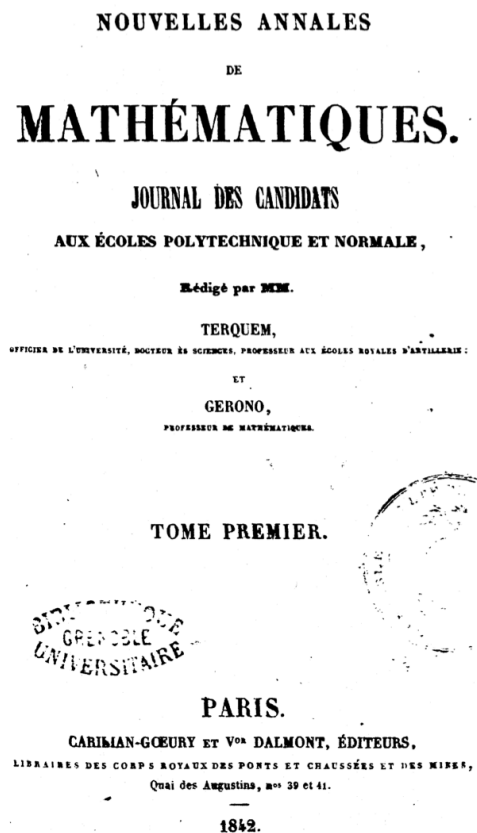


Number Theory in Teaching Mathematical Journals: the Case of *Nouvelles Annales de Mathématiques* (1842- 1927)

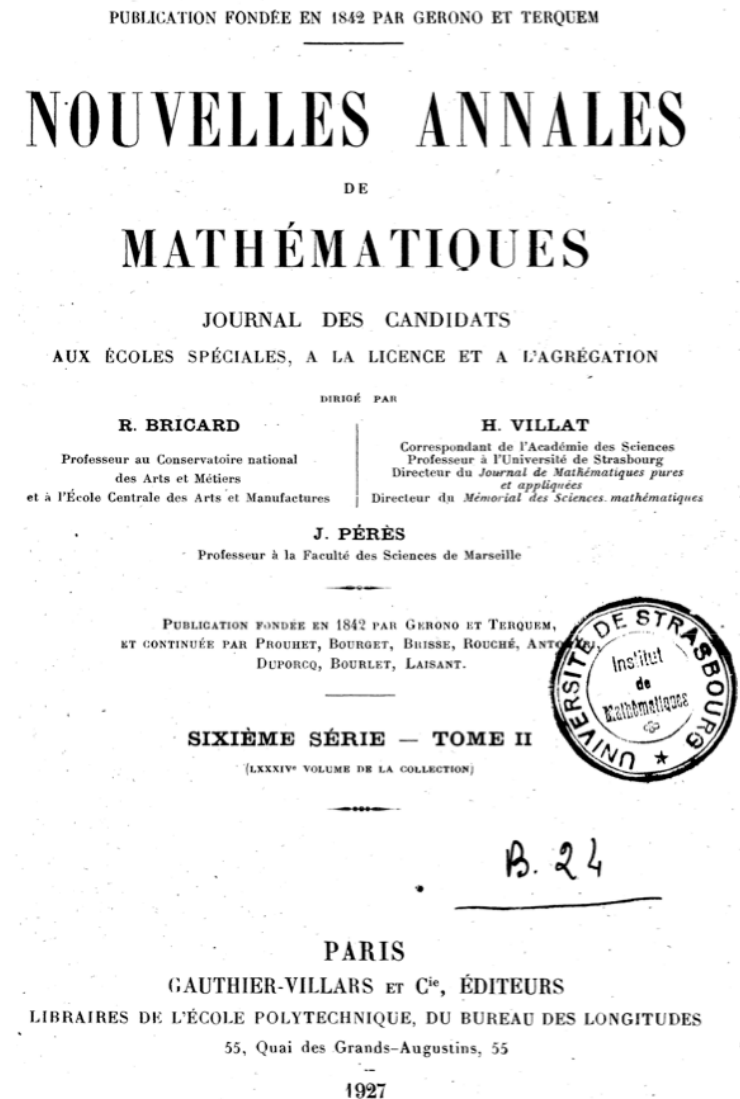


Jenny Boucard
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*ICHME 4, Torino
September 24th 2015*

Nouvelles annales de mathématiques (NAM) : some general data

- 84 volumes
- \approx 5000 contributions
- \approx 1835 authors
- **Target audience : students & teachers** \rightarrow « presse intermédiaire »
 - 1842-1887 : École polytechnique & normale
 - 1888 - 1927 : Écoles spéciales, licence, agrégation
- 1877 -... : *Journal de mathématiques élémentaires*, ...



