

Fabien GRÉGIS

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Education

- 2010–2016 **PhD in History and Philosophy of Science** (with high honors)
Defended on March 25th, 2016
“The value of uncertainty: the evaluation of the precision of physical measurements and the limits of experimental knowledge” (in French)
University Paris Diderot (Paris 7); SPHERE laboratory, UMR 7219, CNRS, Paris
Supervised by Olivier Darrigol (CNRS, Paris 7) and Nadine de Courtenay (Paris 7)
- 2007–2010 **Masters degree in History and Philosophy of Science** (with high honors)
University Denis Diderot (Paris 7), History and Philosophy of Science department,
specialty LOPHISS (LLogic, Philosophy, History and Sociology of Science)
- April 2010 Master thesis: “From error to uncertainty: the theory of measurement of Norman
Robert Campbell (1880–1949)”. Directed by Nadine de Courtenay (Paris 7)
- 2007 **Diploma of the École Normale Supérieure de Cachan**
- 2006–2007 **Preparation of the French “Agrégation” in physics**
École Normale Supérieure de Cachan
One-year postgraduate intensive course in physics and chemistry to prepare for a competitive exam that counts as proof of a high level mastership of the disciplinary field
- 2005–2006 **First year of masters degree in physics**
École Normale Supérieure de Cachan and University Pierre et Marie Curie (Paris 6)
- April–August 2006 Training period on “nonlinearities in superconducting strip-line resonators” in the
Nanostructure Physics Department of KTH (Royal Institute of Technology), Stockholm,
Sweden
- October 2005–
January 2006 Training period in high school: lectures and laboratory work with 10th and 12th
grades, Lycée Descartes (Antony, France)
- 2004–2005 **Graduation in fundamental physics**
ENS Cachan, University Pierre et Marie Curie (Paris 6)
- June 2005 Training period on “shearing of a confined granular layer at low speed” in the unit of
“Dissipation and relaxation at the interfaces” of INSP (Paris NanoSciences Institute)
- 2004 **Admitted to the École Normale Supérieure de Cachan (ENS Cachan)**
The ENS Cachan is a prestigious public institution for advanced undergraduate and graduate studies and one of the major French Grandes Écoles, which are considered the pinnacle of French higher education.
- 2001–2004 **Training for the competitive admission exams of French “Grandes Écoles”**
Lycée Saint-Louis (Paris)
Three-year undergraduate intensive course with an emphasis in mathematics and physics, preparing for the national competitive admission exams of French “Grandes Écoles”
- June 2003 **Second year undergraduate diploma in physics**
University Orsay Paris-Sud (Paris 11)
- June 2001 **“Baccalauréat Scientifique”**
Equivalent to an A-level with an emphasis in mathematics, physics, chemistry and biology

Areas of specialty and competence

AOS	History and philosophy of science, philosophy of measurement
AOC	Epistemology; philosophy of physics; sociology of science; physical sciences

Research grants

2014	Recruited as an ATER (associate teacher and researcher) at University Paris 7 for 1 year. Total of 6 open positions, ranked 4th out of 32 candidates. (15000€)
2013	Recruited as an ATER at University Paris 7 for 1 year. Total of 6 open positions for about 30 candidates. (15000€)
2010-2013	Doctoral grant awarded by ENS Cachan and French Ministry of National Education, Higher Education and Research (20000 € / year)

Publications

de Courtenay, N., and Grégis, F., “The evaluation of measurement uncertainties and its epistemological ramifications”, in Chang, H., Mitchell, D. & Tal, E. (eds.), *The Making of Measurement*, special issue of *Studies in History and Philosophy of Science*, 2017. DOI: doi.org/10.1016/j.shpsa.2017.05.003

Grégis, F. and de Courtenay, N., « Incertitude de mesure et probabilités: la confrontation des approches fréquentiste et bayésienne en métrologie », in Drouet, I. (ed), *Le bayésianisme aujourd'hui. Fondements et pratiques*, Éditions Matériologiques, pp.317–391, 2016.

Grégis, F., “Can we dispense with the notion of true value in metrology?”, in Huber, L. and Schlaudt, O. (eds.), *Standardization in Measurement - Philosophical, Historical and Sociological Issues*, Pickering and Chatto Publishers, London, UK, Series: History and Philosophy of Technoscience, Series Editor: Alfred Nordmann, pp.81-93, 2015.

Tholen, E., Ergül, A., Doherty, E., Weber, F., Grégis, F., Haviland, D., “Nonlinearities and parametric amplification in superconducting coplanar waveguide resonators”, *Applied Physics Letters*, **90**(25), 2007.

