The editors and editions of the writings of Évariste Galois

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Abstract

Before his death in 1832, Évariste Galois had already published some valuable mathematics. The manuscripts he left behind included a memoir that had been rejected by the Académie des Sciences (Paris) in 1831 but which changed the direction of algebra after it was published by Liouville in 1846, two other major works, and a morass of minor items. There have been many editions since then, culminating in the great 1962 Édition critique by Bourgne and Azra. Although both the 1846 edition by Liouville and the 1962 edition by Bourgne and Azra have been described as ‘definitive’, there is evidence that the process of convergence to a truly definitive edition is a long one that is not yet complete—if it ever can be. That evidence is what this note addresses.

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Résumé


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Évariste Galois and his mathematical writings

Évariste Galois (1811–1832), who died on 31 May 1832, shot in a mysterious early-morning duel the previous day, was described by one of his biographers as a ‘Révolutionnaire et Géomètre’ [Dalmas, 1956]. As a republican and revolutionary he was passionate but not a great success. He was, however, a géomètre révolutionnaire, a revolutionary mathematician. After his so-called Premier Mémoire was published by Joseph Liouville in 1846 it changed the direction of algebra, transforming the theory of equations from its classical form into what is now known as Galois theory, a major branch of ‘modern’ or ‘abstract’ algebra, which is taught as an advanced option in many university undergraduate courses in pure mathematics. Famously, he spent the eve of the fatal duel organising and correcting some of his papers and writing a long letter, now known as the Lettre testamentaire, to his friend Auguste Chevalier. In it he summarised his work, announcing discoveries that go considerably beyond what he had got around to writing up. He also, in effect, appointed Chevalier as his literary executor, and it was Chevalier who published (at Galois’ express request) the testamentary letter in September 1832, who took charge of the manuscripts that Galois left behind, copied many of them, and in 1843 gave them to Joseph Liouville, who, three years later, published an edition of the ‘Oeuvres mathématiques d’Évariste Galois’ [Liouville, 1846]. Some comments on the long silent period from 1832 to 1846, ended by the sudden explosion of interest in Galois’ work that was sparked by its publication in 1846, may be found in [Neumann, 2011, Section VII.2].

This is not the place to go into detail about Galois’ mathematical work. Its huge importance is witnessed on the one hand by the fact of his name being used for the modern form, Galois theory, of the theory of equations and by the fact that it is attached to many mathematical concepts (such as Galois groups, Galois correspondences, Galois cohomology), and on the other hand by the number of editions of his work, and the number of biographical, fictional, dramatic, and other works that have been, and continue to be, written about him. The interested reader is referred to the editions [Bourgne and Azra, 1962; Neumann, 2011], and to references listed there. The following are the major items.

(1) An article, ‘Sur la théorie des nombres’, published in the issue for June 1830 of Férussac’s Bulletin des sciences mathématiques, physiques et chimiques. This contains a precursor of the theory of finite fields in relatively concrete (as opposed to ‘abstract’) form, including most of the salient facts.

(2) The ‘Mémoire sur les conditions de résolubilité des équations par radicaux’, known as the Premier Mémoire. This article had been submitted to the Académie des Sciences in Paris in January 1831. It was rejected (on the basis of a fair and rational, if unfortunately non-prescient, report) on 4 July 1831 and the manuscript returned to Galois. It introduces what is now known as ‘Galois theory’, a modern version of the theory of equations, which, however, goes far beyond equations and Galois’ own presentation of his new ideas into the theory of fields, field extensions, and their automorphism groups.

(3) The manuscript entitled ‘Des équations primitives qui sont solubles par radicaux’, known as the Second Mémoire. This is an unfinished first draft of an article that, in effect, develops the theory of groups, a theory that had been introduced in the Premier Mémoire as a tool for studying solubility of equations by radicals.
(4) The letter to Auguste Chevalier date-lined Paris, le 29 Mai 1832, known as the Lettre testamentaire. As has already been mentioned, it was first published (at Galois' express request) in September 1832 in the Revue encyclopédique. It has been re-published many times since.

Besides item (1) there were four other mathematical articles published when Galois was 17 or 18 years old; they are respectable, but not revolutionary. And besides items (2)–(4) there were a number of minor manuscripts and scraps containing jottings and odd calculations in the material collected from Galois' room after his death. The manuscripts are now held in the library of the Institut de France in Paris. There are 285 folios of various shapes and sizes, just over 160 of them by Galois, bound into a volume that includes the copies of some of them made by Chevalier, and a small amount of other material that is not in Galois' hand.

