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(*b*. Bourg-la-Reine, near Paris, France, 25 October 1811; *d*. Paris. 31 May 1832)

mathematics.

There have been few mathematicians with personalities as engaging as that of Galois, who died at the age of twenty years and seven months from wounds received in a mysterious duel. He left a body of work-for the most part published posthumously—of less than 100 pages, the astonishing richness of which was revealed in the second half of the nineteenth century. Far from being a cloistered scholar, this extraordinarily precocious and exceptionally profound genius had an extremely tormented life. A militant republican, driven to revolt by the adversity that overwhelmed him and by the incomprehension and disdain with which the scientific world received his works, to most of his contemporaries he was only a political agitator. Yet in fact, continuing the work of Abel, he produced with the aid of group theory a definitive answer to the problem of the solvability of algebraic equations, a problem that had absorbed the attention of mathematicians since the eighteenth century; he thereby laid one of the foundations of modern algebra. The few sketches remaining of other works that he devoted to the theory of elliptic functions and that of Abelian integrals and his reflections. on the philosophy and methodology of mathematics display an uncanny foreknowledge of modern mathematics.

Galois's father, Nicolas-Gabriel Galois, an amiable and witty liberal thinker, directed a school accommodating about sixty boarders. Elected mayor of Bourg-la-Reine during the Hundred Days, he retained this position under the second Restoration. Galois's mother, Adelaïde-Marie Demante, was from a family of jurists and had received a more traditional education. She had a headstrong personality and was eccentric, even somewhat odd. Having taken charge of her son's early education, she sought to inculcate in him, along with the elements of classical culture, the principles of an austere religion and respect for a Stoic morality; Affect by his father's imagination and liberalism, the varying severity of his mother's eccentricity, and the affection of his elder sister Nathalie-Théodore, Galois seems to have had an early youth that was both happy and studious.

Galois continued his studies at the Collège Louis–le–Grand in Paris, entering as a fourth-form boarder in October 1823. He found it difficult to submit to the harsh discipline imposed by the school during the Restoration at the orders of the political authorities and the Church, and although a brilliant student, he presented problems. In the early months of 1827 he attended the first-year preparatory mathematics courses given by H. J. Vernier, and this first contact with mathematics was a revelation for him. But he rapidly tired of the elementary character of this instruction and of the inadequacies of certain of the textbooks and soon turned to reading the Original Works themselves. After appreciating the rigor of Legendre's *Géométrie*, Galois acquired a soild grounding from the major works of Lagrange. During the, next two years he followed the second-year preparatory mathematics courses taught by Vernier, then the more advanced ones of L.-P.-E. Richard, who was the first to recognize his indisputable superiority in mathematics. With this perceptive teacher Galois was an excellent student, even though he was already devoting much more of his time to his personal work than to his classwork. In 1828 he began to study certain recent works on the theory of equations, number theory, and the theory of elliptic functions. This was the period of his first memorandum, published in March 1829 in Gergonne's *Annales de mathématiques pures et appliquées;* making more explicit and demonstrating a result of Lagrange's concerning continuous fractions, it reveals a certain ingenuity but does not herald an exceptional talent.

By his own account, in the course of 1828 Galois wrongly believed—as Abel had eight years earlier—that he had solved the general fifth-degree equation. Rapidly undeceived, he resumed on a new basis the study of the theory of equations, which he pursued until he achieved the elucidation of the general problem with the help of group theory. The results he obtained in May 1829 were communicated to the Académic des Sciences by a particularly competent judge, Cauchy. But events, were to frustrate these brilliant beginnings and to leave a deep mark on the personality of the young mathematician. First, at the beginning of July came the suicide of his father, who had been persecuted for his liberal opinions. Second, a month later he failed the entrance examination for the École Polytechnique, owing to his refusal to follow the method of exposition suggested by the examiner. Seeing his hopes vanish for entering the school which attracted him because of its scientific prestige and liberal tradition, he took the entrance examination for the É'cole Normale Supérieure (then called the École Préparatoire), which trained future secondary school teachers. Admitted as the result of an excellent grade in mathematics, he entered this institution in November 1829; it was then housed in an annex of the Collège Louis-le-Grand, where he had spent the previous six years. At this time, through reading Férussilc's *Bulletin des sciences mathématiques*, he learned of Abel's recent death and, at the same time, that Abel's last published memoir contained a good number of the results he himself had presented as original in his memoir to the Academy.