Work in progress

Grégis, F., “Reconsidering measurement accuracy: about the assessment of uncertainty in the adjustments of the physical constants since 1929”, in preparation.

Invited Conference and Seminar Presentations

- 2017-04-21 « L'interprétation probabiliste de l'incertitude de mesure » (“The probabilistic interpretation of measurement uncertainty”), invited speaker to the seminar « Probabilités, Décision, Incertitude » (“Probabilities, Decision, Uncertainty”), IHPST, Paris
- 2017-03-31 « L'interprétation probabiliste de l'incertitude de mesure » (“The probabilistic interpretation of measurement uncertainty”), invited speaker to the seminar « Séminaire d'Histoire du Calcul des Probabilités et des Statistiques » (“History of the probability calculus and of statistics”), EHESS & CAMS, Paris
- 2017-02-08 « L'interprétation probabiliste de l'incertitude de mesure » (“The probabilistic interpretation of measurement uncertainty”), invited speaker to the seminar « Histoire des sciences mathématiques » (“History of mathematical sciences”), Institut de Mathématiques de Jussieu-Paris Rive Gauche
- 2016-11-14 « L'incertitude de mesure au contact entre science et philosophie » (“Measurement uncertainty at the frontier between science and philosophy”), invited speaker to the workshop « Perspectives interdisciplinaires sur l'histoire d'incertitude » (“Interdisciplinary perspectives on the history of uncertainty”), Maison des Sciences de l'Homme et de la Société Sud-Est, Université Nice Sophia Antipolis, Nice, France, November 14th, 2016
- 2016-05-20 “About measurement accuracy and measurement uncertainty”, invited panel speaker at the international workshop “Informal Aspects of Uncertainty Evaluation”, Department of History and Philosophy of Science, University of Cambridge, Cambridge, United Kingdom
- 2016-04-28 « Le rôle de l'idéalisation et de l'approximation dans la conception des grandeurs physiques » (“The role of idealization and approximation in the design of physical quantities”), invited speaker to the Journées bisontines de didactique et d'épistémologie (Besançon days for educational sciences and epistemology), Laboratory of Mathematics and Superior Schools of Teaching and Education, University de Franche-Comté, Besançon, France, April 28th and 29th, 2016
- 2014-01-13 “Error and uncertainty in contemporary metrology”, invited speaker to the international workshop “Approximations and error in several contexts”, seminar of History and Philosophy of Mathematics, University Paris 7
- 2012-11-22 « L'erreur de mesure, entre incertitude et confiance » (“Measurement error: between uncertainty and confidence”), invited speaker to the 2012 “Cathy Dufour” colloquium on “error in science”, 22–23 November 2012, department of Science and Technology of the University of Lorraine, Vandoeuvre, France
- 2012-11-09 with Nadine de Courtenay: « Le Guide pour l'expression de l'incertitude de mesure (GUM): un terrain de discussion entre fréquentistes et bayésiens » (“The GUM, a field of discussion between frequentist and Bayesians”), invited speaker to the seminar « Probabilités, Décision, Incertitude » (“Probabilities, Decision, Uncertainty”), IHPST, Paris

Peer-Reviewed Conference and Seminar Presentations

- 2017-06-26 “The meanings of error and accuracy in the adjustments of the physical constants”, workshop “Perspectives on scientific error”, TiLPS, Tilburg University, Netherlands, 26-27 June 2017
- 2017-06-12 “Could there be non-unique ‘true values’ of measurands? An account of definitional uncertainty”, workshop “Physical quantities and measurands: Epistemological issues”, University Paris 7, June 12th 2017
- 2016-11-25 « Raymond T. Birge et l’ajustement des constantes de la physique » (“Raymond T. Birge and the adjustment of physical constants”), 2016 Youth Researchers Days in history of science and technology. Organized by the SFHST, the SHESVIE, the SFHSH, the CoFrHiGeo and the History of Chemistry Club, École normale supérieure, Paris, 25–26 November 2016
- 2016-07-01 « La notion de précision expérimentale dans les ajustements des constantes de la physique » (“The notion of experimental precision in the adjustments of the physical constants”), 6th international congress of the Société de Philosophie des Sciences, University of Lausanne, Switzerland, June 29th – July 1st, 2016
- 2015-07-23 with Nadine de Courtenay: “Grappling with Measurement Uncertainties: Philosophy of Practice and Practice of Philosophy”, international conference “The Making of Measurement”, CRASSH (Centre for Research in the Arts, Social Sciences and Humanities), Cambridge, United Kingdom, 23–24 July 2015
- 2014-09-25 « L’incertitude définitionnelle, une limite ultime à la précision des mesures? » (“Does definitional uncertainty represent an ultimate limit to the precision of measurements?”), International doctoral meetings in philosophy of science (RDIPS), Société de Philosophie des Sciences, Louvain-La-Neuve, 25–26 September 2015
- 2014-01-21 “The International System of Units as an illustration of the social, epistemic and practical values of metrology”, “Modes of Technoscientific Knowledge” winterschool, Manigod (France), 19–25 January 2014
- 2013-03-15 “Can we dispense with the notion of true value in metrology?”, international conference “Dimensions of Measurement”, 14–16 March 2013, ZiF (Zentrum für interdisziplinäre Forschung), Bielefeld, Germany
- 2012-12-04 with Nadine de Courtenay: “Questions raised by the epistemic turn in the Guide to the expression of uncertainty in measurement (GUM)”, international workshop “The taming of measurement uncertainties: Theoretical, philosophical, and practical issues”, University Paris 7
- 2012-09-13 « De l’erreur à l’incertitude: la critique de la notion de “valeur vraie” dans la mesure » (“From error to uncertainty, the criticism of the notion of ‘true value’ in measurement”), Doctoral meetings in philosophy of science (RDPS), Société de Philosophie des Sciences, Paris

