

CURRICULUM VITAE

Renaud CHORLAY

<http://www.rehseis.univ-paris-diderot.fr/spip.php?article35>

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Date of birth : 27th December 1970

Nationality : French

1. Area of Competence : History of Mathematics

2. Research interests

Primary : History of modern mathematics

- History of geometric theories
- History of structuralism

Secondary :

- Historical perspective in maths teaching & teacher training
- Philosophy of mathematical practice

3. Education

- 2007 **Ph.D. (doctorat) History of Mathematics** (*cum laude*)
University Paris 7
Title : *l'émergence du couple local / global dans les théories géométriques, de Bernhard Riemann à la théorie des faisceaux (1851-1953).*
Jury : Pierre Cartier, Christian Houzel (Ph.D supervisor), Erhard Scholz, Jean-Jacques Szczeciniarz, Alain Yger.
Downloadable from my webpage: <http://www.rehseis.univ-paris-diderot.fr/spip.php?article35>
- 2001 **Master : History and Philosophy of Science** (*cum laude*)
University Paris 7
Title : *L'« impitoyable clarté » du Programme d'Erlangen.* (adv. C. Houzel)
- 1997 **Agrégation de mathématiques**
National competitive examination for secondary level mathematics teacher
- 1997 **Master of Mathematics**
Université Paris 7
Title: *Relèvements modulo p^2 et décomposition du complexe de De Rham, d'après Deligne et Illusie.* (adv. Zoghman Mebkhout)
- 1991 **Institut d'Etudes Politiques de Paris**
School of social and political science, usually known as "Sciences-Po Paris"

4. History of employment

2010-	University Paris 4, Teacher training department (IUFM)
2009-2010	ATER (temporary teaching / research position) University of Paris 7, Department of history and philosophy of science
2008-2009	Post-doctoral research fellow <i>Ideals of Proof</i> research team (Pr. Mic Detlefsen, chaire d'excellence ANR) University of Paris 7 http://www.univ-nancy2.fr/poincare/idealsofproof/
2007-2008	ATER (temporary teaching / research position) University of Paris 8, Department of mathematics
1997-2007	High-school maths teacher

5. Publications

(a) Peer reviewed papers

"Local – Global": The First Twenty Years

Archive for History of Exact Sciences, forthcoming (accepted 9.2010). 89 pages.

Abstract. This paper investigates how and when pairs of terms such as "local – global" and "*im Kleinen – im Grossen*" began to be used by mathematicians as explicit reflexive categories. A first phase of automatic search led to the delineation of the relevant corpus, and to the identification of the period from 1898 to 1918 as that of emergence. The emergence appears to have been, from the very start, both transdisciplinary (function theory, calculus of variations, differential geometry) and international, although the AMS-Göttingen connection played a specific part. First used as an expository and didactic tool (e.g. by Osgood), it soon played a crucial part in the creation of new mathematical concepts (e.g. in Hahn's work), in the shaping of research agendas (e.g. Blaschke's global differential geometry), and in Weyl's axiomatic foundation of the manifold concept. We finally turn to France, where in the 1910s, in the wake of Poincaré's work, Hadamard began to promote a research agenda in terms of "*passage du local au general*".

From Problems to Structures: The Cousin Problems and the Emergence of the Sheaf Concept. Archive for History of Exact Sciences 64(1), 2010, p.1-73.

Abstract. Historical work on the emergence of sheaf theory has mainly concentrated on the topological origins of sheaf *cohomology* in the period from 1945 to 1950, and on subsequent developments. However, a shift of emphasis both in time-scale and disciplinary context can help gain new insight into the emergence of the sheaf *concept*. This paper concentrates on Henri Cartan's work in the theory of analytic functions of several complex variables and the strikingly different roles it played at two stages of the emergence of sheaf theory: the definition of a new structure and formulation of a new research programme in 1940-1944; the unexpected integration into sheaf cohomology in 1951-1952. In order to bring this two-stage structural transition into perspective, we will concentrate more specifically on a family of problems, the so-called Cousin problems, from Poincaré (1883) to Cartan. This medium-term narrative provides insight into two more general issues in the history of contemporary mathematics. First, we will focus on the use of problems in theory-making. Second, the history of the design of structures in geometrically flavoured contexts – such as for the sheaf and fibre-bundle structures – which will help provide a more comprehensive view of the *structuralist moment*, a moment whose algebraic component has so far been the main focus for historical work.

Passer au global : le cas d'Élie Cartan, 1922-1930.
Revue d'histoire des mathématiques 15 (2), 2009, p.231-316.