2. The editions

As has already been indicated, Galois had five articles published in his lifetime. Two appeared in Gergonne’s Annales de mathématiques pures et appliquées and three in the Bulletin des sciences mathématiques, physiques et chimiques. This latter was a component of a larger enterprise, the Bulletin universel des sciences et de l’industrie of which it formed the first section, that published a wide variety of reviews, announcements and abstracts, together with a few articles. The Bulletin universel was overseen by the Baron de Férussac, and although its various components had their own editors, such as (in 1830) Sturm and Gaultier de Claubry for the section devoted to Mathematics, Physics, Astronomy and Chemistry, it is known briefly as Férussac’s Bulletin.

The most influential posthumous edition of Galois’ works, including the important material that had not been published in his lifetime, was [Liouville, 1846], which reprinted the material from Gergonne’s Annales and Férussac’s Bulletin, reprinted the testamentary letter from the Revue encyclopédique (1832), and published the Premier Mémoire and the Second Mémoire for the first time. This has been the basis for most subsequent editions. It was reprinted with minor changes as [Picard, 1897], an edition that was described by Jules Tannery, in the preface to the 1903 reprint of [Dupuy, 1896], as ‘une édition définitive’. In 1906/1907 Jules Tannery published most of the minor manuscripts in two articles that were re-published together in book form as [Tannery, 1908]. The great 20th-century edition [Bourgne and Azra, 1962] published everything—the writings, the jottings, the scribbles, the scraps of calculations. This too has been described as a definitive edition, for example in [Rothman, 1982]. And now, since 15 June 2011, digital images of all the manuscripts have been mounted on the Web [Galois, 2011]. For the reader’s convenience I include a chronological summary of the main editions.

1829–1830: Five mathematical (and one non-mathematical) articles published in Galois’ lifetime.
1832: The Lettre testamentaire edited by Chevalier for publication in the Revue encyclopédique, September 1832.
1846: Liouville’s edition in his Journal de Mathématiques pures et appliquées (a successor to Gergonne’s Annales).
1906/1907: Jules Tannery’s edition of most of the important fragments (together with a commentary on [Picard, 1897]).
1947: The Préface that Galois intended for two memoirs on pure analysis was first published in its entirety in [Taton, 1947] (for context and significance see Section 5 below).
1956: André Dalmas included the non-mathematical (philosophical/polemical) writings in an appendix to his biography Évariste Galois, Révolutionnaire et Géomètre.
1984: Harold Edwards provided an English translation of the Premier Mémoire as an appendix to his textbook Galois Theory [Edwards, 1984].

This list is far from exhaustive. It includes only the most influential editions in French, German and English. And even in those three languages there have been many fragmentary re-publications of excerpts from Galois’ writings.

3. The editors

For the purposes of this note I propose to distinguish two broad categories of editor. Type I editors are journal or book editors, publishers. I see their rights and duties as being to get the author’s meaning across; to correct spelling, grammar, punctuation; to impose—within reasonable bounds—a journal or series or publishing-house style; to query (with living authors) matters of fact or style. In relation to the works of Galois, the editors Gergonne, Charles Sturm (for Férussac’s Bulletin), Chevalier (perhaps), Liouville and Picard would seem to me to be of this first type. Their task was to present the mathematics in as understandable a form as possible for other mathematicians to read, understand and develop. Whereas Galois rarely displayed his theorems, lemmas and the like, it was incumbent on these editors to use all the conventional apparatus of mathematical publishing, such as italicisation of statements of propositions and display of complex formulae, which help the mathematical reader follow what is, as in all mathematical exposition, very complex, concentrated and information-rich argument.

Type II editors are those who present historical manuscripts, early printed editions, and the like. Their rights and duties must be to be faithful to the original and to provide commentary as necessary. I place Tannery, Bourgne and Azra, and myself into this category—perhaps also Chevalier (see Section 5). Where type I editors are working as mathematicians, type II editors are working as historians.

This definition of type II editors raises some questions, however. What should ‘faithful to the original’ mean? How far should it go? Where may it stop, or where must it stop?

Here is what Jules Tannery said about his work and his ambitions. In relation to the printed edition [Picard, 1897] he wrote [Tannery, 1906, p. 229], ‘J’ai collationné le manuscrit avec le texte imprimé’ [I have collated the manuscript with the printed text], and [Tannery, 1906, p. 207; 1908, p. 2]:

214
Peter M. Neumann
L’importance de l’œuvre de Galois sera mon excuse pour la minutie de certains détails, où j’ai cru devoir entrer, et qui va jusqu’au relevé de fautes d’impression, dont le lecteur attentif ne peut manquer de s’apercevoir. Je ne me dissimule pas ce que cette minutie, en elle-même, a de puéril.