Cauchy, assigned to report on Galois's work, had to counsel him to revise his memoir, taking into account Abel's researches and the new results he had obtained. (It was for this reason that Cauchy did not present a report on his memoir.) Galois actually composed a new text that he submitted to the Academy at the end of February 1830, hoping to win the *grand prix* in mathematics. Unfortunately this memoir was lost upon the death of Fourier, who had been appointed to examine it. Brusquely eliminated from the competition, Galois believed himself to be the object of a new persecution by the representatives of official science and of society in general. His manuscripts have preserved a partial record of the elaboration of this memoir of February 1830, a brief analysis of which was published in Férussac's *Bulletin des sciences mathématiques* of April 1830. In June 1830 Galois published in the same journal a short note on the resolution of numerical equations and a much more important article, "Sur la théorie des nombres," in which he introduced the remarkable theory of "Galois imaginaries." That this same issue contains original works by Cauchy and Poisson is sufficient testimony to the reputation Galois had already acquired, despite the misfortune that plagued him. The July Revolution of 1830, however, was to mark a severe change in his career.

After several weeks of apparent calm the revolution provoked a renewal of political agitation in France and an intensification in republican propaganda, especially among intellectuals and students. It was then Galois became politicized. Before returning for a second year to the École Normale Supérieure in November 1830, he already had formed friendships with several republican leaders, particularly Blanqui and Raspail. He became less and less able to bear the strict discipline in his school, and he published a violent article against its director in an opposition journal, the *Gazette des écoles*. For this he was expelled on 8 December 1830, a measure approved by the Royal Council on 4 January 1831.

Left to himself, Galois devoted most of his time to political propaganda and participated in the demonstrations and riots then agitating Paris. He was arrested for the first time following a regicide toast that he had given at a republican banquet on 9 May 1831, but he was acquitted on 15 June by the assize court of the Seine. Meanwhile, to a certain extent he continued his mathematical research. His last two publications were a short note on analysis in Férussac's *Bulletin des sciences mathématiques* of December l830 and "Lettre sur l'enseignement des sciences," which appeared on 2 January 1831 in the *Gazette des écoles*. On 13 January he began a public course on advanced algebra in which he planned to present his own discoveries; but this project seems not to have had much success. On 17 January 1831 Galois presented to the Academy a new version of his "Mémoire sur la résolution des équations algébriques," hastily written up at the request of Poisson. Unfortunately, in his report of 4 July 1831 on this, Galois's most important piece of work, Poisson hinted that a portion of the results could be found in several posthumous writings of Abel recently published and that the remainder was incomprehensible. Such a judgment, the profound injustice of which would become apparent in the future, could only stiffen Galois's rebellion.

Galois was arrested again during a republican demonstration on 14 July 1831 and placed in detention at the prison of Sainte-Pélagic, where in a troubled and often painful situation he pursued his mathematical investigations, revised his memoir on equations, and worked on the applications of his theory and on elliptic functions. On 16 March 1832, upon the announcement of a cholera epidemic, he was transferred to a nursing home, where he resumed his research, wrote several essays on the philosophy of science, and became involved in a love affair, of which the unhappy ending grieved him deeply.