What is Number Theory in the XIXth century ?

A brief and incomplete panorama...

▶ Academies and 'research' mathematical journals

- ▶ Around 1800 : [Legendre 1798], [Gauss 1801]
- ▶ 1820-1860 : Arithmetic Algebraic Analysis (congruences, ideal numbers, elliptic functions and integrals, arithmetical forms, ...) / Congruences & forms in books
- ▶ 1900' : the so-called *elementary* number theory (congruences, quadratic reciprocity law, some quadratic forms, ...), arithmetic theory of forms, algebraic number theory, theory of ideal numbers and generalisations, analytical number theory, ...

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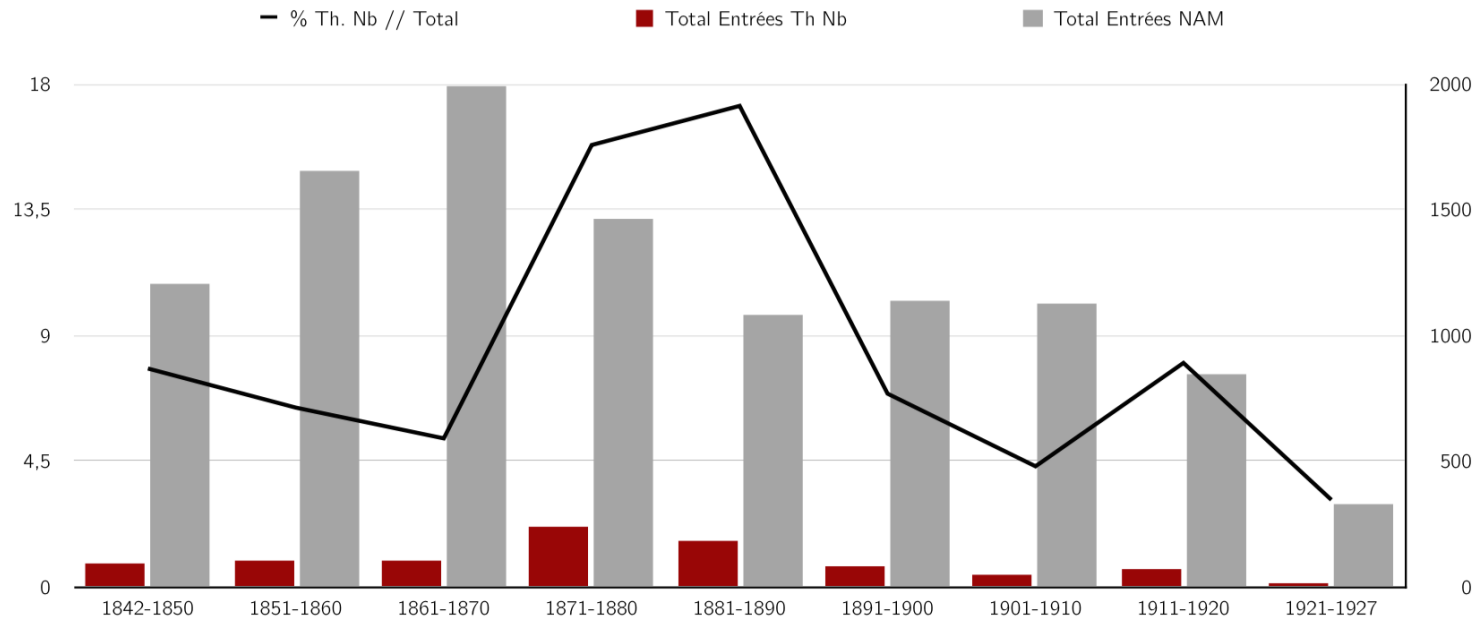
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▶ Teaching places in France

- ▶ 1843 - ... : *Cours de mathématiques élémentaires* (Prime numbers, Properties of divisibility, Decimal fractions & periodic decimal fractions) & *mathématiques spéciales* (Continued fractions, indeterminate equations of 1st degree) - quite stable until 1914
- ▶ Agregation : similar and stable
- ▶ Universities : some courses (mostly XXth century)