[The importance of Galois’ work will be my excuse for the extreme care over certain details that I have entered into, extending as far as the listing of printing errors which the attentive reader could not fail to notice for himself. I am well aware that, in itself, this extreme care has a trifling element.]

Referring to the manuscripts that had never been previously published he wrote [Tannery, 1907, p. 279; 1908, p. 37],

Quant aux fragments qui suivent, j’ai cru devoir les reproduire tels quels, avec une exactitude minutieuse, en conservant l’orthographe, la ponctuation ou l’absence de ponctuation, sans les quelques corrections qui se présentent naturellement à l’esprit. Cette minutie m’était imposée pour les quelques passages où la pensée de Galois n’était pas claire pour moi; sur cette pensée, les fragments informes que je publie jetteront peut-être quelque lueur. Je me suis efforcé de donner au lecteur une photographie sans retouche.

[As for the fragments which follow, I believed I should reproduce them as they are, with minute exactitude, preserving the spelling, the punctuation or the absence of punctuation, without the few corrections that naturally occur to one’s mind. This great care was imposed upon me for the few passages where the thinking of Galois was not clear to me; the imperfect fragments which I am publishing will perhaps throw a glimmer of light on this thinking. I have made great efforts to give the reader an un-retouched photograph.]

In his preface [Bourgne and Azra, 1962, p. xv], echoing and extending Tannery’s words, Robert Bourgne wrote,

Ce livre rassemble tout ce que nous avons conservé d’Evariste Galois, ...

On l’a fait pour qu’il livre au mathématicien un texte exact et complet, pour qu’il offre à l’historien de quoi préciser un grand moment de la pensée mathématique. Il ne s’agissait que de lire scrupuleusement les manuscrits et, s’ils manquent, de revenir à la publication originale. Point de retouche. Nous livrons la copie exacte. Nous avons respecté la ponctuation de Galois et maintenu les distractions du manuscrit ou les fautes du texte original. Si la correction s’impose, on la signale en note.

Nous avons déchiffré toutes les ratures.

[This book gathers together everything by Evariste Galois that is preserved for us, ... It has been prepared in order to deliver to the mathematician a correct and complete text, in order to offer to the historian something to define a great moment in mathematical thought. There was nothing to be done but to read the manuscripts scrupulously and, where they are missing, to return to the original publication. Absolutely no retouching. We deliver an exact copy. We have respected Galois’ punctuation and retained the slips in the manuscript or the original text. Where correction is required it is indicated in a note. We have deciphered all the crossings-out.]

In those passages both Jules Tannery and Robert Bourgne describe, and claim for themselves, high ambitions. They seem to me to be entirely appropriate as ambitions for a type II editor. But how realistic are they? Manuscript and print are different media.

Galois rarely wrote the word ‘même’ like that, with a recognisable circumflex accent, for example. Usually he either missed the accent, or wrote what looks very like ‘mème’. But was
that really a grave accent? Or is it a hastily written circumflex? Can we always distinguish misspelling from malformation of characters? Punctuation offers similar difficulties. Galois often spaced his commas a long way beyond the preceding word. If something like this comes almost immediately preceding another word, is it really a comma? Is it perhaps an inadvertent mark? What does even the most punctilious of editors do where Galois has squeezed something into the end of a line where there is too little space for the punctuation that Galois might have used but might equally have forgotten? The answer ought to be that the matter, trivial though it is, becomes the subject of a note. But in fact editors have very rarely gone so far.

As a matter of fact, I have discovered well over 500 discrepancies between the manuscripts and [Bourgne and Azra, 1962]. Almost all of them are trivial matters of punctuation or spelling (accents mostly, though there are other spelling corrections—in the printed edition, for example, Galois’ usages ‘symmetric’ and ‘symmétrique’ are systematically corrected to ‘symétrique’, which he also used, though rarely). Apart from the fact that they represent the undermining of a claim to scrupulousness, perhaps even the breaking of a promise, these are completely unimportant. They do not affect our understanding of the mathematics, nor do they affect our appreciation of how Galois thought. There are some, however, that are more interesting in that they give us evidence of inter-dependency between the various editions.

