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# GENIUS AND BIOGRAPHERS: THE FICTIONALIZATION OF EVARISTE GALOIS

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## I. Introduction

In Paris, on the obscure morning of May 30, 1832, near a pond not far from the pension Sieur Faultrier, Evariste Galois confronted Pescheux d'Herbenville in a duel to be fought with pistols, and was shot through the stomach. Hours later, lying wounded and alone, Galois was found by a passing peasant. He was taken to the Hospital Cochin where he died the following day in the arms of his brother Alfred, after having refused the services of a priest. Had Galois lived another five months, until October 25, he would have attained the age of twenty-one.

The legend of Evariste Galois, creator of group theory, has fired the imagination of generations of mathematics students. Many of us have experienced the excitement of Freeman Dyson who writes:

In those days, my head was full of the romantic prose of E. T. Bell's *Men of Mathematics*, a collection of biographies of the great mathematicians. This is a splendid book for a young boy to read (unfortunately, there is not much in it to inspire a girl, with Sonya Kovalevsky allotted only half a chapter), and it has awakened many people of my generation to the beauties of mathematics. The most memorable chapter is called "Genius and Stupidity" and describes the life and death of the French mathematician Galois, who was killed in a duel at the age of twenty.<sup>1</sup>

Dyson goes on to quote Bell's famous description of Galois's last night before the duel:

All night long he had spent the fleeting hours feverishly dashing off his scientific last will and testament, writing against time to glean a few of the great things in his teeming mind before the death which he saw could overtake him. Time after time he broke off to scribble in the margin "I have not time; I have not time," and passed on to the next frantically scrawled outline. What he wrote in those last desperate hours before the dawn will keep generations of mathematicians busy for hundreds of years. He had found, once and for all, the true solution of a riddle which had tormented mathematicians for centuries: under what conditions can an equation be solved?<sup>2</sup>

This extract is likely the very paragraph which has given the greatest impetus to the Galois legend. As with all legends the truth has become one of many threads in the embroidery. E. T. Bell has embroidered more than most, but he is not alone. James R. Newman, writing in *The World of Mathematics*, notes: "The term *group* was first used in a technical sense by the French mathematician Evariste Galois in 1830. He wrote his brilliant paper on the subject at the age of twenty, the night before he was killed in a stupid duel."<sup>3</sup> From a description in the famed Bullitt archives of mathematics issued by the University of Louisville library, we learn: "Goaded by a 'mignonne' and two of her slattern confederates into a 'duel of honor,' Galois was shot and killed at the age of 20."<sup>4</sup> Leopold Infeld, in his biography of Galois,<sup>5</sup> invokes a conspiracy theory to explain Galois's death: Galois was considered one of the most dangerous republicans in Paris; the government wanted to get rid of him; a female agent provocateur set him up for the duel with d'Herbenville; et cetera. Fred Hoyle, in his *Ten Faces of the Universe*,<sup>6</sup> attempts a partial inversion of the argument: Galois's ability to carry on complex calculations entirely in his head made him appear distant to others; personal animosities arose with his republican friends; they began to think he was not fully for the cause; Galois in their eyes was the agent provocateur; et cetera. All three authors, Bell, Hoyle, and Infeld, invoke a political cause for the duel, with a mysterious coquette just off center.

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This article is an attempt to sift some of the facts of Galois's life from the embroidery. It will not be an entirely complete account and will assume the reader is familiar with the story, presumably through Bell's version. Because these authors have emphasized the end of Galois's life, I will do so here. As will become apparent, many of the statements just cited are at worst nonsensical, and at best have no basis in the known facts.

Although a number of the documents presented here are, I believe, translated into English for the first time, it should be emphasized that they are not new, just ignored. There is more known about Galois than recent authors admit. It is my hope that some ambitious historian will find the requisite letter in an attic trunk or a newspaper clipping in the Paris archives to unravel the remaining mysteries.

## II. Sources

It is not difficult to trace the story of Galois's brief life through its increasingly embellished incarnations. The primary source of information, containing eyewitness accounts and many relevant documents, is the original study of Paul Dupuy, which appeared in 1896.<sup>7</sup> Dupuy was a historian and the Surveillant Général of the Ecole Normale. Bell, Hoyle, and Infeld all cite it as an important reference but never once explicitly quote it. Indeed, Bell acknowledges<sup>8</sup> that his account is based on Dupuy and the documents in Tannery<sup>9</sup> (see below), but it remains unclear how much Bell has read of Dupuy; for while numerous passages are lifted bodily from Dupuy, other important information in the latter is strangely absent. Dupuy's study itself is lacking a number of important letters and documents. Whether Dupuy was unaware of their existence or chose not to publish them I do not know. He also makes a number of minor errors in chronology. In any case, the first lesson is already learned: those who use Dupuy as their sole source of information must make mistakes. Nevertheless, this original biography is much more complete and accurate than the subsequent dilutions and contains more information than a reading of Bell, Hoyle, or Infeld would even suggest. A translation of Dupuy into English should be undertaken.

Some of the documents not found in Dupuy are contained in Tannery's 1908 edition of Galois's papers.<sup>9</sup> All are contained in the definitive 1962 edition of Bourgne and Azra.<sup>10</sup> This volume contains every scrap of paper known to have been written by Galois, an accurate chronology, facsimiles of some of his original manuscripts, and a number of relevant letters by others. When quoting Galois, I have worked exclusively from this edition.

The memoirs of Alexandre Dumas<sup>11</sup> contain a pertinent chapter, and the *Lettres sur les Prisons du Paris* by François Vincent Raspail<sup>12</sup> are the primary source on Galois's months in prison. Some of these letters are quoted by Dupuy and Infeld. Other references will be cited as they appear.

## III. Early Life and Louis-le-Grand

I will not dwell at length on the first sixteen years of Galois's life, for they are reported with fair accuracy by Bell. This is not surprising; his account approaches that of a somewhat abridged translation of Dupuy. The divergences will set in later. Thus this section and the next may be taken as a rather condensed review and criticism of Bell. Infeld and Hoyle, who concentrate most of their energies on the duel, will be dealt with at the appropriate time.