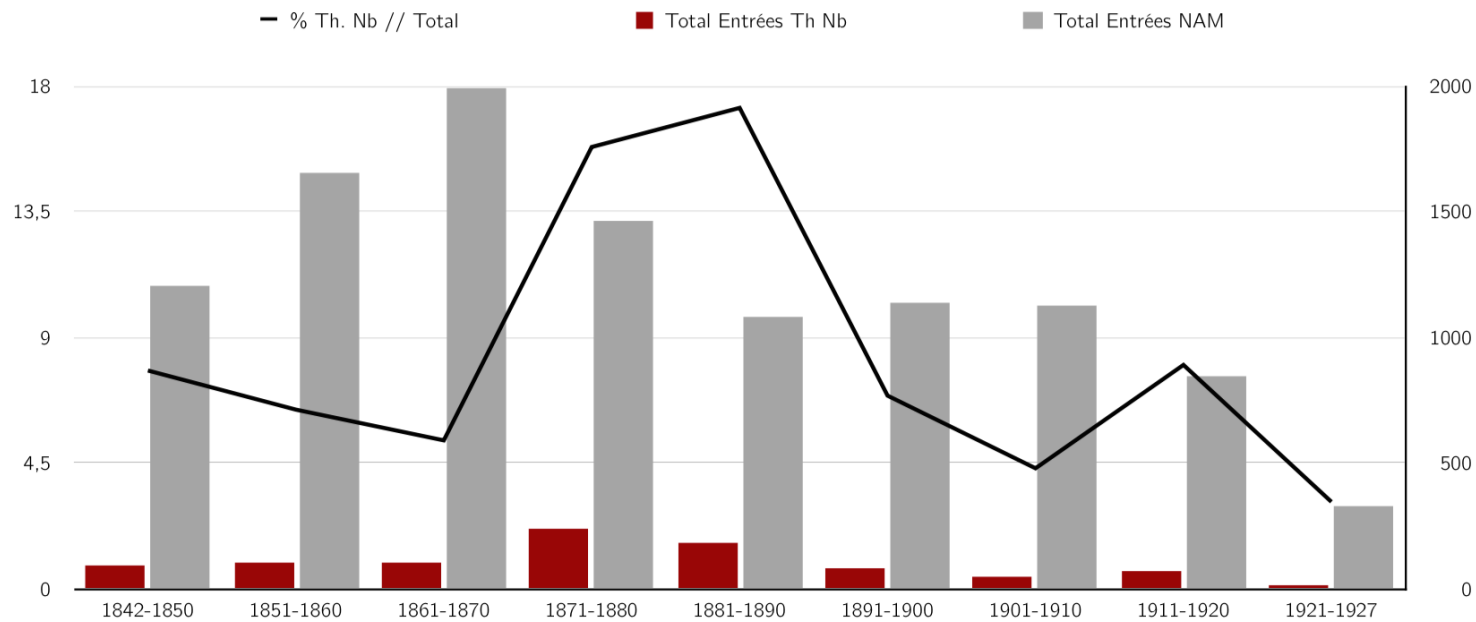
Number theory in *Nouvelles annales de mathématiques* : panorama