Provoked to a duel in unclear circumstances following this breakup, Galois felt his death was near. On 29 May he wrote desperate letters to his republican friends, hastily sorted his papers, and addressed to his friend Auguste Chevalier—but really intended for Gauss and Jacobi—a testamentary letter, a tragic document in which he attempted to sketch the principal results he had achieved. On 30 May, mortally wounded by an unknown adversary, he was hospitalized; he died the following day. His funeral, on 2 June, was the occasion for a republican demonstration heralding the tragic riots that bloodied Paris in the days that followed.

Galois's work seems not to have been fully appreciated by any of his contemporaries. Cauchy, who would have been capable of grasping its importance, had left France in September 1830, having seen only its first outlines. Moreover, the few fragments published during Galois's lifetime did not give an overall view of his achievement and, in particular, did not afford a means of judging the exceptional interest of the results obtained in the theory of equations and rejected by Poisson. The publication in September 1832 of the famous testamentary letter does not appear to have attracted the attention it deserved. It was not until September 1843 that Liouville, who prepared Galois's manuscripts for publication, announced officially to the Academy that the young mathematician had effectively solved the problem, already considered by Abel, of deciding whether an irreducible first-degree equation is or is not "solvable with the aid of radicals." Although announced and prepared for the end of 1843, the publication of the celebrated 1831 memoir and of a fragment on the "primitive equations solvable by radicals" did not occur until the October-November 1846 issue of the *Journal de mathématiques pures et appliquées*.

It was, therefore, not until over fourteen years after Galois's death that the essential elements of his work became available to mathematicians. By this time the evolution of mathematical research had created a climate much more favorable to its reception: the dominance of mathematical physics in the French school had lessened, and pure research was receiving a new impetus. Furthermore, the recent publication of the two-volume *Oeuvres complètes de Niels-Henrik Abel* (1839), which contained fundamental work on the algebraic theory of elliptic functions and an important, unfinished memoir, "Sur la résolution algébrique des équations," had awakened interest in certain of the fields in which Galois has become famous. Lastly, in a series of publications appearing in 1844–1846, Cauchy, pursuing studies begun in 1815 but soon abandoned, had—implicitly—given group theory a new scope by the systematic construction of his famous theory of permutations.

Beginning with Liouville's edition, which was reproduced in book form in 1897 by J. Picard, Galois's work became progressively known to mathematicians and exerted a profound influence on the development of modern mathematics. Also important, although they came to light too late to contribute to the advance of mathematics, are the previously unpublished texts that appeared later. In 1906–1907 various manuscript fragments edited by J. Tannery revealed the great originality of the young mathematician's epistemological writings and provided new information about his research. Finally, in 1961 the exemplary critical edition of R. Bourgne and J. P. Azra united all of Galois's previously published writings and most of the remaining mathematical outlines and rough drafts. While this new documentary material provides no assistance to present-day mathematicians with their own problems, it does permit us to understand better certain aspects of Galois's research, and it will perhaps help in resolving a few remaining enigmas concerning the basic sources of his thought.

To comprehend Galois's work, it is important to consider the earlier writings that influenced its initial orientation and the contemporary investigations that contributed to guiding and diversifying it. It is equally necessary to insist on Galois's great originality: while assimilating the most vital currents of contemporary mathematical thought, he was able to transcend them thanks to a kind of prescience about the conceptual character of modern mathematics. The epistemological texts extracted from his rough drafts sketch, in a few sentences, the principal directions of present-day research; and the clarity, conciseness, and precision of the style add to the novelty and impact of the ideas. Galois was undoubtedly the beneficiary of his predecessors and of his rivals, but his multifaceted personality and his brilliant sense of the indispensable renewal of mathematical thinking made him an exceptional innovator whose influence was long felt in vast areas of mathematics.