Evariste Galois was born on October 25, 1811, not far from Paris in the town of Bourg-la-Reine, France. His father was Nicholas-Gabriel Galois, who was then thirty-six years of age, and his mother was Adelaide-Marie Demante. Both parents were highly intelligent and well educated in the subjects considered important at the time: philosophy, classical literature, and religion. Bell points out that there is no record of any mathematical talent on either side of the family. A more neutral statement should perhaps be made: no record exists in favor of or against any such talent. M. Galois did possess the talent for composing rhymed couplets with which he would amuse neighbors. This harmless activity, as Bell notes, would later cause his undoing. Evariste seems to have inherited some of this ability, participating in the fun at house parties. For the first twelve years of his life, Evariste's mother served as his sole teacher, giving him a solid background in Greek and Latin, as well as passing on her own skepticism toward religion.

In 1815, during The One Hundred Days, M. Galois was elected mayor of Bourg-la-Reine. He had been a supporter of Napoleon and, in fact, had been elected chief of the town's liberal party during Napoleon's first exile. After Waterloo, he had planned to relinquish his post to his predecessor, but the latter had left the country. Galois demanded to be either confirmed or replaced, and in the confusion managed to keep his office. He served the new King faithfully, but from this point on he met increasing resistance from the conservative elements of his town. It is probably safe to say that the younger Galois inherited his liberal ideas from his parents.

On October 6, 1823, Evariste was enrolled in the Lycée of Louis-le-Grand, a famous preparatory school (which still exists) in Paris. Both Robespierre and Victor Hugo had studied there. Louis-le-Grand is where Evariste's troubles began, where Infeld's account of his life essentially opens, and where Bell introduces his theme of "Genius and Stupidity," taking on the tone of a blanket condemnation of almost everyone and everything that surrounded Galois. "Galois was no 'ineffectual angel,'" Bell writes in his introduction, "but even his magnificent powers were shattered before the massed stupidity aligned against him, and he beat out his life fighting one unconquerable fool after another."<sup>13</sup> I believe we will see that the problems ran much deeper than that.

Bell's first liberties with Dupuy are minor. Bell describes Louis-le-Grand as a "dismal horror" and goes on to say "the place looked like a prison and was."<sup>14</sup> Admittedly, Dupuy writes that Louis-le-Grand happened to look like a jail because of its grills, but he then goes on to describe the underlying "passions of work, academic triumph, passions of liberal ideas, passions of memories of the Revolution and the Empire, contempt and hate for the legitimist reaction."<sup>15</sup> Bell, by cutting Dupuy's sentence in half, has begun the slant toward the negative.

At this particular time, there were problems. During Galois's first term, the students, who suspected the new provisor of planning to return the conservative Jesuits to the school, protested by staging a minor rebellion. When required to sing at a chapel service they refused. When required to recite in class, they refused. When required to toast King Louis XVIII at an official school banquet, they refused. The provisor summarily expelled the forty students whom he suspected of leading the insurrection. Galois was not among those expelled, nor is it known if he was even among the rebels, but we may guess that the arbitrariness of the provisor and the general severity of the school's regime made a deep impression on him.

Nevertheless, Galois's first two years at Louis-le-Grand were marked by a number of successes. He received a prize in the General Concourse and three mentions. At this point we witness the first of Bell's distortions of chronology to give the impression that Galois was misunderstood and persecuted. Galois was asked to repeat his third year because of his poor work in rhetoric. Bell writes, "His mathematical genius was already stirring," and "He was forced to lick up the stale leavings which his genius had rejected."<sup>16</sup> I cannot say for certain whether Galois's mathematical genius was already stirring, but it is known that Galois did not enroll in his first mathematics course until *after* he had been demoted.

During this first mathematics course, which he began in February 1827, Galois discovered Legendre's text on geometry, soon followed by Lagrange's original memoirs: *Resolution of Numerical Equations*,\* *Theory of Analytic Functions*, and *Lessons on the Calculus of Functions*. Doubtlessly, Galois received his initial ideas on the theory of equations from Lagrange. I do not understand why Bell claims Galois's classwork was mediocre; his instructor, M. Vernier, constantly writes such accolades as "zeal and success," "zeal and progress very marked."<sup>17</sup>

With his discovery of mathematics, Galois became absorbed and neglected his other courses. Before enrolling in M. Vernier's class, typical comments about him had been:<sup>18</sup>

Religious Duties—Good	Work—Sustained
Conduct—Good	Progress—Marked
Disposition—Happy	Character—Good, but singular

\*Here and elsewhere, read "algebraic equations" for "numerical equations."

After a trimester in M. Vernier's class, the comments were:

Religious Duties—Good	Work—Inconstant
Conduct—Passable	Progress—Not very satisfactory
Disposition—Happy	Character—Closed and original

The words "singular," "bizarre," "original," and "closed" would appear more and more frequently during the course of Galois's career at Louis-le-Grand. His own family began to think him strange. His rhetoric teachers would term him "dissipated." Bell discusses these remarks at some length. His use of the indefinite pronoun "they" gives the impression that the entire faculty was aligned against Galois. A perusal of Dupuy's appendix, however, shows the negative remarks were penned, by and large, by Galois's two rhetoric teachers. Until this point in his life, I believe it fair to say that Galois was somewhat misunderstood by his teachers in the humanities, but not that he was persecuted.

Slightly more serious problems were soon to arise. His mathematics teacher, M. Vernier, constantly implored Galois to work more systematically. His remark on one of Galois's trimester reports makes this clear: "Intelligence, marked progress, but not enough method,"<sup>19</sup> Galois did not take the advice; he took the entrance examination to l'Ecole Polytechnique a year early, without the usual special course in mathematics, and failed. Apparently he did not know some basics. To Galois, his failure was a complete denial of justice. This and subsequent rejections embittered him for life. When we examine some of his later writings, I think it will be evident that he developed not a little paranoia.

Galois did not yet give up. The same year, 1828, saw him enroll in the course of Louis-Paul-Emile Richard, a distinguished instructor of mathematics. Richard encouraged Galois immensely, even proclaimed that he should be admitted to the Polytechnique without examination. The results of such encouragement were spectacular. In April of 1829, Galois published his first small paper, "Proof of a Theorem on Periodic Continued Fractions." It appeared in the *Annales de Gergonne*.

This paper was a minor aside. Galois had also been working on the theory of equations ("Galois theory"). On May 25 and June 1, 1829, while still only 17, he submitted to the Academy his first researches on the solubility of equations of prime degree. Cauchy was appointed referee.