4. Some comparisons with the manuscripts and between editions

Picard’s 1897 edition is a pretty faithful reprint of [Liouville, 1846]. It is not an exact copy. Typography and layout differ a little. But punctuation and spelling are essentially the same. The only significant differences (as far as I have been able to ascertain) are that the clause

\[
\text{en général par quantité rationnelle, une quantité qui s’exprime en fonction rationnelle des coefficients de la proposée}
\]

has been omitted from the end of the fifth paragraph of the text of the Premier Mémoire (see [Tannery, 1906, p. 232]), and the phrase ‘écrite dans un ordre inverse’ has been added to the end of the first paragraph of the proof of the theorem in the first of the published articles by Galois, the ‘Démonstration d’un théorème sur les fractions continues périodiques’ [Gergonne’s Annales (1829)]. These words echo a phrase at the end of the statement of the theorem, but they occur neither in the original article nor (contrary to what is indicated in [Bourgne and Azra, 1962, p. 368]) in Liouville’s edition.

The difficulty of ensuring that details are correct is illustrated by the matter of the spelling and the placement of the exclamation ‘Oh! Cherubins’, which appears on what is now the inside front cover of the manuscript of the Premier Mémoire. Jules Tannery [1906, p. 231] gets the placement right. Robert Bourgne places it ‘sous les noms de Lacroix et Poisson, rapporteurs’ [under the names of the referees Lacroix and Poisson], and therefore on the outside front cover [Bourgne and Azra, 1962, pp. x, 482]. When Alain Connes recently wrote (see http://www.alainconnes.org/docs/galoistext.pdf),

\[
\text{Galois écrit simplement ‘Oh, chérubins’ sous les arguments des referees}
\]

presumably this was his source (though only the referees’ names appear in the manuscripts, not their arguments—which were printed in the Minutes of the Academy). Those names, however, appear on folio 1 recto, which is the first side of the cover sheet of the manuscript.
of the Premier Mémoire, whereas the exclamations ‘ou bien’ and ‘Oh! Cherubins’ are written on the verso of this page. Then there is the matter of detail of spelling and capitalisation. Tannery reports ‘Oh! chérubins’, Bourgne and Azra have ‘Oh! Chérubins’, Galois wrote ‘Oh! Cherubins’. Do such trivial discrepancies matter? Of course not. Except that they undermine an editor’s claim to offer an exact copy.

A similar infelicity occurs with reference to one of Galois’ interesting cadences. The one-sentence paragraph

Ces principes posés, nous allons passer à l’exposition de notre théorie.

originally occurred at the bottom of folio 3 recto after the original brief and exiguous explanation of Lemma IV of the Premier Mémoire. Galois deleted it in his manuscript to make way for the late addition of a proof of the lemma. Chevalier, Liouville, Picard, Tannery respect the deletion and ignore it. Curiously, however, in [Bourgne and Azra, 1962, p. 51] it is reinstated without any indication that it had been deleted by Galois.

One of the most interesting discrepancies in the various editions concerns a date. Poisson, as Academy referee of the Premier Mémoire, pencilled a now very famous note to Lemma III in the margin of the page:

La démonstration de ce lemme n’est pas suffisante; mais il est vrai d’après le No. 100 du mémoire de Lagrange, Berlin, 1771.

In [Bourgne and Azra, 1962, p. 48] the date is misprinted as 1775. When I first saw this I took it to be a simple misprint; after all, the relevant memoir by Lagrange is very well known to be dated 1770/71; moreover (though I did not spot this until many years later) the relevant manuscript page is reproduced as the sixth frontispiece to [Bourgne and Azra, 1962], and in that facsimile the date 1771 is clear. The note by Poisson is not reproduced in [Liouville, 1846] or [Picard, 1897]. Tannery, however, records it in [Tannery, 1906, p. 232] with the date given as 1775. Did Tannery originate the misprint? No! Chevalier made a copy of the Premier Mémoire and included Poisson’s annotation as a footnote. It turns out that he mis-copied 1771 as 1775. His digit 5 is a narrow, sinuous symbol. It could just possibly be 1, but it seems very much more likely that it is 5, and certainly it was read as 5 by Liouville’s printer, who was working from Chevalier’s copy. The note, later to be suppressed, appears in the extant proof-sheets of an aborted 1843 publication of the Premier Mémoire by Liouville. What this seems to indicate is that, contrary to his claim, Tannery based his check of the Picard edition of the Premier Mémoire as much on Chevalier’s copy or Liouville’s original proof-sheets as on the genuine Galois manuscript. And that Robert Bourgne either did the same or, more probably, relied on [Tannery, 1906, 1908].