Abstract. After his work on connections and generalised spaces between 1922 and 1925, Élie Cartan began laying the foundation of the topological and geometric study of Lie groups and homogeneous spaces (1925-1930). We will endeavour to establish that the emergence of global questions is but part and parcel of a thorough restructuring around the epistemological polarity between local and global, a restructuring that occurs at three levels : a theoretical level, a thematic level and a rhetorical level. This new central polarity replaced a 19th century polarity between the infinitesimal and the finite. Our chronological exposition of Cartan's work in the period between 1922 and 1930 will pay special attention to modes of writing, comparing with the works of Hermann Weyl and Otto Schreier. We shall see, in particular, that in spite of the stability of terms such as "neighbourhood", "manifold" or "group", the meaning of these words underwent a dramatic change after 1925.

Keywords : Cartan (Élie), Weyl, Einstein, local, global, connections, Lie groups, manifolds.

AMS Subject Classification : 01A22, 01A53, 01A58, 01A83.

(b) Book

Mathématiques globales : l'émergence du couple local/global dans les théories géométriques (1851-1953).

Collection « Sciences dans l'Histoire », Librairie Albert Blanchard, Paris.

463 pages, forthcoming.

Abstract. Since the 1950s, the distinction between "local" and "global" has been of constant use in the exposition of various fields of mathematics. However, the first writings to make use of the opposition of local and global notions in a systematic way appeared in the first years of the 20th century, and expounded mathematical theories which had emerged as long ago as the 1850s.

The book is divided in five parts, in chronological order. In the first part we present Riemann's work in global complex Analysis and in differential geometry, discuss its reading by Neumann and Klein, and study some of Poincaré's works. Besides specific mathematical results, we focus on the descriptive framework employed by these authors and their pre-set-theoretic means of referring to loci. In the second part, we identify and explore two distinct frameworks, the "world of quantity" and the "world of sets" ; it allows us to characterise different periods in the evolution of Analysis in the 19th century, and to describe the conditions for the explicit emergence of the distinction between local and global notions. The third part is devoted to this explicit emergence, between 1898 and 1913, in the works of W.F. Osgood, Hadamard and Weyl. We distinguish between three levels on which the distinction emerged : the meta-level, thematic level and structural level. The fourth part deals with the rise of global problems in differential geometry and in the theory of Lie groups, through a study of the deeply interconnected work of Weyl and Elie Cartan in the 1920s. Lastly we study the emergence and elaboration of structures designed to express and address specifically global problems : differentiable manifolds, fibre spaces and sheaves, in the period from 1930 to 1953.

(c) Other publications

i. History of Mathematics

Des problèmes aux structures : Henri Cartan et les problèmes de Cousin.

Gazette des Mathématiciens n°120 (April 2009), p.9-19.

<http://smf.emath.fr/Publications/Gazette/>

L'Analysis situs de Poincaré : les limites d'une synthèse classique

Proceedings : Congrès de la Société Française d'Histoire des Sciences et des Techniques, Poitiers, 20-22 mai 2004.

Cahier d'histoire et de philosophie des sciences, numéro hors série, 2006. p.32-39.

L'idée de géométrie différentielle intrinsèque de Gauss à Einstein

Bulletin de l'Union des Professeurs de Spéciale n°208, octobre 2004. p.11-24

Les fonctions implicites : de la notion au théorème
Mnemosyne n°18, IREM Paris 7, octobre 2003. p.15-58.

ii. Teaching and Learning of Mathematics

Quand Leibniz joue aux dés
in *De grands défis mathématiques, d'Euclide à Condorcet*, IREM, Adapt-Vuibert, 2010. p. 99-115.

La multiplicité des points de vue en Analyse élémentaire comme construit historique
in *Histoire et enseignement des mathématiques : erreurs, rigueurs, raisonnements*, E. Barbin et D. Bénard (eds.), INRP, 2007. p.203-227.

iii. Translations

Nigel Hitchin *Mathematics and Culture. Geometry in Oxford 1960-1990*, CNRS editions.
Forthcoming, in the French edition of *La matematica. I luogo e i tempi*. 23 pages.

iv. In preparation

Géométrie et topologie différentielles, 1918-1932. Textes traduits et présentés par Renaud Chorlay.
Translation phase completed for this sourcebook.

Handbook on Generality in Mathematics and the Sciences
K. Chemla, R. Chorlay, D. Rabouin (eds.). Nearly complete. General introduction to be written.

Questions of Generality as Probes into Nineteenth Century Analysis
in *Handbook on Generality in Mathematics and the Sciences*, K. Chemla, R. Chorlay, D. Rabouin (eds.). 26 pages.

6. Presentations

(a) History and Philosophy of Mathematics

On The Use of Problems: The Case of the Cousin Problems (1883-1953)
Invited plenary talk.

International Conference on the History of Modern Mathematics, Northwest University, Xi'an (China), 11-17th August 2010.

Tracing the Emergence of "Local" and "Global": Some Methodological Issues
International Congress on the History of Science and Technology, Budapest, 28th July-2nd August 2009.