We now encounter a major myth which evidently has its origins in the very first writings on Galois and which has been perpetuated by virtually all writers since. This myth is the assertion that Cauchy either forgot or lost the papers (Dupuy, Bell<sup>20</sup>) or intentionally threw them out (Infeld<sup>21</sup>). Recently, however, René Taton has discovered a letter of Cauchy in the Academy archives which conclusively proves that he did not lose Galois's memoirs but had planned to present them to the Academy in January 1830.<sup>22</sup> There is even some evidence that Cauchy encouraged Galois. The letter and related events will be discussed in more detail later; for now we note only that to hold Cauchy responsible for "one of the major disasters in the history of mathematics," to paraphrase Bell,<sup>23</sup> is simply incorrect, and to add neglect by the Academy to the list of Galois's difficulties during this period appears entirely unwarranted.

A truly tragic blow came within a month of the submissions: on the second of July, 1829, Galois's father committed suicide. The reactionary priest of Bourg-la-Reine had signed Mayor Galois's name to a number of maliciously forged epigrams directed at Galois's own relatives. A scandal erupted. M. Galois's good nature could not withstand such an attack and he asphyxiated himself in his Paris apartment "not two steps from Louis-le-Grand." During the funeral, when the same clergyman attempted to participate, a small riot erupted. The loss of his father may explain much of Galois's future behavior. We must wait a few years, until Evariste's second prison term, to see this. In any case, he loved his father dearly, and if an iron link had not already been forged between the Bourbon government and the Jesuits, it had now.\*

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\*Probably the clearest picture of the relationship between the Jesuits and the Bourbons, one which contains episodes paralleling that of M. Galois's misfortunes, is Stendhal's famous novel *The Red and The Black*.

But Galois's troubles were not yet over. A few days later, he failed his examination to l'Ecole Polytechnique for the second and final time. Legend has it that Galois, who worked almost entirely in his head and who was poor at presenting his ideas verbally, became so enraged at the stupidity of the examiner that he hurled an eraser at him. Bell records this as a fact,<sup>24</sup> although Dupuy specifically states that it is only an unverified tradition.<sup>25</sup> The examination failures, as well as the misunderstanding of his humanities teachers, left him irrevocably embittered. Bell quotes him as writing, "Genius is condemned by a malicious social organization to an eternal denial of justice in favor of fawning mediocrity."<sup>26</sup> I believe Bell constructed this quotation from a passage of Dupuy<sup>27</sup> but Galois did express similar sentiments in his fragmentary essay "Sciences Hiérarchie: Ecoles" and in "Sur l'Enseignement des Sciences" ("Hierarchy is a means for the inferior."<sup>28</sup>). In Bell's diatribe against this famous examination, as well as in other accounts of it, the suggestion that the death of Galois's father several days before may have had something to do with the outcome never arises. It is a simple matter for Bell to lay the fault squarely with the examiner's stupidity because Bell has placed the examination before M. Galois's unfortunate suicide. In this case, Bell is not fully to blame; Dupuy does not date the examination.<sup>29</sup> I do not wish to suggest Galois should have been failed. I only wish to point out that the examination must have been held under the worst possible conditions.

Thus, Galois's secondary school career ended in a string of minor setbacks and two major disasters. Evariste had not planned to take the Baccalaureate examinations, because the Ecole Polytechnique did not require them. Now, having failed the Polytechnique's entrance examination and having decided to enter the less prestigious Ecole Normale,\* he was forced to reconsider. "Still persecuted and maliciously misunderstood by his preceptors," in Bell's words, "Galois prepared himself for the final examinations."<sup>30</sup> Despite such malice, Galois did very well in mathematics and physics, although less well in literature. He received both a Bachelor of Letters and a Bachelor of Science on the twenty-ninth of December, 1829.

It is interesting to note that, although he has continued to play the role of muckraker of malice, Bell has failed to mention M. Richard's distinct cooling toward Galois, on whom he had previously bestowed encomia. After the first trimester of the 1828–1829 academic year, Richard wrote: "This student is markedly superior to all his classmates." After the second: "This student works only in the highest realms of Mathematics." After the third: "Conduct good, work satisfactory."

Because I do not have an accurate date for this report, I cannot propose a specific event as the cause of this obvious change in attitude. Presumably, it occurred in the spring of 1829, shortly before or after Galois's time of troubles began. One could, of course, argue that M. Richard had simply become bored with Galois. Otherwise, it does serve to show that Bell's black-and-white presentation of Galois's preceptors is an oversimplification.

#### IV. L'Ecole Normale

The early months of 1830, which saw Galois officially enrolled as a student at l'Ecole Normale, also witnessed an interesting series of transactions with the Academy. As will be recalled, Galois submitted his first researches to the Academy on May 25 and June 1 of 1829. On January 18, 1830, Cauchy wrote the previously mentioned letter discovered by Taton:<sup>31</sup>

I was supposed to present today to the Academy first a report on the work of the young Galois, and second a memoir on the analytic determination of primitive roots in which I show how one can reduce this determination to the solution of numerical equations of which all roots are positive integers. Am indisposed at home. I regret not to be able to attend today's session, and I would like you to schedule me for the following session for the two indicated subjects.

Please accept my homage . . .

A.-L. Cauchy

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\*During the restoration, l'Ecole Normale was actually called l'Ecole Préparatoire.

This letter makes it clear that, six months after their receipt, Cauchy was still in possession of Galois's manuscripts, had read them, and very likely was aware of their importance. At the following session on 25 January, however, Cauchy, while presenting his own memoir mentioned above, did not present Galois's work. Taton hypothesizes that between January 18 and January 25, Cauchy persuaded Galois to combine his researches into a single memoir to be submitted for the Grand Prize in Mathematics, for which the deadline was March 1. Whether or not Cauchy actually made the suggestion cannot yet be proved, but in February Galois did submit such an entry to Fourier in his capacity as perpetual secretary of mathematics and physics for the Academy. In any case, there is an additional piece of evidence which attests to Cauchy's appreciation of Galois's work. This is an article which appeared the following year on 15 June 1831 in the Saint-Simonian journal *Le Globe*. The occasion was an appeal for Galois's acquittal after his arrest following the celebrated banquet at the *Vendanges des Bourgogne*:

Last year before March 1, M. Galois gave to the secretary of the Institute a memoir on the solution of numerical equations. This memoir should have been entered in the competition for the Grand Prize in Mathematics. It deserved the prize, for it could resolve some difficulties that Lagrange had failed to do. *M. Cauchy had conferred the highest praise on the author about this subject. And what happened?* The memoir is lost and the prize is given without the participation of the young *savant*. [Taton's italics.]<sup>32\*</sup>