➡ 876 entries & 236 authors



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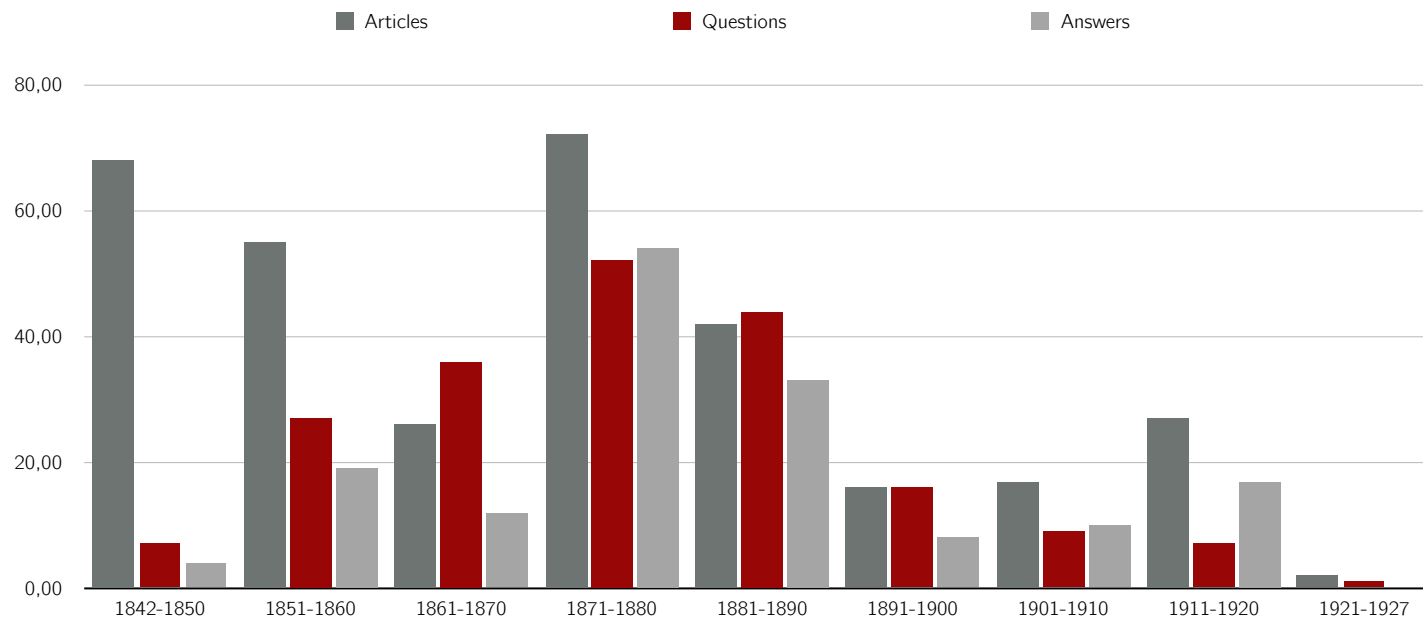
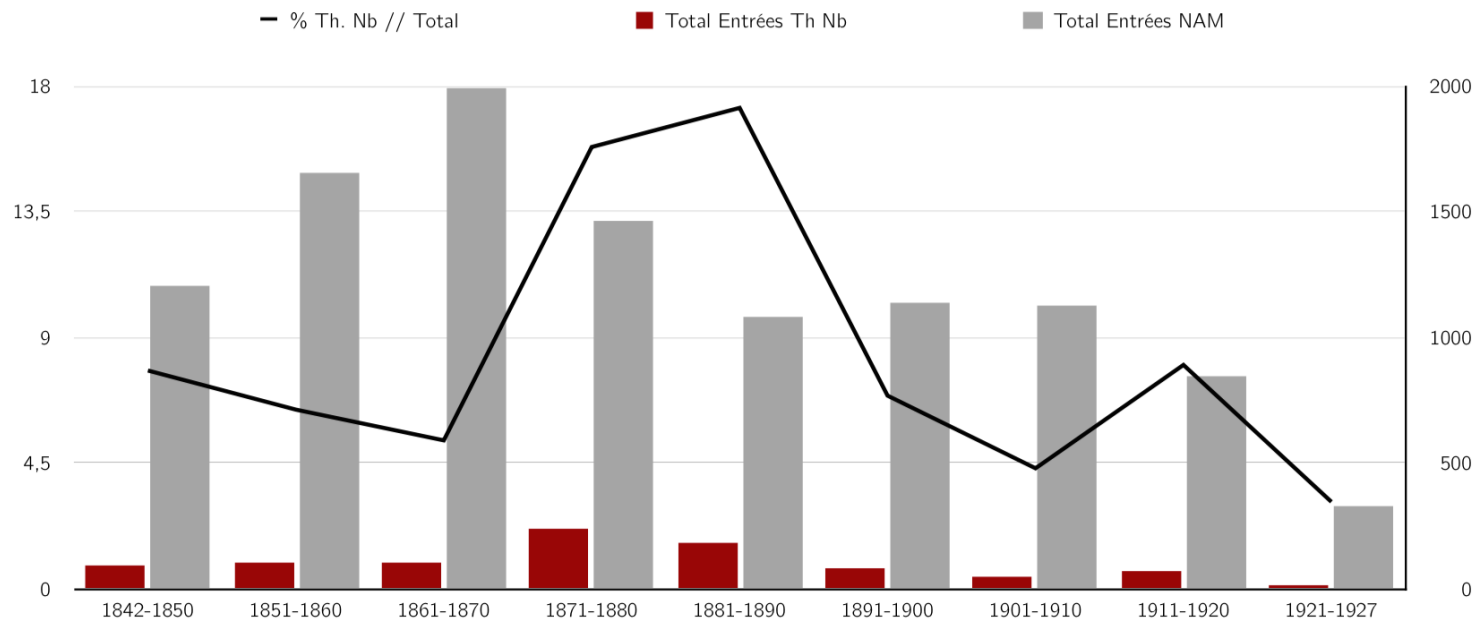
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- ▶ 331 articles
- ▶ 198 questions
- ▶ 159 answers
- ▶ 49 comments on exams and contests
- ▶ 34 extracts of letters
- ▶ 25 reviews
- ▶ 80 bibliographic announcements

