L A B O R A T O I R E S P H E R E , U M R 7 2 1 9

SÉMINAIRE

MATHÉMATIQUES 19E-21E, HISTOIRE ET PHILOSOPHIE

Mathematics 19th – 21st, History and Philosophy

http://www.sphere.univ-paris-diderot.fr/spip.php?article814

2021 – 2022

Le séminaire d'histoire et de philosophie des mathématiques modernes est un lieu de présentation et de discussion de textes mathématiques produits aux 19e, 20e et 21e siècles, dans des perspectives aussi bien historiques que philosophiques. Il entend servir de lieu d'exploration (lecture, traduction, explication) de documents mathématiques peu ou mal connus, mais également de présentation de travaux en cours sur ces périodes. L'accent est mis sur la proximité avec les sources textuelles. Les séances prennent, le plus souvent, la forme d'une discussion desdites sources (auxquelles les orateurs donnent accès au préalable), précédée d'un exposé historique ou mathématique. Les langues de travail seront le français et l'anglais.

Organisation : Nicolas Michel (Université d'Utrecht, Dpt de Mathématiques, & SPHere), Frédéric Jaeck (ENS),

Le séminaire, mensuel, se réunira le lundi en salle 646A (Mondrian),
Bâtiment Condorcet, Université de Paris (Campus Grands Moulins),
Pour participer à distance, le lien Zoom sera disponible en écrivant à l'avance aux organisateurs :
N. Michel ou F. Jaëck

INTERVENANTS

Lundi 25 octobre 2021, 14:00 – 16:00, hybride

Sara CONFALONIERI (HPS, Université de Paris, SPHere)

Lundi 13 décembre 2021, 14:00 – 16:00, hybride

Sébastien GANDON (Université Clermont-Auvergne)

Lundi 24 janvier 2022, 13:30 – 16:30, hybride

Brigitte STENHOUSE (Oxford University), Tom HEDLEY (Trinity College Dublin)

Lundi 21 février, 13:30 – 16:30, hybride

Nicola OSWALD (Bergische Universität Wuppertal), Norbert SCHAPPACHER (Université de Strasbourg)

Lundi 14 mars, 13:30 – 16:30, hybride

Ralf KRÖMER (Bergische Universität Wuppertal), Silvia de TOFFOLI (Princeton University)

Lundi 4 avril 2022, 13:30 – 16:30, hybride

Brice HALIMI (Université de Paris, HPS, SPHere), Andrew ARANA (Archives Henri-Poincaré)

Lundi 23 mai 2022, 14:00 – 16:00, hybride

Alexander JONES (New York University, Institute for the Study of the Ancient World)

!! Mardi !! 14 juin 2022, 14:00 – 16:00, hybride

Clément BONVOISIN (Université Paris Cité, SPHere)

PROGRAMME

Lundi 25 octobre 2021, 15:00 – 17:00, visioconférence

Sara CONFALONIERI (HPS, Université de Paris, SPHere)

La méthode de Fourier pour dénombrer et séparer les racines réelles : « Et je l'ai résolue par une méthode exacte et générale »

Le théorème de Sturm (1829) sur le dénombrement des racines réelles d'un polynôme réel eut une grande résonnance. L'exposé examine la méthode de Fourier (1787-1831) qui est la source d'inspiration explicitement déclarée par Sturm, d'un côté en visant à une remise en contexte à plusieurs niveaux (interactions avec la règle des signes de Descartes ainsi qu'avec le plus ample contexte des discussions sur les nombres complexes), et de l'autre côté en formulant des hypothèses sur sa réception manquée.

Lundi 13 décembre 2021, 15:00 – 17:00, hybride

Sébastien GANDON (Université Clermont-Auvergne)

Assignation rétrospective et histoire des mathématiques

Les historiens des mathématiques utilisent souvent, pour étudier les mathématiques d'une période donnée, des mathématiques qui ont émergé après la période cible. Une telle pratique d'assignation rétrospective est-elle justifiée ? L'article de Sheldon Smith («Incomplete Understanding of Concepts : The Case of the Derivative», Mind, 2015), revendiquant un point de vue d'historien et argumentant contre ces assignations rétrospectives, servira de point de départ à la réflexion.

Lundi 24 janvier 2022, 13:30 – 16:30, exclusivement en visioconférence

Brigitte STENHOUSE (Oxford University):

Mary Somerville's abandoned manuscripts and the promotion of analytical mathematics in 1830s Britain

In her 1831 book, *Mechanism of the Heavens*, Mary Somerville (1780-1872) actively promoted the adoption of analytical methods both to mathematicians and to those natural philosophers who were not mathematically literate. She argued that a true understanding of physical astronomy - the motions and shapes of the planets, moons, and comets - could only be reached by those who understood mathematical analysis. However, although she continued to publish articles and books on the physical sciences, none of Somerville's subsequent works spoke directly to mathematicians nor did they prioritise mathematical questions. This is somewhat surprising considering that Somerville had explicitly depicted analytical mathematics as a fertile ground waiting to be farmed. In this talk I will give an overview of two book-length manuscripts first written by Somerville in the 1830s - one a volume on the form and rotation of planets, the other an analytical work on curves and surfaces. Somerville evidently spent large amounts of time on these technical manuscripts, which include hundreds of hand-drawn diagrams, but in 1834 they were left by the wayside and she instead brought a survey of recent scientific advancements to press in which all the mathematical formulae had been removed. By considering the market for mathematical books at the time, alongside Somerville's place in the scientific community as a self-educated woman, I will demonstrate why these manuscripts remained unfinished and unpublished.