The misfortune referred to above was the death of Fourier in April. Galois's entry could not be found among Fourier's papers. In Galois's eyes this could not be an accident. "The loss of my memoir is a very simple matter," he wrote. "It was with M. Fourier, who was supposed to have read it and, at the death of this *savant*, the memoir was lost."<sup>33</sup> It was an unfortunate coincidence; however it was not Fourier's sole responsibility to read the manuscript, for the committee appointed to judge the Grand Prize consisted also of Lacroix, Poisson, Legendre, and Poinot.<sup>34</sup> I mention this because a number of sources give the impression that somehow Fourier either intentionally lost the paper or could not understand it.<sup>35</sup>

In spite of the setback caused by the loss of his manuscript, April saw the publication of Galois's paper "An analysis of a Memoir on the Algebraic Resolution of Equations" in the *Bulletin de Ferussac*. In June he published "Notes on the Resolution of Numerical Equations" and the important article "On the Theory of Numbers."<sup>36</sup>

In addition to propagating the legend that Cauchy lost the manuscripts, Bell, curiously, does not mention Fourier by name in the preceding misadventure, although Dupuy is explicit on the identity of the Academy's Perpetual Secretary. I do not understand the reason for this omission unless Bell felt it a little too much to "expose" Cauchy, Fourier, and later Poisson, as incompetents. Bell also does not make it clear that the papers listed above (plus a later memoir) constitute what is now called Galois theory. If this point had been clarified, the claim that Galois had written the theory down on the eve of the duel would be difficult to substantiate or even to suggest.

From this point onward, the scenario of Galois as a passive victim of negligence, misunderstanding, and bad luck begins to break down—if it has not already. More and more he participated in the creation of his own disasters. But this picture does not fit Bell's plan. Therefore chronology is rearranged, events are omitted, and others invented in increasing quantity, until the end of his account is largely fantasy. The wholesale reordering of events will be especially evident in what follows.

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\*My own interpretation of this article is slightly different from that of Taton. Taton writes that the journalist evidently had first-hand information. But note the date: 15 June 1831. In the aftermath of the July revolution, Cauchy fled France during September, almost nine months prior to the article's publication. It is difficult to see when the journalist would have spoken to Cauchy. However, the article appeared in a Saint-Simonian journal. Galois's best friend, Auguste Chevalier, was one of the most active Saint-Simonians. My own suspicion, which I cannot prove, is that the journalist was Chevalier and the information was coming directly from Galois. If this hypothesis is correct, Galois himself is admitting Cauchy's encouragement.

Most important, Bell gives an extremely late start to Galois's political activities. He remarks that had Evariste's teachers at Louis-le-Grand allowed him to study only mathematics he might have lived to be eighty.<sup>37</sup> Unlikely. According to Dupuy, one of the reasons Galois had hoped to attend the Polytechnique was to participate in political activities. At l'Ecole Normale he became a "polytechnician in exile." The July revolution of 1830 reared its head. The Director of l'Ecole Normale, M. Guigniault, locked the students in so that they would not be able to fight on the streets. Galois was so incensed at the decision that he tried to escape by scaling the walls. He failed, and in doing so missed the revolution. Afterwards, the Director put the students in the service of the provisional government. Charles X had fled France. He would be followed in September by Cauchy. Louis-Phillipe was the new King.

The events of July, severely abridged here, Bell chronicles accurately. He does fail to mention that Galois probably joined the Society of the Friends of the People, one of the most extreme republican secret societies, within the next month, certainly before December.<sup>38</sup> The importance of this omission will be explained after we have filled in the remaining gaps of the narrative.

In December of that year, M. Guigniault was engaging in polemics against students in the pages of several newspapers. Galois saw his chance for attack and jumped into the squabble with a blistering letter to the *Gazette des Ecoles*. It read in part:

Gentlemen:

The letter which M. Guigniault inserted yesterday in the *Lycée* on the occasion of one of the articles in your journal has seemed to me very inappropriate. I had thought that you would welcome with eagerness every means to expose this man.

Here are the facts which can be verified by forty-six students.

On the morning of July 28, when many of the students wished to leave the school and fight, M. Guigniault told them on two occasions that he would call the police to reestablish order within the school. The police on the 28th of July!

On the same day, M. Guigniault told us with his usual pedantry: "There are many brave men fighting on both sides. If I were a soldier I would not know what to decide—to sacrifice liberty or LEGITIMACY?"

Here is the man who the next day covered his hat with an immense tricolor cockade. Here are our liberal doctrines!<sup>39</sup>

Galois continues. According to Dupuy, every statement in the letter is accurate. Nonetheless, the result was what might have been anticipated: Galois was expelled. The action was to become official on January 4, but Galois quit school immediately and joined the Artillery of the National Guard, a branch of the militia which was almost entirely composed of republicans. It is interesting that the forty-six students referred to in the letter actually published a reply *against* Galois, but this seems to have been at the "prompting" of M. Guigniault.<sup>40</sup>

December was a turbulent month for other reasons. After the Bourbons had fled France, four of their ex-ministers were tried for treason. Popular sentiment called for their execution. The decision to execute or imprison for life was to be announced on December 21. That day, the Artillery of the National Guard was stationed in the quadrangle at the Louvre. Galois was certainly there. The atmosphere was very tense. If the ministers were given a life sentence, the artillerymen had planned to revolt. But the Louvre was soon surrounded by the full National Guard and troops of the line, more trustworthy arms of the military. A distant cannon shot was heard. It signaled the end of the trial and that the ministers had indeed been given imprisonment over execution. The artillerymen and the National Guard readied themselves for bloodshed, but with the arrival at the Louvre of thousands of Parisians, the fighting did not erupt. Over the next few days, the situation in Paris grew calmer with the appearance of Lafayette, who called for peace, and daily proclamations calling for order. On December 31, 1830, the Artillery of the National Guard was abolished by royal decree in fear of its threat to the throne.<sup>41</sup>

In January 1831 Galois, no longer a student, attempted to organize a private class in mathematics. At the first meeting, about forty students appeared<sup>42</sup> but the endeavor did not last long, evidently because of Galois's political activities. On the 17th of that month, upon the



invitation of Poisson, Galois submitted a third version of his memoir to the Academy. Later, in July, Poisson would reject the manuscript.\* This rejection will be discussed at the proper time, but we should note that by that time Galois would have already been arrested.