Number theory in *Nouvelles annales de mathématiques* : panorama

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Who are the authors ?

Teachers (collège/lycée)	62 (34.5%)
Teachers (X, gvt schools)	6 (3.5%)
University	34 (19 %)
Students	35 (19.5 %)
Military	15 (8.5%)
Engineers	9 (5%)
Religious	7 (4%)
Editors	4 (2%)
Others	2 (1%)
<i>Unknown / Ano.</i>	<i>56</i>

	Articles	%	Nb th.
Réalis, S.	88	<i>51,1</i>	45
Lionnet, E.	68	<i>60,3</i>	41
Césaro, E.	100	<i>37,0</i>	37
Lucas, É.	56	<i>62,5</i>	35
Catalan, E.	102	<i>34,3</i>	35
Lebesgue, V. - A.	75	<i>45,3</i>	34
Moret-Blanc, C. S.	158	<i>19,6</i>	31
<i>Laisant, A.</i>	90	<i>21,1</i>	19
<i>Bricard, R.</i>	150	<i>10,7</i>	16
<i>Prouhet, E.</i>	213	<i>7,5</i>	16
Genocchi, A.	43	<i>30,2</i>	13
André, D.	25	<i>44,0</i>	11
Brocard, H.	130	<i>7,7</i>	10
<i>Terquem, O.</i>	377	<i>2,7</i>	10

Teachers in [Nabonnand & Rollet 2011] : 37% (1842-1862) ; 36% (1863-1895) ; 47.5% (1896-1927)

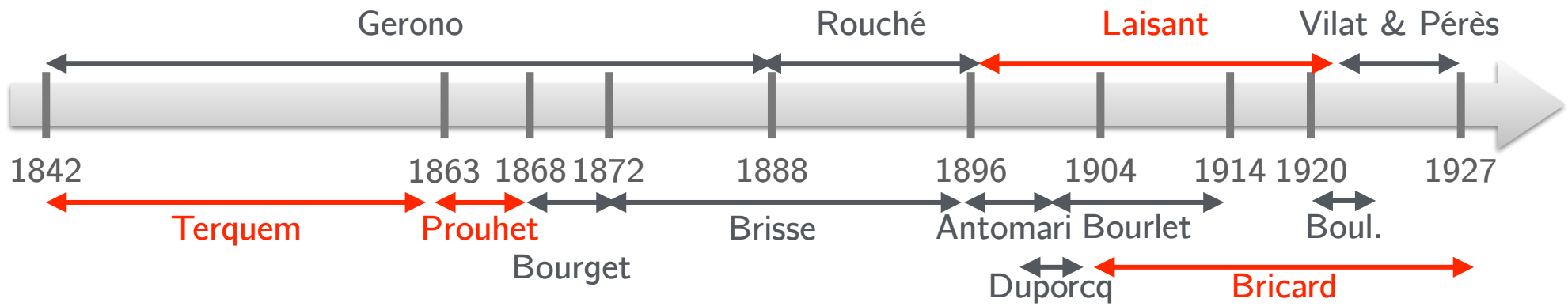
Students in [Nabonnand & Rollet 2011] : 37% (1842-1862) ; 36% (1863-1895) ; 10% (1896-1927)

What Number Theory in the *NAM* ?