Galois's first investigations, like Abel's, were inspired by the works of Lagrange and of Gauss on the conditions of solvability of certain types of algebraic equations and by Cauchy's memoirs on the theory of substitutions. Consequently their similarity is not surprising, nor is the particular fact that the principal results announced by Galois in May—June 1829 had previously been obtained by Abel. In the second half of 1829 Galois learned that Abel had published his findings in Crelle's *Journal für die reine und angewandte Mathematik* a few days before he himself died young. The interest that Galois took from that time in the work of Abel and of his other youthful rival, Jacobi, is evident from numerous reading notes. If, as a result of the progressive elaboration of group theory, Galois pursued the elucidation of the theory of algebraic equations far beyond the results published by Abel, beginning with the first months of 1830 he directed a large proportion of his research toward other new directions opened by both Abel and Jacobi, notably toward the theory of elliptic functions and of certain types of integrals.

The advances that Galois made in his first area of research, that of the theory of algebraic equations, are marked by two great synthetic studies. The first was written in February 1830 for the Academy's grand prize; the summary of it that Galois published in April 1830 in Férussac's *Bulletin des sciences mathématiques* establishes that he had made significant progress beyond Abel's recent memoir but that certain obstacles still stood in the way of an overall solution. The publication in Crelle's *Journal für die reine und angewandte Mathematik* of some posthumous fragments of Abel's work containing more advanced results (the unfinished posthumous memoir on this subject was not published until 1839) encouraged Galois to persevere in his efforts to overcome the remaining difficulties and to write a restatement of his studies. This was the purpose of the new version of the "Mémoire sur la résolution des équations algébriques" that he presented before the Academy.

Despite Poisson's criticisms Galois rightly persisted in thinking that he had furnished a definitive solution to the problem of the solvability of algebraic equations and, after having made a few corrections in it, he gave this memoir the first place in the list of his writings in his testamentary letter of 29 May 1837. This was the "definitive" version of his fundamental memoir, and in it Galois continued the studies of his predecessors but at the same time produced a thoroughly original work. True, he formulated in a more precise manner essential ideas that were already in the air, but he also introduced others that, once stated, played an important role in the genesis of modern algebra. Moreover, he daringly generalized certain classic methods in other fields and succeeded in providing a complete solution—and indeed a generalization—of the problem in question by systematically drawing upon group theory, a subject he had founded concurrently with his work on equations.

Lagrange had shown that the solvability of an algebraic equation depends on the possibility of finding a chain of intermediate equations of binomial type, known as resolvent equations. He had thus succeeded in finding the classic resolution formulas of the "general" equations of second, third, and fourth degree but had not been able to reach any definitive conclusion regarding the general fifth-degree equation. The impossibility of solving this last type of equation through the use of radicals was demonstrated by Paolo Ruffini and in a more satisfactory manner by Abel in 1824. Meanwhile, in 1801, Gauss had published an important study of binomial equations and the primitive roots of unity; and Cauchy in 1815 had made important contributions to the theory of permutations, a particular form of the future group theory.

In his study of the solvability of algebraic equations. Galois developing an idea of Abel's, considered that with each intermediate resolvent equation there is associated a field of algebraic numbers that is intermediate between the field generated by the roots of the equation under study and the field determined by the coefficients of this equation. His leading idea, however, was to have successfully associated with the given equation, and with the different intermediate fields involved, a sequence of groups such that the group corresponding to a certain field of the sequence associated with the equation is a subgroup distinct from the one associated with the antecedent field. Such a method obviously presupposes the clarification of the concept of field already suspected (without use of the term) by Gauss and Abel, as well as a searching study of group theory, of which Galois can be considered the creator.

Galois thus showed that for an irreducible algebraic equation to be solvable by radicals, it is necessary and sufficient that its group be solvable, i.e., possess a series of composition formed of proper subgroups having certain precisely defined properties. Although this general rule did not in fact make the actual resolution of a determinate equation any simpler, it did provide the means for finding, as particular cases, all the known results concerning the solvability of the general equations of less than fifth degree as well as binomial equations and certain other particular types of equations; it also permitted almost immediate demonstration that the general equation of higher than fourth degree is not solvable by radicals, the associated group (permutation group of *n* objects) not being solvable. Galois was aware that his study went beyond the limited problem of the solvability of algebraic equations by means of radicals and that it allowed one to take up the much more general problem of the classification of the irrationals.