There was another misprint in [Bourgne and Azra, 1962] which jumped out of the page when I first acquired a copy in 1971. On p. 145 the displayed equation

\[(rk + s)k - m(ak + n) = 0\]

(from the transcription of folio 41 recto of the manuscript of the Second Mémoire) makes no sense. It has got to read

\[(rk + s)k - (ak + n) = 0,\]

which both makes sense and fits into the context of the surrounding argument. I discovered recently that this misprint occurs in [Picard, 1897] and in [Liouville, 1846], but does not occur in the original manuscript (see Figure 1), nor in Chevalier’s manuscript copy. Thus it was Liouville’s printer who originated this misprint, and although Liouville seems to have
been an excellent editor and a careful proof-reader, it slipped past him. Maser reproduced it in his 1889 German edition; Picard reproduced it in 1897; Tannery failed to pick it up in 1906; Bourgne reproduced it in 1962. What does this tell us? First, that misprints are devilish things to get rid of. Once a misprint creeps in, it all too easily stays in. Secondly, however, even careful editors like Tannery and Bourgne may be influenced in their reading of manuscripts by having studied earlier editions.

There are a number of other items of evidence that, despite his protestations, Robert Bourgne was influenced by earlier editions. Here are a few.

- The word ‘irrationalité’, to be found in the *Lettre testamentaire* (ms. folio 10 verso and [Chevalier, 1832, p. 575]), is mis-spelled as ‘irrationnalité’ in [Liouville, 1846, p. 414; Picard, 1897, p. 31; Bourgne and Azra, 1962, p. 185].
- The word ‘étant’ (*Premier Mémoire*, folio 2 recto) is corrected to ‘ayant été’ in [Liouville, 1846, p. 417; Picard, 1897, p. 33; Bourgne and Azra, 1962, p. 43].
- The words ‘de lettres’ just before Proposition II in the *Premier Mémoire*, folio 4 recto, are missing from Chevalier’s manuscript copy and are missing from all print editions.
- Folio 82 recto of the manuscripts contains a collection of notes and ‘bullet points’ that Galois might perhaps have intended as memoranda for an exposition of his theory of groups of permutations and of substitutions. It begins with the line

\[
\text{Permutations. Nombre des lettres } m.
\]

In [Tannery, 1907, p. 280] this is rendered as

\[
\text{Permutations. Nombres de lettres } m.
\]
Precisely the same misprint is to be found in [Bourgne and Azra, 1962, p. 73].

- The word ‘ainsi’ is missing from the phrase (folio 88 verso)

Vous obtiendrez ainsi un groupe réductible

as transcribed in [Tannery, 1907, p. 289] and also in [Bourgne and Azra, 1962, p. 107].

- Both [Tannery, 1907, p. 295] and [Bourgne and Azra, 1962, p. 151] have

Ainsi, le théorème que j’avais énoncé dans mon mémoire

whereas

Ainsi, le théorème que j’avais avancé dans mon mémoire

is clear in the manuscript (folio 95 verso).

These seem to me to provide clear evidence of dependency—and evidence (if evidence is needed) that proof-reading in one’s native language, where one all too easily reads what one knows ought to be there, rather than what actually is there, is an unreliable affair.

5. Editorial decisions

Whether Auguste Chevalier should be counted as an editor is a moot point. He copied five or six of the Galois manuscripts. His copies of the Premier Mémoire, the Second Mémoire, the Discours Préliminaire, the Préface, and the Discussions sur les progrès de l’analyse pure still exist. Perhaps he also made a copy of the Lettre testamentaire that was used by the editor and printer of the Revue encyclopédique in September 1832. Certainly the extant manuscript of the letter is the original and bears no signs of having been used as printer’s copy. It is therefore a reasonable conjecture that Chevalier made a copy which was used for the publication and was not returned.

He comes as an important intermediary between Galois and the more conventional editors. As such he has some of the characteristics of both my types of editor. His intention seems to have been to get Galois’ ideas understood, but also to ensure that the historical record was robust. Although there are a few discrepancies, there are very few. His copies are models of accurate transcription—the work of a true friend and disciple.