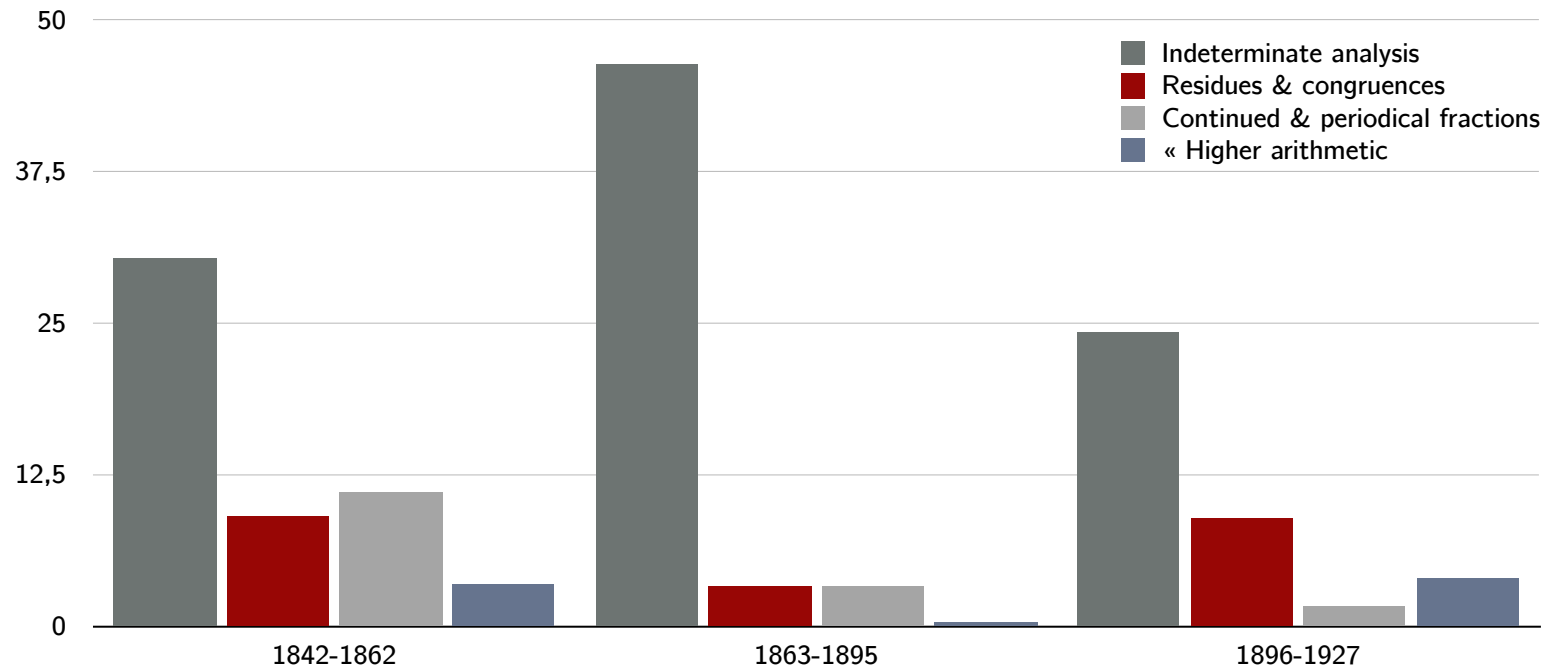
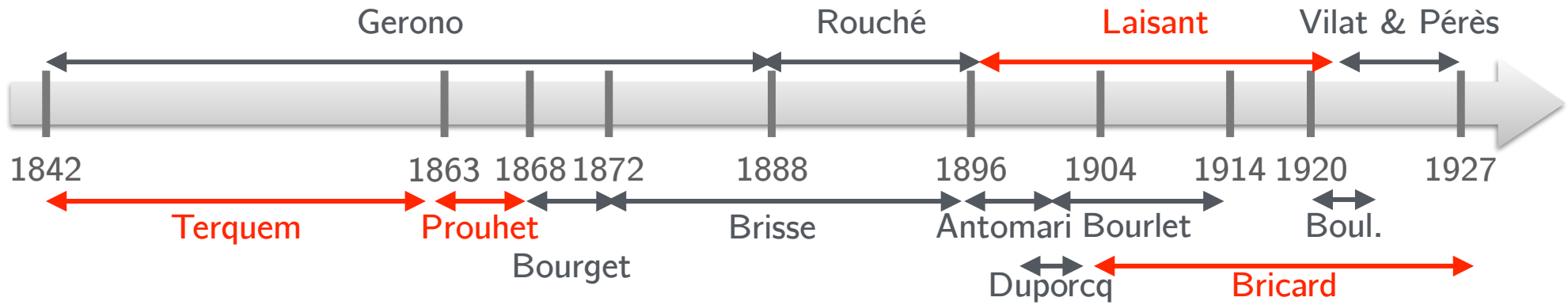
% (1842-1927)	Total	Articles	Questions
Indeterminate analysis	37,7	35,1	37,7
Others	18,6	15,5	20,8
Divisibility	10,9	9,9	12,6
Residues & congruences	6,0	8,7	2,9
Continued & periodical fractions	5,3	8,4	2,4
Arithmetical fonctions	4,3	3,7	5,8
Prime numbers	4,1	5,1	6,1
Arithmetic & geometry	3,8	4,0	4,3
Special Numbers	2,9	3,7	3,4
Numeration	2,3	1,2	3,4
Magic squares, ...	2,2	2,2	2,4
« Higher arithmetic »	1,9	3,7	0,5