Tom HEDLEY (Trinity College Dublin)

Killing the Pope : Hausdorff, Nietzsche and the Modern(ist) Language of Mathematics

A few months before his inaugural lecture on the problem of space at the Universität Leipzig in 1903, Felix Hausdorff released one of his last (and most extensive) essayistic works under his pseudonym, Paul Mongré, entitled "*Sprachkritik*" (Critique of Language). The role and influence of Nietzsche and the Eternal Return in Hausdorff/Mongré's earlier philosophical works and his turn to Cantor's set theory has in recent years received due scholarly attention, but by 1903, Mongré seemed to distance himself from Nietzsche's latter-day fanaticism. On the face of it, the subject of Mongré's Sprachkritik is the Vienna-based language theorist Fritz Mauthner, whose own critique of language is paralysed by the central paradox that one has to use language itself to critique it — a predicament Mauthner compares to the Pope accidentally killing himself when he tries to eradicate his bedbugs. In his essay, Mongré rises above Mauthner's pessimistic stance and turns to mathematics as the language that can outwit this paradox. His turn, however, can only be explained by his lingering indebtedness to Nietzsche, this time his fiery (and surprisingly brief) language criticism in "*Über Wahrheit und Lüge im außermoralischen Sinne*". In this talk, I will explore how Nietzsche too, his bloodlust unsatisfied by famously killing God in the 1880s, had to insist on the death of the Pope in order to unshackle artistic creativity in language, and I will ask how Mongré was able to draw on this twist to arrive at mathematics as free, creative thought par excellence.

Lundi 21 février, 13:30 – 16:30, hybride

Nicola OSWALD (Bergische Universität Wuppertal)

A socio-mathematical network : insights into a lifelong correspondence between David Hilbert, Hermann Minkowski and Adolf Hurwitz

In my talk I present the correspondence between Adolf Hurwitz, Hermann Minkowski and David Hilbert, from the period between 1886 and 1919 covering a variety of contemporary mathematics and references to the mathematical community. Using two selected examples of content, three proofs of transcendence of e in 1893 and thematic reports for the mathematical community, I take a look at characteristics of these contemporary mathematicians as well as local circumstances. In particular, I am interested in their roles in the social network of mathematicians at the turn of the 20^{eth} century.

Norbert SCHAPPACHER (Université de Strasbourg)

A "Revolution" in Mathematical Practice ? Reflections on the Introduction of Cohomological Methods

Revolution or not, it seems that the considerable reshaping of topology and geometry by cohomological notions, especially since the second half of the twentieth century, deserves the attention of (future?) historians, and maybe also philosophers, of mathematics. The aim of the talk is to prepare this domain of reserach by asking adequate questions, and sketching possible answers.

Lundi 14 mars, 13:30 – 16:30, hybride

Ralf KRÖMER (Bergische Universität Wuppertal)

Stone's work on duality : what can be learned from writing its history ?

In the talk, we investigate the contributions of Marshall Stone (1903-1989) to the study of phenomena of duality in mathematics. In fact, Stone's name is related to the history of at least two such phenomena, namely adjoint (or dual) operators in functional analysis, and the result known as Stone duality in the theory of Boolean algebras. The latter is a statement of the form that two operations are dual to each other in the sense that applying one after the other yields the original object, up to an appropriate notion of equivalence. We can put this type of duality in relation with other types. Concerning terminology, we will see that Stone and others often gave preference to other terms than «dual», and it is interesting to analyze the reasons for this. The case study also offers hints for understanding what distinguishes theorems characterized as duality theorems from theorems characterized as representation theorems. Finally, observations of a different kind can be made, not concerning the conceptual but the social history of mathematics. In several lines of development, the problem that the community of researchers in some mathematical field might be unaware of notions, techniques or results very well known in another field play a role; to focus on this phenomenon throws light on networks in mathematical research and the interaction or non-interaction between these.