In his testamentary letter, Galois summarized a second memoir (of which several fragments are extant) that dealt with certain developments and applications of the theory of equations and of group theory. The article "Sur la théoric des nombres" is linked with it; it contained, notably, a daring generalization of the theory of congruences by means of new numbers that are today called Galois imaginaries and its application to research in those cases where a primitive equation is solvable by radicals. Beyond the precise definition of the decomposition of a group, this second memoir included applications of Galois's theory to elliptic functions; in treating the algebraic equations obtained through the division and transformation of these functions, it presents, without demonstration, the results concerning the modular equations upon which the division of the periods depends.

The third memoir that Galois mentions in his testamentary letter is known only through the information contained in this poignant document. This information very clearly demonstrates that, like Abel and Jacobi, Galois passed from the study of elliptic functions to consideration of the integrals of the most general algebraic differentials, today called Abelian integrals. It seems that his research in this area was already quite advanced, since the letter summarizes the results he had achieved, particularly the classification of these integrals into three categories, a result obtained by Riemann in 1857. This same letter alludes to recent meditations entitled "Sur l'application á l'analyse transcendante de la théorie de I'ambiguïté." but the allusion is too vague to be interpreted conclusively.

Galois often expressed prophetic reflections on the spirit of modern mathematics: "Jump with both feet on the calculus and group the operations, classifying them according to their difficulties and not according to their forms; such, in my view, is the task of future mathematicians" (*Écrits et mémoires*, p.9).

He also reflected on the conditions of scientific creativity: "A mind that had the power to perceive at once the totality of mathematical truths—not just those known to us, but all the truths possible—would be able to deduce them regularly and, as it were, mechanically…but it does not happen like that" (*ibid*, pp. 13–14). Or, again, "Science progresses by a series of combinations in which chance does not play the smallest role; its life is unreasoning and planless [*brute*] and resembles that of minerals that grow by juxtaposition" (*ibid*, p. 15)

Yet we must also recall the ironic, mordant, and provocative tone of Galois's allusions to established scientists: "I do not say to anyone that I owe to his counselor to his encouragement everything that is good in this work. I do not say it, for that would be to lie" (*ibid*, p. 3). The contempt that he felt for these scientists was such that he hoped the extreme conciseness of his arguments would make them accessible only to the best among them.

Galois's terse style, combined with the great originality of his thought and the modernity of his conceptions, contributed as much as the delay in publication to the length of time that passed before Galois's work was understood, recognized at its true worth, and fully developed. Indeed, very few mathematicians of the mid-nineteenth century were ready to assimilate such a revolutionary work directly. Consequently the first publications that dealt with it, those of Enrico Betti (beginning in 1851), T. Schönemann, Leopold Kronecker, and Charles Hermite, are simply commentaries, explanations, or immediate and limited applications. It was only with the publication in 1866 of third edition of Alfred Serret's *Cours d'algeèbre supérieure* and, in 1870, of Camille Jordan's *Traité des substitutions* that group theory and the whole of Galois's *oeuvre* were truly integrated into the body of mathematics. From that time on, its development was very rapid and the field of application was extended to the most varied branches of the science; in fact, group theory and other more subtle elements included in Galois's writings played an important role in the birth of modern algebra.