What Number Theory ?

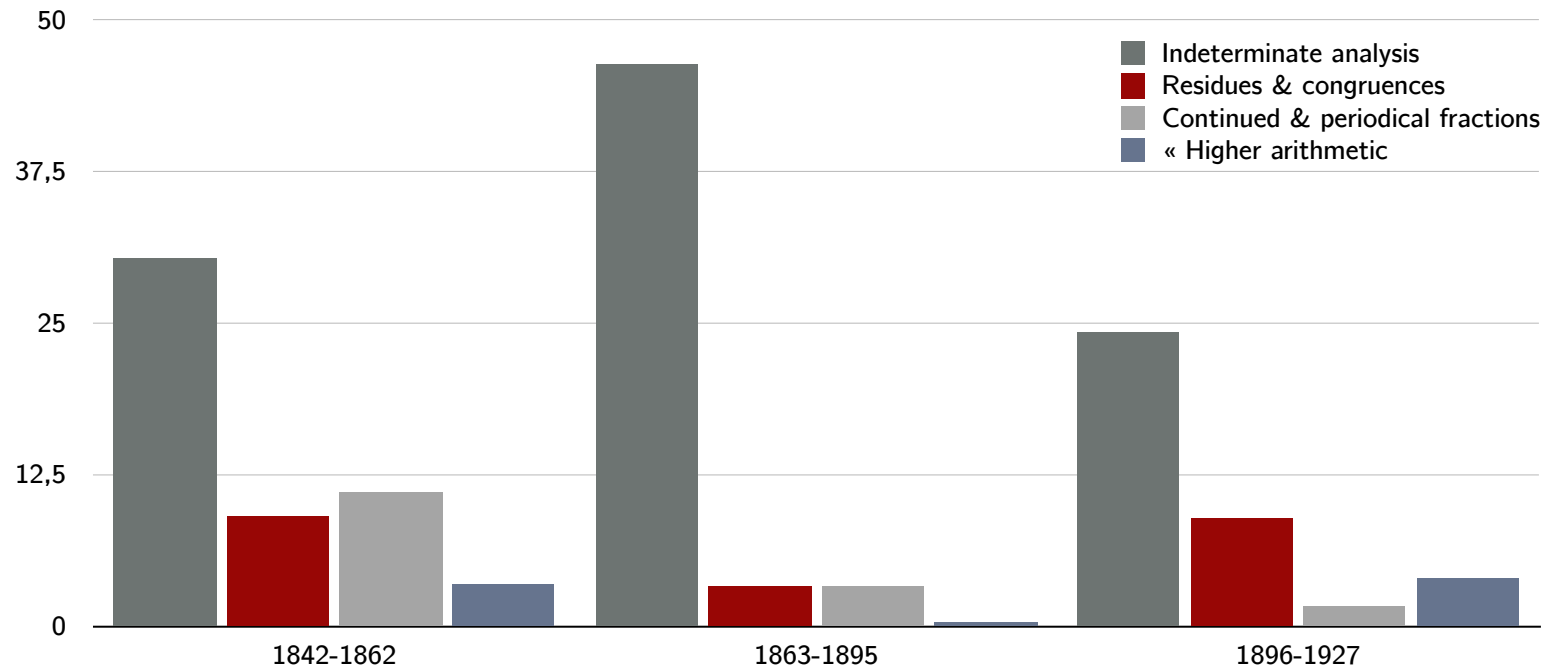
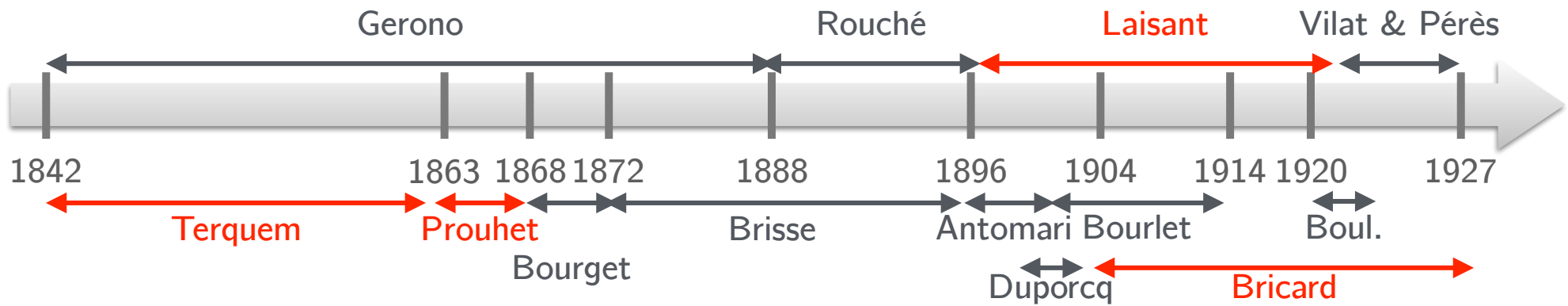
What Number Theory ?