Silvia de TOFFOLI (Princeton University)

Recalcitrant disagreement in mathematics : an endless and depressing controversy in the history of italian algebraic geometry

If there is an area of discourse in which disagreement is virtually absent, it is mathematics. After all, mathematicians justify their claims with deductive proofs : arguments that entail their conclusions. But is mathematics really exceptional in this respect ? Looking at the history and practice of mathematics, we soon realize that it is not. First, deductive arguments must start somewhere. How should we choose the starting points (i.e., the axioms) ? Second, mathematicians, like the rest of us, are fallible. Their ability to recognize whether a putative proof is correct is not infallible. In most cases, disagreement over the correctness of a putative proof is, however, evanescent. Once an error is spotted and communicated, the disagreement disappears. But this is not always the case. Sometimes it is recalcitrant ; that is, it persists over time. In order to zoom in on this type of disagreement and explain its very possibility, we focus on a single case study : a decades-long (1921-1949) controversy between Federigo Enriques and Francesco Severi, two prominent exponents of the Italian school of algebraic geometry. We suggest that the instability of the mathematical community to which they belonged can be explained by the gap between an abstract criterion of rigor and local criteria of acceptability. It is this instability that made the existence of recalcitrant disagreement over putative proofs possible. We do not condemn speculative mathematics but rather its pretense of being rigorous mathematics. In this respect, we show that the overly self-confident Severi and the more intuitive, visionary Enriques had a completely different attitude.
[Based on joint work with Claudio Fontanari]

Lundi 4 avril 2022, 13:30 – 16:30, hybride

Brice HALIMI (Université de Paris, HPS, SPHere)

L'o-minimal et le pathologique

La théorie des structures o-minimales en logique présente un certain nombre de similitudes avec la théorie des CW-complexes et des ensembles simpliciaux en topologie algébrique. Dans les deux cas, il s'agit principalement d'écarter toute une classe de cas jugés pathologiques, afin de rendre possibles quelques preuves et quelques calculs importants. Dans mon exposé, je présenterai brièvement des connexions entre ces deux domaines : un certain nombre de rapprochements possibles entre les sous-ensembles définissables d'une structure o-minimale et les CW-complexes, puis un lien entre la

catégorie des structures o-minimales et une sous-catégorie de la catégorie des ensembles simpliciaux.

Andrew ARANA (Archives Henri-Poincaré)

Einstein on purity in geometry

In 1937 Albert Einstein corresponded with his friend Max Wertheimer, the Gestalt psychologist, about "the problem of axioms". Seeking to understand Wertheimer's problem better, Einstein asked if Wertheimer wanted "to compare the value of two proofs which are themselves based on the same system of (concepts and) axioms." He wrote: "In that case, surely, we are completely satisfied only if we feel of each intermediate concept that it has to do with the proposition to be proved." To clarify this, Einstein then presents two proofs of the theorem of Menelaus, as "a pretty example of two proofs of different degrees of perspicuity." In this talk I will discuss Einstein's two proofs and his conclusions about purity.

Lundi 23 mai 2022, 14:00 – 16:00, hybride

Alexander JONES (New York University, Institute for the Study of the Ancient World

Sexagesimal and other fractional notations in Greek astral science

In texts and tables of Greek mathematical astronomy, as well as in related fields such as astrology and mathematical geography, whole numbers were expressed in the so-called Ionian non-place-value decimal notation that employed an augmented 27-letter Greek alphabet to represent numbers (1 through 9) of units, tens, and hundreds. For fractional quantities there were two common notations, both incorporating the Ionian notation. One, structurally resembling Egyptian fractional notation, expressed a fractional quantity as a string of one or more distinct nth-part fractions (equivalent to 1/2, 1/3, 1/4,…). The other, adapted from Babylonian sexagesimal place-value notation, expressed fractions as strings of one or more whole numbers (0 through 59) representing multiples of consecutively decreasing powers of 60 (60-1, 60-2, 60-3,…). The two notations could coexist in a single work, and sometimes the same body of data is found expressed in the one notation in one context and in the other in a different context. This talk explores two topics : the functions of the two fractional notations, and certain distinctive and crucial features of the Greek sexagesimal notation that differentiate it from its Babylonian antecedents.

!! Mardi !! 14 juin 2022, 14:00 – 16:00, hybride

Clément BONVOISIN (Université Paris Cité, SPHere)

A Soviet mathematical tool in the United States : Leonard Berkovitz's paper on Lev Pontryagin's maximum principle (1961)

From 1956 to 1961, the Soviet mathematician Lev Pontryagin (1908 – 1988) and two of his students published a series of works on a result, the maximum principle, for solving optimal control problems. These problems, which had emerged in some scientific and engineering communities during World War II and the early Cold War, are about finding the best ways to transfer a system from one state to another, desired one. Although there were already several lines of approach to such problems when Pontryagin's group released their material, they claimed the tool they had forged – quickly named Pontryagin's maximum principle – surpassed the state of the art.

Soon, US mathematicians interested in optimal control problems began to discuss the Soviet achievement. One of these mathematicians, Leonard Berkovitz (1924 – 2009) argued in a paper released in 1961 that Pontryagin's maximum principle was merely a rephrasing of the Weierstrass condition from the calculus of variations. Moreover, he pointed out that an American specialist in the calculus of variations, Magnus Hestenes, had already offered a similar rephrasing in an unpublished report in 1950. For the historian of science, this raises several questions I intend to address: how did Pontryagin and Berkovitz drew connections between existing knowledge in the calculus of variations and a new result? How did it led them to seemingly opposed conclusions? What are the consequences of this for the historiography on optimal control problems?