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I. Original Works. Galois's scientific writings have appeared in the following versions: "Oeuvres mathématiques d'Evariste Galois." J Liouville, ed., in *Journal de mathèmatiques pures et appliquées*, 11 (Oct.-Nov . 1846), 381–448 ; Oeuvres mathèmatiques d'Evariste Galois, J .Picard, ed. (Parris, 1897), also in facs. Repro. (Paris, 1951) with a study by G. Verriest: "Manuscrits et papiers inédits de Galois," J. Tannery, ed., in *Bulletin des sciences mathématiques*, 2nd ser., **30** (Aug.-Sept. 1906), 246–248, 255–263 **31** (Nov. 1907), 275–308; *Manuscrits d'Euariste Galois* J. Tannery, ed. (Paris, 1908); and *Écrits et mémoirés mathématiques d'Evariste Galois*, R. Bourgne and J.-P. Azra, eds (Paris, 1962), with pref.by J. Dieudonné. These eds, will be designated, respectively, as "Oeuvres," *Oeuvres* "Manuscrits," *Manuscrits*, and *Écrits et mémoires*. Since the *Oeuvres* and *Manuscrits* are simply reeditions in book form of the "Oeuvres" and of the "Manuscrits," they are not analyzed below: the contents of the other three are specified according to date in the following list.

1. Scientific texts published during his lifetime.

Apr. 1829: "Dèmonstration d'un théoréme sur les fractions continues périodiques," in Gergonne' s *Annales de mathématiques pures et appliquées*, **19** , 294–301.

Apr;1830: “Analyse d’un mémoire sur la résolution algébrique des équations,” in Férussac’s *Bulletin des sciences mathématiques*, **13** , 271–272.

June 1830: “Note sur la résolution des équation numériques,” *ibid*, 413–414.

June 1830: “Sur la théorie des nombres,” *ibid*., 428–436.

Dec. 1830: “Notes sur quelques points d’analyse,” in Gergonne’s *Annales de mathématiques pures et appliquées***21** , 182–184.

Jan. 1831: “Lettre sur l’enseignement des sciences,” in *Gazette des écoles*, no. 110 (2 Jan. 1831).

2. Postumous publications.

Sept. 1832: “Lettre à Auguste Chevalier,” in *Reuvencyclopédique***55** , 568–576.

Oct.-Nov. 1846: “Oeuvres,” considered definitive until 1906; in addition to the memoirs published in Galois’s lifetime (except for the last) and the letter to Auguste Chevalier, this ed. contains the following previously unpublished memoirs: “Mémoire sur les conditions de résolubilité des équations par radicaux,” pp. 417–433; and “Des équations primitives qui sont solubles par radicaux,” pp. 434–444.

Aug.-Sept. 1906: “Manscrits,” pt. 1, which contains, besides a description of Galois’s MSS, the text of the following previously unpublished fragments (titles given are those in *Écrits et mémoires*): “Discours préliminaire”; “Projet de publication”; “Note sur Abel”; “Préface” (partial); “Discussions sur les progrès de l’analyse pure”; “Fragments”; “Science, hiéarchie, écoles”; and “Catalogue, note sur la théorie des équations.”

Nov. 1907: “Manuscrits,” pt. 2, containing “Recherches sur la théorie des permutations et des équations algébriques”; “Comment la théorie des équations algèbriques” “Comment la théorie des équations dépend de celle des permutations”; “Note manuscrite”; “Additions au second mémoire”; “Mémoiré sur la dividions des fonctions elliptiques de premiére espèce”; “Note sur l’intégration des équtions lineéaires”; “Recherches sur les équations du second degré.”

Jan-Mar. 1948; entire text of the “Préface” and of the “Project de publication,” R. Taton, ed., in *Reuve d’ historie des sciences*, **1** 1223–128.

1956; “Lettre sur l’enseignemnt des sciences,” repr. in *A. Dalmas, Éuariste d’Galois*… …(Paris, 1956), pp. 105–108.