Research Group Meetings and Doctoral Meetings Interventions

- 2012-02-07 « Modèles, idéalisation et approximation » (“Models, idealization and approximation”), SPHERE PhD students’ working group in history and philosophy of physics
- 2012-06-18 « Les usages de l’erreur de mesure dans les ajustements des constantes fondamentales de la physique au XXe siècle » (“The uses of measurement error in the adjustments of the fundamental constant of physics in the XXst century”), doctoral meetings in History and Philosophy of Science, Archives Henri Poincaré, Nancy, France
- 2011-06-30 « La connaissance et l’erreur. Approches philosophiques sur la mesure et exemple du *Guide pour l’expression de l’incertitude de mesure* » (“Knowledge and error. Philosophical approaches on measurement with the example of the *Guide to the expression of uncertainty in measurement*”), SPHERE doctoral meeting, University Paris 7

Work experience

2015–2017	Part-time lecturer at University Denis Diderot (Paris 7) Lecturer in the LOPHISS masters degree, History and Philosophy of Science department
2015–2017	Lecturer for undergraduate students preparing for the competitive exams to the French “Grandes Écoles”, Lycée Sainte-Geneviève, Versailles. Second year undergraduate classes, physics and chemistry
2013–2015	ATER (associate teacher and researcher) at the History and Philosophy of Science department, University Paris Diderot (Paris 7) Research: PhD in History and Philosophy of Science Teaching (total teaching load of 92 hours): lecturer in third year undergraduate classes; TA in masters degree and PACES (first year of medical studies)
2010–2013	Doctoral grant with a teaching component, University Denis Diderot (Paris 7), History and Philosophy of Science department Research: PhD in History and Philosophy of Science Teaching (total teaching load of 64 hours): TA in masters degree and PACES (first year of medical studies)
2007–2010 & 2013–2017	Lecturer for undergraduate students preparing for the competitive exams to the French “Grandes Écoles”, Lycée Louis-Le-Grand, Paris. First year undergraduate classes, physics and chemistry

Teaching experience

2016–2017	“History and epistemology of measurement”, M2 LOPHISS, University Paris 7 (6 hours)	Lectures
2014–2017	“Conducting interviews for history and sociology”, in “Innovation, publics and companies”, M2 LOPHISS, University Paris 7 (6 hours / year, sessions shared with Quentin Lade, Univ. Paris 7)	Lectures
2013–2015	“Science and society: popular science and science education”, Licence 3 EICS, University Paris 7 (22 hours / year). In charge of the module with Aurélien Féron (EHESS)	Lectures
2011–2015	General history and general philosophy of science, LOPHISS masters degree, University Paris 7 (8 hours / year)	TA
2011–2012 & 2013–2015	Epistemology, history and philosophy of care, health and sciences, PACES (1st year of medical studies), University Paris 7 (40 to 70 hours / year)	TA
2007–2010 & 2013–2017	Physics and chemistry, lecturer for undergraduate students preparing for the competitive exams to the French “Grandes Écoles”, Lycée Louis Le Grand (Paris, 2007–2010 and 2013–2017) and Lycée Sainte Geneviève (Versailles, 2015–2017) (60 hours / year)	Oral exams
October 2005– January 2006	Physics and chemistry, training for teaching in high school, Lycée Descartes (Antony, France) (10 hours)	Lectures and experiments

