreal, Canada, 2013, .www); iii) power-laws (Complex Systems Institute, Lyon, France, 2013, .www); iv) Long-Range Dependence, Self-Similarity and Heavy Tails (Research Triangle Park, NC, USA, 2012, .www); v) Mathematics: Muse, Maker, and Measure of the Arts (BIRS, Banff, Canada, 2011, .www); vi) Int. Conf. Probability and Mathematical Statistics (Lithuania, 2010); vii) Conf. Analysis and its Applications (Indian Institute of Science, India, 2009); viii) New Mathematical Frontiers in Network Multi-Resolution Analysis (IPAM, UCLA, USA, 2008); ix) Wavelet Theory and Applications (National University of Singapore, 2008); x) Int. Symp. on Applications in the Internet (Japan, 2007);

3 Summer School Lectures: i) New Trends in Applied Harmonic Analysis (Argentina, 2013, .www); ii) Indian Institute of Science (India, 2009); iii) Signals, Images and Complex Systems (France, 2008, .www); iv) Taller sobre Multifractalidad y Autosimilaridad (Caracas, Venezuela, 2005). Mar del Plata.

5 Secondary Education Conferences:

Scientific Leadership and International Research Expeditions

For references [Xx], see publication list

Robust Internet traffic characterization and Security Assessment (2007-14): Internet traffic is widely variable by nature, and a recurrent issue consists in discriminating anomalous (and aggressive) changes from wild yet legitimate fluctuations. While numerous works made attempts to create references by comparing against past or synthetic traffic, we proposed to let the traffic design its own real-time reference by incorporating random-projections (or sketches) into statistical analysis that create, from one single traffic, a collection of surrogate traffic with statistical properties equivalent to those of the background legitimate traffic. This gave birth to highly cited articles in the top international journals and conferences of the field ([A41,P6]: 51/64/134, [C62]: 30/59/161, [C52]: -/57/125, [A42]: 13/19/45), and numerous invited lectures (AINTEC2009, TMA2009). (*Coll. K. Fukuda, Nat. Inst. Info., K. Cho, Internet Initiative Japan, Tokyo, Japan; CNRS-WIDE Grant*)

Intrapartum Fetal Heart Rate Variability (2010-16): We showed that scale invariance for Intrapartum Fetal HRV characterization permits to decrease the number of false alarms in fetal acidosis detection and thus of unnecessary operative deliveries (cesarean sections) ([A45,P9]: 22/23/26, [A50]: 10/9/15). This yield an invited talk in a Special Session at EMBC2013, a keynote lecture at BSI2016, and received a Conference Best Paper Award at CBMS2013 [C89]). (*Coll. M. Doret, M.D., Academic Hospital, F; ANR Grant FETUSES 2012-14*)

Wavelet-leader multifractal analysis (2007-16): Multifractal analysis constitutes a useful, yet theoretical, extension of self-similarity, to model scale invariance. We proposed a theoretically well-grounded, efficient and simple to use tool, the wavelet leaders, to actually implement multifractal analysis. The well-cited corresponding article ([A30,P1]: 76/85/128) and open-access toolbox have renewed the theoretical understanding and practical use of multifractal analysis, with notable successes in image processing ([A39,P2]: 44/50/86) and other applications, e.g., hydrodynamic turbulence ([A23,P7]: 36/35/50). MATLAB INC. has contacted us and now decided to include our Wavelet Leaders in its Wavelet Toolbox Matlab 2016B release. (*Coll. S. Jaffard, Math., Paris, F.; H. Wendt, Signal Proc., Toulouse, F.; V. Pipiras, Math., UNC, USA; ANR Grant AMATIS, 2011-15*).

Internet Traffic Long Memory Measurement (1998-2008): with D. Veitch (Melbourne Univ., Australia). Work at the origin of the program evidencing long memory in Internet traffic traces, collected across different continents and networks, leading to massively cited publications. [A5], [A14], [A18]

Wavelet and Self-Similarity (1995-99): with D. Veitch (Melbourne University, AUS), V. Pipiras (U. North Carolina, USA). *Wavelet Hurst parameter estimator massively quoted and used in applications* [B1], [A8]

Wavelet Design (1992-96): with P. Flandrin (ENS Lyon, F), A. Aldroubi (Van der Bilt Univ, USA) [A7], Book [A3], [A7]