1962 : Écrits et mèmoires mathematiques d’Evariste Galois,

R. Bouourgne and J.P. Azra, eds (Paris, 1962). This remrkable ed. contains all of Galois’s *oeuvre:* the articles published in his lifetime and a critical ed., with corrections and variants, of all his MSS, including his rough drafts. The majority of the many previously unpublished texts presented here are grouped in two categories: the “Essais,” dating from the period when Galois was a student (pp. 403–453, 519–521) and the “Calculs et brouillons inédits” (pp. 187–361, 526–538), classed under five headings— “Intégrales eulériennes,” “Calcul intégral,” “Fonctions elliptiques,” “Groupes de substitutions,” and “Annexe.” “Galois’s de substitutions,” nine known letters are reproduced and described (pp. 459–471, 523–525). Galois’s MSS, preserved at the Bibliothéque de l’Institut de France (MS 2108), are the subject of a detailed description that provides many complementary details (App. I, 478–521; App. II., 526–538).

II. Secondary Literature. At the present time there is no major synthetic study of Galois’s life and work. The principal biographical source remains P. Dupuy, “La vie d’Evariste Galois,” in *Annales scientifiques de l’École normale supérieure*, 3rd ser., **13** (1896), 197–266 with documents and two portraits.; reiss. As *Cahiers de la quinzaine*, 5th ser., no. s 2 (Paris, 1903).

Among the few earlier articles the only ones of any documentary value are the two brief obituaries in *Revue encyclopédique*, **55** (Sept. 1832): the first (pp. 566–568), unsigned, is very general; the second (“Nécrologie,” pp. 744–754), by Auguste Chevalier, Galois’s best friend, is a source of valuable information. See also an anonymous notice, inspired by Evariste’s younger brother, Alfred Galois, and by one of his former classmates, P,-P. Flaugergues, in *Magasin pittoresque*, **16** (1848), 227–228; and a note by O. Terquem in *Nouvelles annals de mathématiques*, **8** (1849), 452.

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G. Sarton, “Evariste Galois,” in *Scientific Monthly*, **13** (Oct. 1921), 363–35, repr. in *Osiris*, **3** (1937), 241–254; and E. T. Bell, *Men of Mathematics* (New York, 1937), pp. 362–377, were directly inspired by Dupuy. L. Infeld, *Whom the Gods Love. The Story of Evariste Galois* (New York, 1948); and A. Arnoux, *Algorithme* (Paris, 1948), mix facts with romantic elements.

Galois’s scientific work has not yet received the thorough study it merits, although numerous articles attempt to bring out its main features. Among the older ones, beyond the “commentaries” of the first disciples, particularly Betti and Jordan, are the following: J. Liouville, “Avertissement” to the"Oeuvres,” in *Journal de mathématiques pures et appliquées***11** (1846), 381–384; S. Lie, “Influence de Galois sur le développement des mathématiques,” in *Le cententenaire de l’École normle* (Paris, 1895), pp. 481–489; E. Picard, “Introduction” to *Oeuvres* (Paris, 1897), pp. v-x; J. Pierpont, “Early History of Galois’s Theory of Equations,”in *Bulletin of the American Mathematical Society*, **4** (Apr. 1898), 332–340; J. Tannery, “Introduction” to “Manuscits” in *Bulletin des sciences mathématiques*, **30** (1906), 1–19, repr, in *Manuscrits*, pp. 1–19.

The most important recent studies are G. Verriest, *Evariste Galois et la théorie des équations algébriques* (Louvain-Paris, 1934; reiss. Paris, 1951); L. Kollros, *Evariste Galois* (Basel, 1949); J. Dieudonné, “Préface” (pp. v-vii), R. Bourgne, “Avertissement” (pp, ix-xvi), and J.-P. Azra, “Appendice” (pp. 475–538), in *Écrits et méemoires mathématiques* (cited above); N. Bourbaki, *Éléments d’histoire des mathématiques*, snd ed. (Paris, 1969), pp. 73–74, 104–109; and K. Wussing, *Die Gebesis des abstrakten Gruppenbrgriffes* (Berlin, 1969), esp. pp. 73–87, 206–211.

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