If we return to Bell's account, we will now find a totally distorted chain of events: The months after July are missing; Galois still has not joined the Society of Friends of the People. He leaves school in December but has not joined the artillery. The events at the Louvre, which will turn out to have critical importance for the remainder of the story, never take place. Galois attempts to organize his private course in mathematics. Bell writes: "Here he was at nineteen, a creative mathematician of the first rank, peddling to no takers. . . . Finding no students, Galois temporarily abandoned mathematics and joined the Artillery of the National Guard. . . ." <sup>43</sup> According to Bell, Galois submits his paper to Poisson, it is rejected; and this being the "last straw," Galois decides to devote "all his energy to revolutionary politics."

The chronology presented by Bell is thus completely backwards. The impression given by this rearrangement of events is once again that of a misunderstood and persecuted Galois who, surrounded on all sides by idiots, finally gives up and goes into radical politics. By writing that Galois found no students, Bell of course strengthens this impression. A more balanced account clearly requires what is lacking in Bell: a Galois of volition. We may get a better indication of his character and behavior during the spring of 1831 from a letter written on April 18 by the mathematician Sophie Germain to her colleague Libri: <sup>44</sup>

... Decidedly there is a misfortune concerning all that touches upon mathematics. Your preoccupation, that of Cauchy, the death of M. Fourier, have been the final blow for this student Galois who, in spite of his impertinence, showed signs of a clever disposition. All this has done so much that he has been expelled from l'Ecole Normale. He is without money and his mother has very little also. Having returned home, he continued his habit of insult, a sample of which he gave you after your best lecture at the Academy. The poor woman fled her house, leaving just enough for her son to live on, and has been forced to place herself as a companion in order to make ends meet. They say he will go completely mad, I fear this is true.

Unfortunately, as Bell observes, Galois was no ineffectual angel.

Before continuing, another historical detail should be mentioned. As an aftermath of the December events at the Louvre and the dissolution of the Artillery of the National Guard, nineteen officers were arrested, having been suspected of planning to deliver their cannons to the people. The charge was conspiracy to overthrow the government. In April, all nineteen were acquitted.

Until now, my criticism has been devoted almost entirely to Bell. Partly, this has been because his account is by far the most famous. There are other reasons as well. Hoyle's short essay, as already mentioned, is purely concerned with Galois's death and thus has little to say concerning the foregoing events. Infeld's account, on the other hand, is of book length. In a single article it would be difficult to debate all salient points. Nonetheless, Infeld has also stated <sup>45</sup> that he is primarily concerned with the events surrounding the duel. It is then reasonable to devote attention here to that aspect of the book. Infeld's work is actually something of a curiosity. The bulk of it is a fictionalized biography, interspersed with real documents and eyewitness accounts. All dates, names, and places are respected. The second part of the biography consists of a lengthy Afterword in which Infeld details exactly what he has invented, what he has not, and what he believes to be true. He also includes a fairly comprehensive bibliography. In my criticisms of Infeld to follow, I only take issue with those points he claims not to have invented. The reader may get the flavor of the author's intent by noting that at Galois's private class in algebra, spoken of earlier, Infeld has stationed two police spies. <sup>46</sup>

It might also be noted that, according to James R. Newman's brief remark quoted in the Introduction, Galois at this point in the narrative would be dead.

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\*Dupuy does not date this event and its placement in the narrative may have misled Bell.

## V. Arrest and Prison

And thus we arrive on May 9, 1831. The occasion was the republican banquet at the restaurant *Vendanges des Bourgogne*, where approximately two hundred republicans were gathered to celebrate the acquittal of the nineteen republicans on conspiracy charges. As Dumas says in his memoirs, "It would be difficult to find in all Paris two hundred persons more hostile to the government than those to be found reunited at five o'clock in the afternoon in the long hall on the ground floor above the garden."<sup>47</sup> It is worth quoting Bell's description of this event:

The ninth of May, 1831, marked the beginning of the end. About two hundred young republicans held a banquet to protest against the royal order disbanding the artillery which Galois had joined. Toasts were drunk to the Revolutions of 1789 and 1793, to Robespierre, and to the Revolution of 1830. The whole atmosphere of the gathering was revolutionary and defiant. Galois rose to propose a toast, his glass in one hand, his open pocket knife in the other. "To Louis-Phillipe"—the King. His companions misunderstood the purpose of the toast and whistled him down. Then they saw the open knife. Interpreting this as a threat against the life of the King, they howled their approval. A friend of Galois, seeing the great Alexander Dumas and other notables passing by the open windows, implored Galois to sit down, but the uproar continued. Galois was the hero of the moment, and the artilleryists adjourned to the street to celebrate their exuberance by dancing all night. The following day Galois was arrested at his mother's house and thrown into the prison at Sainte-Pélagie.<sup>48</sup>

Dumas himself describes this event at length in his memoirs. To save space, we quote only a portion:

Suddenly, in the midst of a private conversation which I was carrying on with the person on my left, the name Louis-Phillipe, followed by five or six whistles, caught my ear. I turned around. One of the most animated scenes was taking place fifteen or twenty seats from me.

A young man who had raised his glass and held an open dagger\* in the same hand was trying to make himself heard. He was Evariste Galois, since killed by Pescheux d'Herbenville, a charming young man who made silk-paper cartridges which he would tie up with silk ribbons.<sup>†</sup>

Evariste Galois was scarcely 23 or 24 at the time. He was one of the most ardent republicans. The noise was such that the very reason for this noise had become incomprehensible.

All I could perceive was that there was a threat and that the name of Louis-Phillipe had been mentioned; the intention was made clear by the open knife.

This went way beyond the limits of my republican opinions. I yielded to the pressure from my neighbor on the left who, as one of the King's comedians, didn't care to be compromised, and we jumped from the window sill into the garden.

I went home somewhat worried. It was clear this episode would have its consequences. Indeed, two or three days later, Evariste Galois was arrested.<sup>49</sup>

The amusing discrepancies between the two accounts are not entirely difficult to explain. Bell has taken his description from Dupuy, almost word for word, who in turn has based his account on Dumas and the report in the *Gazette des Ecoles*.<sup>50</sup> The toasts Bell mentions as well as the description of the general atmosphere are found in Dupuy. But Bell has mistranslated: Dupuy writes that "...*Dumas et quelques autres passaient par le fenêtre dans le jardin pour ne pas se compromettre*..."<sup>51</sup> which, in this context, means "...Dumas and several others jumped through the window into the garden in order not to be compromised." It does not here mean, "Dumas and several others passed by the window in order not to be compromised." One of course wonders how Bell interpreted the clause "in order not to be compromised" in light of his own translation. Why should Dumas be passing by open windows in order not to be compromised? It is difficult to call this carelessness. Bell has also distorted the reason for the banquet. Dupuy clearly states<sup>52</sup> that

\*Literally, *poignard*.