He was the first to make choices, however. The Lettre testamentaire, the Premier Mémoire, and the Second Mémoire were obviously important. But what made him choose the other three items for copying? They are very different. They contain no mathematics, they contain rambling philosophical polemic. They highlight the fact that if Galois created anything of mathematical value in the last two years of his life, he did not write it down coherently. It existed only in his head—as the last few paragraphs of the testamentary letter attest. Turning this question around, why did Chevalier prefer these three items to some of the remaining mathematics such as the Addition au mémoire sur la résolution des Équations or the untitled manuscript on the division of elliptic functions? Readers of Galois’ writings will make many plausible guesses of their own as to the reasons, but they must remain as guesses.

In the case of Jules Tannery, however, we have his own explanations of some of the choices he made. He published only just under half of the Préface and explained why [Tannery, 1906, p. 242; 1908, p. 17]:

Après l’avoir lue et relue, je me suis décidé à n’en publier qu’un extrait, la fin, un peu moins de la moitié; c’est que je suis arrivé à cette conviction qu’en écrivant les premières
pages, Galois n’était pas en possession de lui-même: le malheureux enfant était en prison, il avait la fièvre, ou il était encore sous l’influence des boissons que ses compagnons de captivité le forçaient parfois d’avaler. Dans ces pages, sans intérêt scientifique, la continuelle ironie fatigue par sa tristesse; les injures à Poisson, aux examinateurs de l’École polytechnique, à tout l’Institut sont directes et atroces; certaines allusions sont obscures et veulent être perfides; les plaisanteries, assez lourdes, se prolongent d’une façon fastidieuse et maladive; il y a tel passage où l’écriture est si désordonnée, si surchargée, que Chevalier lui-même n’a pu, à ce qu’il semble, le lire complètement; telles notes qu’il n’a pas voulu reproduire dans sa copie. [...] Vers le milieu de la préface, la pensée se calme; c’est de mathématiques qu’il s’agit; la sérénité revient.

[After having read and re-read it I have decided to publish only an extract from it, its end, a little less than half of it. I have come to believe that when he wrote the first pages Galois was not in full possession of himself: the unhappy child was in prison, he had a fever, or he was still under the influence of the drink which his companions in captivity forced him to take sometimes. In these pages, of no scientific interest, the continual irony wears one down by its sadness; the insults to Poisson, to the examiners at the École Polytechnique, to all the Institute are direct and dreadful; certain allusions are obscure and may well be deceitful; the somewhat heavy pleasantries are extended in a tedious and sickly way. There is a passage in which the writing is so disordered, so overwritten, that Chevalier himself was unable, or so it seems, to read it fully; there are some notes that he did not wish to reproduce in his copy. [...] Towards the middle of the preface thoughts calm; it is the mathematics that matters; serenity returns.]

Later editors had no such qualms and the piece was published in its entirety first by René Taton in [Taton, 1947], then a few years later in [Dalmas, 1956] (where essentially all the non-mathematical writings by Galois are included as an appendix), and of course in [Bourgne and Azra, 1962; Neumann, 2011].

As for me, limitations of space and time constrained me to restrict my edition [Neumann, 2011] by excluding the items that represent school exercises by Galois. They are interesting, but, given that something had to go, they seemed less interesting than the original work.

6. Conclusions

Although some deficiencies in the various presentations of the work of Galois over the last 160 years have been brought to light by my researches, they must not be taken very seriously. The fact remains that every one of the original editors, Auguste Chevalier, Joseph Liouville (followed by Émile Picard), Jules Tannery, and Robert Bourgne (with Jean-Pierre Azra) did a wonderful job. Chevalier and Liouville gave Galois theory to mathematics and mathematicians. Tannery and Bourgne presented the writings of Galois to mathematicians and historians of mathematics in great detail. The flaws in their work really do not matter much. All they prove is that it is dangerous to claim that one has delivered a perfect copy, an un-retouched photograph. Perhaps they prove more—that no edition can ever substitute for the original. Ideally an edition supplements the original, making it readable and comprehensible. Now that digital images of the manuscripts have been published on the Web [see Galois, 2011], readers have the facility to check every detail of the editions.

I can hope, but cannot believe, that my edition [Neumann, 2011] is error-free. I can hope, and can also believe, that it should contain fewer infelicities than earlier editions. That is the way with these things. Each edition builds on its predecessors. Convergence towards some limit is all we can expect.
Acknowledgments

Much of this article is auto-plagiarised from [Neumann, 2011]. What comes from there appears, however, in notes dotted around all over that book, and the opportunity to turn it (via a lecture) into a more coherent form was welcome. I am most grateful to Dr Benjamin Wardhaugh for providing the opportunity, the inspiration, and the encouragement that were necessary. I owe to him and to a benevolent anonymous referee warm thanks for helpful comments on a previous draft of this article.

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