Organisation of workshops, working groups and seminars

2017	With Nadine de Courtenay (SPHERE, Univ. Paris 7): international workshop “Physical Quantities and Measurands: Epistemological Issues”, 12 June 2017, Univ. Paris 7 Program: www.sphere.univ-paris-diderot.fr/spip.php?article1964
2012–2015	With Vincent Daudon, Jonathan Regier and Philippe Stamenkovic (SPHERE): PhD students monthly seminar in history and philosophy of physics, University Paris 7 Program: www.sphere.univ-paris-diderot.fr/spip.php?article1570
2012	With Nadine de Courtenay (SPHERE, University Paris 7), Olivier Darrigol (SPHERE, CNRS), Oliver Schlaudt (Archives Henri Poincaré): international workshop “The taming of measurement uncertainties: Theoretical, philosophical, and practical issues”, 4 December 2012, University Paris 7 Program: www.sphere.univ-paris-diderot.fr/spip.php?article1021
2011–2012	With Gihane Ait-el-Aouad and Jonathan Regier (SPHERE): PhD Students reading group on “Analogy, models, representation”, University Paris 7 <i>Reading group gathering the PhD students of the SPHERE laboratory on a monthly basis around articles of history and philosophy of science</i>
2010	SPHERE’s doctoral meeting, 2010-06-30, University Paris 7

Contribution to the administration of research and education

2013–2015	With Nadine de Courtenay: LOPHISS masters degree student’s mid-term presentation of their masters degree dissertations, University Paris 7
2012–2015	Tutoring for students of the LOPHISS masters degree, University Paris 7 (8 students)

Participation to summer schools

2014-01	“Modes of Technoscientific Knowledge” winterschool, Manigod (France), 19–25 January 2014. Organized by Bernadette Bensaude-Vincent (Univ. Paris 1 Sorbonne); Alfred Nordmann (Technische Univ. Darmstadt); Astrid Schwarz (University of Basel); and Sacha Loeve (Univ. Paris 1 Sorbonne). With the support of Université Paris 1 Panthéon - Sorbonne and Technische Universität Darmstadt, French-German ANR-DFG program GOTO, BiCoDa Alliance
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Skills

Languages	French: native English: fluent – TOEIC: 955. German: basics
Computing	Computer simulation: Matlab, Fortran. Document composition: \LaTeX (I worked in 2010 with H&K, a French publisher specialized in solutions of written tests for advances studies).

Academic references

Anouk Barberousse, University Paris 4
Nadine de Courtenay (thesis advisor), University Paris 7
Olivier Darrigol (thesis advisor), CNRS
Giora Hon, University of Haifa
Eran Tal, McGill University

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Thesis outline

“The value of uncertainty: the evaluation of the precision of physical measurements and the limits of experimental knowledge”

Defended on March 23th, 2016

PhD dissertation abstract. A measurement result is never absolutely accurate: it is affected by an unknown “measurement error” which characterizes the discrepancy between the obtained value and the “true value” of the quantity intended to be measured. As a consequence, to be acceptable a measurement result cannot take the form of a unique numerical value, but has to be accompanied by an indication of its “measurement uncertainty”, which enunciates a state of doubt. What, though, is the value of measurement uncertainty? What is its numerical value: how does one calculate it? What is its epistemic value: how one should interpret a measurement result? Firstly, we describe the statistical models that scientists make use of in contemporary metrology to perform an uncertainty analysis, and we show that the issue of the interpretation of probabilities is vigorously debated. This debate brings out epistemological issues about the nature and function of physical measurements, metrologists insisting in particular on the subjective aspect of measurement. Secondly, we examine the philosophical elaboration of metrologists in their technical works, where they criticize the use of the notion of “true value” of a physical quantity. We then challenge this elaboration and defend such a notion. The third part turns to a specific use of measurement uncertainty in order to address our thematic from the perspective of precision physics, considering the activity of the adjustments of physical constants. In the course of this activity, physicists have developed a dynamic conception of the accuracy of their measurement results, oriented towards a future progress of knowledge, and underlining the epistemic virtues of a never-ending process of identification and correction of measurement errors.

Keywords. History and philosophy of science, epistemology; measurement, metrology; error, measurement error, precision, accuracy, uncertainty; statistical models, probabilities, frequentism, Bayesianism; physics, physical constants, adjustments

Discipline: History and Philosophy of Science

Host team

University Paris Diderot–Paris 7 (5 rue Thomas-Mann 75013 Paris)
Doctoral School 400 – “Scientific knowledge, epistemology, history of science, educational science”
SPHERE laboratory – CNRS, UMR 7219