†This is a literal translation of Dumas. We have not been able to discover exactly to what this occupation refers, but it is a plausible guess that d'Herbenville made what the British call "crackers" (French, *diablotins*), party favors that pop when the ribbons are pulled and contain inspirational messages. They seem to have been invented at about this time.

it was a celebration for the acquittal of the nineteen conspirators. But Bell has not mentioned the trial. For consistency's sake, he must therefore emphasize the obviously revolutionary character of the gathering.

The issue of accuracy becomes more important when we question the most glaring omission in Bell's account: the absence of any mention of Pescheux d'Herbenville. The single sentence in Dumas is the only extant evidence that d'Herbenville was the man who eventually shot Galois. Although Dumas is repeatedly cited by Dupuy, Bell has obviously not read Dumas. If he had, Bell might have seen fit to close the discrepancies in the banquet accounts, in order not to be compromised. On the other hand, Bell claims to have read Dupuy; Dupuy, once again citing Dumas, explicitly names d'Herbenville as Galois's adversary.<sup>53</sup> Hoyle is guilty of the same charge; listing Dupuy as a main reference, he relegates d'Herbenville to the ranks of anonymous assassins. Infeld, who does identify d'Herbenville, attempts to prove he was a police agent.

For mathematics, of course, it is not important to know exactly who killed Galois; for historical accuracy, it is. In light of the plethora of theories which have arisen to explain the cause of the celebrated duel, most of which involve police spies, agents provocateurs, and political overtones, the identity of d'Herbenville might be a key piece of information. We will, in fact, find that the only evidence strongly indicates d'Herbenville was *not* a police agent. d'Herbenville and the conspiracy theories will be discussed in greater detail later, but for now let us return to Galois.

Evariste was arrested at his mother's house the day following the banquet, which does indicate that police or informers were at the dinner, although the celebration was open to any subscriber. Galois was held in detention at Sainte-Pélagie prison until June 15, when he was tried for threatening the King's life. Bell's description of this event is highly oversimplified. Indeed, the defense lawyer did claim Galois has actually said, "To Louis-Phillipe, *if he betrays*," but that the noise had been such to drown out the qualifying clause. Nonetheless, the matter took on a less facetious aspect when the prosecutor asked Galois if he really intended to kill the King. Galois replied, "Yes, if he betrays." The prosecutor goes on to ask how Galois "can believe this abandonment of legality on the part of the King," and Galois answers, "Everything makes us believe he will soon turn traitor if he has not done so already." Galois is asked to clarify his remarks and basically repeats what he has already said: "I will say that the trend in government can make one suppose that Louis-Phillipe will betray one day if he hasn't already."

As Dumas aptly remarks, "One understands that with such lucidity in the questions and answers, the discussion did not last long." Apparently moved by Galois's youth, the jury acquitted him within moments. Dumas writes, "I repeat that this is a rude generation, perhaps a bit foolish, but you will recall Beranger's song *Les Fous* ["The Fools" or "The Madmen"]."<sup>54</sup>

Shortly after this event, the Academy rejected Galois's memoir on the resolution of equations, this time with Poisson as referee. The rejection was written on July 4, although according to Infeld<sup>55</sup> Galois did not receive the letter until October, when he was in prison again.\* By this time, about eight months had passed since he had submitted the paper at Poisson's request. As we will see, Galois did not take the rejection lightly.

The cause for Galois's second arrest was preventive: On Bastille Day, July 14, 1831, he and his republican friend Duchatelet were apprehended dressed in Artillery Guard uniforms and heavily armed. Because the Artillery Guard had been disbanded on the last day of 1830 in fear of its becoming an instrument of the republicans, to wear the uniform was an outright gesture of defiance. It was also illegal. This was the charge brought against Galois, but not until the late date of October 23; he was sentenced to six months in prison. The sentence was confirmed by the court of appeals on December 3. In the meantime, Galois had been sitting in Sainte-Pélagie prison since his arrest in July.

In Bell's fierce diatribe against this arrest he forgets to mention several relevant points. First, he does not seem to comprehend that this was not the Paris of our day but Paris one year after a

\*I have found no other source which either corroborates or contradicts Infeld's claim that the rejected manuscript was not received until October, three months after the actual rejection.

revolution, when street riots were rampant, assassination attempts not uncommon, and republican activity dangerous.<sup>56</sup> The “celebration” Bell mentions was a republican demonstration on Bastille Day. Today such a demonstration would be considered patriotic; then it was seditious. This is exactly what the police chief decided when he went on record opposing the demonstration.<sup>57</sup> Bell concedes, “True, Galois was armed to the teeth when arrested, but he had not resisted arrest.”<sup>58</sup> More precisely, Galois was carrying a loaded rifle, several pistols, and his dagger, a punishable offense even in our more moderate times. To say that he had not resisted arrest may also be inaccurate. The police came to Galois’s house to detain him, but Evariste had already decamped.

Galois’s predicament was not helped by his friend Duchatelet, who drew a picture on the wall of his cell of the King’s head lying next to a guillotine with the inscription “Phillipe will carry his head to your altar, O Liberty!”<sup>59</sup> Part of the delay in bringing Galois to trial was the fact that Duchatelet was tried first.

The point here is not to argue for or against the justice of Galois’s arrest. The point is that he was behaving dangerously in a dangerous time. Two forces are clearly at work here: the government’s intention to deal harshly with him after his threat of regicide and his own inability to keep out of trouble.

During his stay in prison, a number of events occurred which throw further light on Galois’s personality. These incidents were recorded by the republican François Vincent Raspail. Raspail was an early botanist, one of the first to advocate the use of the microscope to examine cell structure in plants. He also had his troubles with the Academy and was sitting next to Dumas at the May 9 banquet. An ardent republican, he refused to receive the Cross of the Legion of Honor from Louis-Phillipe and during the years 1830–1836 spent a total of twenty-seven months in prison.<sup>60</sup> Later in life, Raspail became a famous statesman. He is now remembered by a boulevard and a metro stop in Paris. He lived to be about eighty. One of his many arrests occurred at about the same time Galois was taken. Raspail recorded the following incidents in several of his letters. Infeld quotes him several times at great length but never explains who he was.