Designing Mixed Structures (2 talks)
Workshop "*Category Theory and Related Topics: History and Beyond*"
MFO Oberwolfach, 15-21st February 2009

"im Kleinen – im Grossen" : Turn of the Century Concepts
Workshop "*Mathematics at the Turn of the 20th Century : Explorations and Beyond*"
Erwin Schrödinger Institut, Vienna, 7-12th January 2009.

Riemann – Weierstrass on the Foundations of Complex Analysis : A Focus on Cooperative Aspects.
Invited special session on History of Mathematics (J. Dauben, K. Parshall et al. org.)
Joint Mathematics Meeting AMS – MAA, Washington D.C., 5-8th January 2009.

Analyse complexe à la Riemann, analyse complexe à la Weierstrass : retour sur une opposition topique
3rd Congrès de la SFHST (Société Française d’Histoire des Sciences et Techniques), Paris, 4-6th Septembre 2008.

« *Meta* » *in the Making*
Workshop « *Mathematical Practices* », **Universidad de Sevilla** (Spain), 16-17th June 2008.

Making Sense of it with Structures : the Case of Charles Ehresmann.
Workshop « *Mathematical Understanding* », Université Paris 7 (Département Histoire et Philosophie des Sciences), 9-13th June 2008.

L’explicitation du couple local/global : questions de périodisation
Joint Meeting SFHST - SIHM (Société Française d’Histoire des Sciences et Techniques, Société Italienne d’Histoire des Mathématiques), Paris, 25-27th Octobre 2007

Evolution of the notion of neighbourhood and emergence of the “local”
Novembertagung 2005, Paris, 8th Novembre 2005

L’Analysis situs de Poincaré : les limites d’une synthèse classique
Congrès de la SFHST, Poitiers, 20-22nd May 2004

(b) Teaching and Learning of Mathematics

From Historical Analysis to Classroom Work : Function Variation and Long-term Development of Functional Thinking
CERME 6 (6th Conference of European Research in Mathematics Education), Lyon, 28th January – 1st February 2009.

The multiplicity of viewpoints in elementary function theory : historical and didactical perspectives
HPM 2008 (History and Pedagogy of Mathematics satellite meeting of ICMI 11), Mexico City, 14-18th July 2008

Möbius : du calcul barycentrique à la bande unilatère
17th inter-**IREM** Meeting, Université de Nancy, 23-24th May 2008

Using historical texts in the classroom : examples in statistics and probability theory (with P. Brin).
ESU 5 (5th European Summer University on History and Epistemology in Mathematics Education), Prague, 19-24th July 2007

La multiplicité des points de vue en Analyse élémentaire comme construit historique
EMF 2006 Conference (Espace Mathématique Francophone, satellite conference of the ICMI), Sherbrooke (Québec, Canada), 27-31st May 2006

La multiplicité des points de vue en Analyse élémentaire comme construit historique (plenary)
Joint **INRP / inter-IREM** Meeting on History of Mathematics in Maths Education, Université de Clermont-Ferrand, 19-20th May 2006.

Jouer de la multiplicité des points de vue (with A. Michel-Pajus)
EMF 2003, Tozeur (Tunisia), 19-23rd Decembre 2003

7. Teaching experience

(a) Higher education : University of Paris 8, 2007-2008

- Mathematics
 - Introduction to Advanced Mathematics (Exercise class, L1, 26 hours)
 - Probability Theory (Exercise class, L2, 26 hours)
 - Number Series & Function Series (Lecture & exercise class, L2, 26 hours)
- History of mathematics
 - The Mathematical Revolution of the 17th Century (Lecture, L2, 39 hours)
 - The Advent of “Rigour” in 19th Century Mathematical Analysis (Lecture, L3, 39 hrs)

(b) Teacher training : University of Paris 7, 2002-2009

Training sessions for in-service maths teachers, at the IREM (Institute for Research on Mathematics Education, <http://iremp7.math.jussieu.fr/>)

- *Using Historical Documents in the Classroom* (3 days per academic year, since 2002)
- *Mathematical Instruments* (3 days per academic year, since 2007)

(c) Secondary level

- Teaching of mathematics in secondary schools (1 year in middle-school, 9 years in high-school).
- Teaching of mathematics in English (2006-2007).

8. Professional activities

2010- Associate editor for the history of mathematics section of the on-line journal *Images des mathématiques*

<http://images.math.cnrs.fr/>

2005- Associate researcher, REHSEIS (UMR 7219 CNRS- University of Paris 7)

<http://www.rehseis.univ-paris-diderot.fr/>

2008- Appointed to the Advisory board of HPM

<http://www.clab.edc.uoc.gr/HPM/>

Referee for *International Journal of Mathematics Education in Science and Technology*

9. Referees

(a) History of mathematics

Pr. Jeremy GRAY
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Open University
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Pr. Erhard SCHOLZ
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(b) Philosophy of mathematics

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