What Number Theory ?



What Number Theory ?



↑
Terquem

↑
Laisant & Bricard

Comments & Reviews

▶ Remarks by the redactor (Terquem) on articles

- ▶ « It is in order to propagate it [the method of congruences] that we inserted this article » [Terquem, on Midy's text, 1845]

▶ Critical reviews on arithmetical treatises

▶ Positive reviews on number theory books (Lebesgue 1875, Lucas 1891, Cahen 1900, Cahen 1913)

▶ Regrets...

- ▶ Terquem (1850) : « Mr. Crelle's Journal [...] contains three arithmological Memoirs of M. E.-E. Kummer. [...] Note. Number theory is little cultivated and widely despised in France, and for good reason. »
- ▶ Bricard (1913) : « It is really unfortunate that we have not yet an original book on this chapter of the General Arithmetic [algebraic numbers and ideals], that we agree to consider as the most beautiful of all. »

▶ Hopes : « If among the younger generation of French scholars... » [Laisant 1892]

Questions and answers : a training for the readers ?

- ▶ A diversity of questions
 - ▶ A training for students : indeterminate equations, divisibility, ...
 - ▶ Higher arithmetic : on algebraic numbers
 - ▶ Conjecture (Catalan, Goldbach)

48. Théorème. Deux nombres entiers consécutifs, autres que 8 et 9, ne peuvent être des puissances exactes. (Catalan.) *NAM*, I, 1 (1842)

- ▶ Circulations
 - ▶ Books : Serret, Lionnet, Lucas, ...
 - ▶ *Educational Times*
 - ▶ *Sphinx- Oedipe*, ...
- ▶ + 40 authors with non-published answers

Various ways for the *NAM*'s readers to access to Number theory...

- ▶ Number theory content concerning teaching curricula:
 - ▶ Number theory in teaching programs : indeterminate equations, periodical fractions
 - ▶ Number theory (residues, congruences, ...) in order to simplify
- ▶ Introduction to higher arithmetic
 - ▶ Original articles : Introductions (residues, complex integers, ...)
 - ▶ Translations (Jacobi & cyclotomy, Minkowski & geometry of numbers, ...)
 - ▶ Reviews of advanced number theory treatises
 - ▶ Valuation of some thematics (geometry of numbers, algebraic numbers, ...)
- ▶ Essential role of several actors (editors and authors) in the valuation of number theory
- ▶ Circulation between several media (translations - mostly from German -, questions, reviews and bibliography ...)