On July 25, 1831, Raspail wrote that his fellow prisoners had taunted Galois into drinking some liquor, a pastime at which he was apparently a novice:

To refuse the challenge would be an act of cowardice. And our poor Bacchus has so much courage in his frail body that he would give his life for the hundredth part of the smallest good deed. He grasps the little glass like Socrates courageously taking the hemlock; he swallows it at one gulp, not without blinking and making a wry face. A second glass is not harder to empty than the first, and then the third. The beginner loses his equilibrium. Triumph! Homage to the Bacchus of the jail! You have intoxicated an ingenious soul, who holds wine in horror.<sup>61</sup>

The scene repeats itself. This time Galois empties a bottle of brandy in a single draught. Galois, drunk, pours out his soul to Raspail in haunting prophecy:

How I like you, at this moment more than ever. You do not get drunk, you are serious and a friend of the poor. But what is happening to my body? I have two men inside me, and unfortunately I can guess which is going to overcome the other. I am too impatient to get to the goal. The passions of my age are all imbued with impatience. Even virtue has that vice with us. See here! I do not like liquor. At a word I drink it, holding my nose, and get drunk. I do not like women and it seems to me that I could only love a Tarpeia or a Graccha.\* And I tell you, I will die in a duel on the occasion of some *coquette de bas étage*. Why? Because she will invite me to avenge her honor which another has compromised.

Do you know what I lack, my friend? I confide it only to you: it is someone whom I can love and love only in spirit. I have lost my father and no one has ever replaced him, do you hear me...?<sup>62</sup>

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\*The *Encyclopedia Britannica* states that Tarpeia, according to Roman legend, was the daughter of the Roman Commander in charge of defending the capital against the Sabines. She offered to betray the citadel in exchange for what the Sabines wore on their left arms, i.e., their bracelets. Taking her at her word, the Sabines crushed her under their shields. Graccha refers to Cornelia Graccha, the mother of Tiberius and Gaius, who is remembered as their educator as well as an accomplished author in her own right. Although hostile propaganda later suggested she encouraged her sons’ more revolutionary policies, she seems rather to have restrained them.

The aftermath of this episode is neither heartwarming nor pleasant; Galois in a delirium attempts suicide:

We laid him out on one of our beds. But the fever of intoxication tormented our unhappy friend. . . . He would fall back senseless only to raise himself with new exaltation, and he foretold sublime things which a certain reserve often rendered ridiculous.

"You despise me, you who are my friend! You are right, but I who committed such a crime must kill myself!"

And he would have done it if we had not flung ourselves on him, for he had a weapon in his hands. . . .<sup>63</sup>

Several important points need to be made about these passages. Bell, in his account, says only, "Goaded beyond endurance, Galois seized a bottle of brandy, not knowing or caring what it was, and drank it down. A decent fellow prisoner took care of him until he recovered."<sup>64</sup> Thus, the really important parts of the episode, which tell us something about Galois's character and which bear on future events, are omitted altogether.

Later, in attempting to understand the cause of Galois's death, Dupuy remarks, "If I credit an allusion of Raspail, Galois lost his virgin heart to *quelque coquette de bas étage*."<sup>65</sup> Bell writes: "Some worthless girl [*quelque coquette de bas étage*"] initiated him."<sup>66</sup> Here, Bell is taking a conjecture of Dupuy based on a letter of Raspail reporting an utterance of Galois spoken in a delirium a year before the duel as a characterization of real events. This can only be termed fabrication. And it is very likely that this piece of fabrication is responsible for the widespread belief that a prostitute was the cause of Galois's death.

Infeld, in his version of the prison scene, quotes the letters far more fully than Dupuy, but jumps from "Tarpeia and Graccha" to "Do you know what I lack, my friend?" In other words, he omits Galois's prophecy that he will die in a duel. He also makes no comment whatsoever on Galois's suicide attempt. This selective presentation and slanting of evidence is characteristic of Infeld's book. He publishes any document or any portion of a document which does not interfere with his stated hypothesis that Galois was killed by the secret police. More obvious examples will be presented later when we discuss the actual circumstances surrounding the duel.

On August 2, Raspail chronicles an interesting series of events which took place after his previous letters. On July 27, the prisoners were invited to attend a mass in memory of those killed during the July revolution a year earlier. Because many of the prisoners were political, the atmosphere was tense and an open riot was expected to erupt at any moment. A few prudent prison leaders defused the situation, and two days passed without violence. At lock-up time on the 29th, a shot was heard throughout the prison, followed by cries of "Help, murder!" The following day, the mystery was clarified. Raspail, quoting the conversation of another prisoner with the prison superintendent, writes:

"Here are the facts. I am one of those in the attic room of the bathing pavilion. We were quietly going to bed. The man whose bed is between two casements had his face toward the window while undressing and he was humming a tune."

"At that moment a shot was fired from the garret opposite. We thought our comrade was dead, but he was only unconscious. Not knowing where the shot had come from, nor how serious the wound was, we called for help. For in such a room, open in all directions through six windows, a better-aimed shot would have struck down its man."<sup>67</sup>

The shot, it turned out, came from a garret, across the street, where one of the prison guards lived. Galois was not the man who was at the window and wounded. However, he was in the same room and was later thrown into the dungeon, evidently because he had insulted the superintendent, probably accusing him of having intentionally arranged the shooting. Raspail continues to record the conversation. The prisoner already quoted is talking:

"What? You have no order to seize the guilty man [the guard who fired the shot]? But you have one to throw into the dungeon both the victim of this shameful trap and the witnesses of it? It may sound insolent to say that the administration pays turnkeys to murder prisoners. But what if this insolent statement is true? And I bear witness that no other insolence has come from those who were thrown into the dungeon. This

young Galois doesn't raise his voice, as you well know; he remains as cold as his mathematics when he talks to you."

"Galois in the dungeon!" repeats the crowd. "Oh, the bastards! They have a grudge against our little scholar."

"Of course they have a grudge against him. They trick him like vipers. They entice him into every imaginable trap. And then, too, they want an uprising."<sup>68</sup>

An uprising they got. This oblique conversation ends with the superintendent taking to his heels as the prisoners take control of the prison. The situation remains stalemated until late that night when the infantry is called in. The prisoners surrender without violence and remarkably no one is hurt.

I have tried to present this episode in as neutral a tone as possible. Infeld interprets the shot as an assassination attempt on Galois's life, and later cites it in his Afterword as his first piece of evidence that Galois was murdered by the government.<sup>69</sup> It is agreed that the moderate government of Louis-Phillipe would have liked to have been rid of all political extremists. But a conspiracy theory presumes there exists a reason to single out a particular victim. Why Galois over Raspail? A shot was fired in a prison full of political prisoners on the verge of a riot, at night ("lock-up time"), into a room containing an unknown number of men, evidently "aimed" at someone else. Yes, it could have been an attempt to kill Galois. I do not find the evidence compelling.

More compelling is the evidence for the absolute hatred Galois had developed for the Academy, which I feel can only be termed paranoid. And, as is not uncommon with paranoiacs, there was a kernel of justification for the behavior. At some point in October, according to Infeld, Galois was notified of Poisson's rejection of his latest manuscript on the theory of equations.\* Infeld quotes the following letter, which was originally published by Bertrand. It is not quoted by Dupuy.

Dear M. Galois:

Your paper was sent to M. Poisson to referee. He has returned it with his report, which we quote:

"We have made every effort to understand M. Galois's proofs. His argument is neither sufficiently clear nor sufficiently developed to allow us to judge its rigor; it is not even possible for us to give an idea of this paper.

The author claims that the propositions contained in his manuscript are a part of a general theory which has rich application. Often different parts of a theory clarify each other and can be more easily understood when taken together than when taken in isolation. One should rather wait to form a more definite opinion, therefore, until the author publishes a more complete account of his work."

For this reason, we are returning your manuscript in the hope that you will find M. Poisson's remarks useful in your future work.

François Arago, Secretary to the Academy<sup>70</sup>

Bell, elaborating from Dupuy, states that Poisson found the manuscript "incomprehensible" but "did not state how long it had taken him to reach this remarkable conclusion."<sup>71</sup> I believe this is an unfair characterization of Poisson's comments. This is the rejection that Bell has occurring before Galois's arrest.

In light of previous events and in light of his character, it is not terribly surprising that Galois reacted violently to what might nowadays be considered an encouraging rejection letter. He gave up all plans to publish his papers through the Academy and decided to publish them privately with the help of his friend Auguste Chevalier. Galois collected his manuscripts and in December, while still in Sainte-Pélagie, penned what surely must be one of the most remarkable documents in the history of mathematics, his *Préface*. The entire *Préface* runs about five pages. Infeld, to his credit, prints some of it, although he alters and omits certain parts at will. To save space, I here quote only the first page. The full text can be found in Bourgne and Azra:

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\*See footnote to page 93.

Firstly, you will notice the second page of this work is not encumbered by surnames, Christian names or titles. Absent are eulogies to some prince whose purse would have opened at the smoke of incense, threatening to close once the incense holder was empty. Neither will you see, in characters three times as high as those in the text, homage respectfully paid to some high-ranking official in science, or to some savant-protector, a thing thought to be indispensable (I should say inevitable) for someone wishing to write at twenty. I tell no one that I owe anything of value in my work to his advice or encouragement. I do not say so because it would be a lie. If I addressed anything to the important men of science or of the world (and I grant the distinction between the two at times is imperceptible) I swear it would not be thanks. I owe to important men the fact that the first of these papers is appearing so late. I owe to other important men that the whole thing was written in prison, a place, you will agree, hardly suited for meditation, and where I have been dumbfounded at my own listlessness in keeping my mouth shut at my stupid, spiteful critics: and I think that I can say "spiteful critics" in all modesty because my adversaries are so low in my esteem. The whys and wherefores of my stay in prison have nothing to do with the subject at hand; but I must tell you how manuscripts go astray in the portfolios of the members of the Institute, although I cannot in truth conceive of such carelessness on the part of those who already have the death of Abel on their consciences. I do not want to compare myself with that illustrious mathematician but, suffice to say, I sent my memoir on the theory of equations to the Academy in February of 1830 (in a less complete form in 1829) and it has been impossible to find them or get them back. There are other anecdotes in this genre but I would be ungracious to recount them because, other than the loss of my manuscripts, those incidents do not concern me. Happy voyager, only my poor countenance saved me from the jaws of wolves. Perhaps I have already said too much for the reader to understand why, as much as I would have liked otherwise, it is absolutely impossible for me to embellish or disfigure this work with a dedication.<sup>72</sup>

The remainder of the *Préface* continues in much the same tone ("And thus it is knowingly that I expose myself to the laughter of fools"). Other of his writings are not dissimilar.<sup>73</sup> Among his papers is the picture of a bizarre, torsoless figure, captioned by Bourgne and Azra "Riquet à la Houppe."<sup>74</sup> The picture must have been drawn shortly before his death. It may be significant that Riquet à la Houppe was in French folklore a character, short, ugly, disdained by all, but nonetheless very clever.

## VI. The Duel and Theories Surrounding It

We are almost at the end of this short story. Galois remained in Sainte-Pélagie without further recorded incident until March 16, 1832, when he was transferred to the pension Sieur Faultrier. Ironically enough, this was to prevent the prisoners from being exposed to the cholera epidemic then sweeping Paris. Galois was due to be given his freedom on April 29. From this point on, the historical record is very scanty. On May 25, Galois writes to his friend Chevalier and clearly alludes to a broken love affair:

My dear friend, there is a pleasure in being sad if one can hope for consolation; one is happy to suffer if one has friends. Your letter, full of apostolitic unction, has given me a little calm. But how can I remove the trace of such violent emotions that I have felt?

How can I console myself when in one month I have exhausted the greatest source of happiness a man can have, when I have exhausted it without happiness, without hope, when I am certain it is drained for life?<sup>75</sup>

The letter continues in similar tones. Galois goes on to say that he is disgusted with the world: "I am disenchanted with everything, even the love of glory. How can a world I detest soil me?"<sup>76</sup>

The next few days are a complete blank. On the morning of May 30, the famous duel took place. The previous evening, Galois wrote several well-known letters to his republican friends:

I beg patriots, my friends, not to reproach me for dying otherwise than for my country.

I die the victim of an infamous coquette and her two dupes. It is in a miserable piece of slander that I end my life.

Oh! Why die for something so little, so contemptible?

I call on heaven to witness that only under compulsion and force have I yielded to a provocation which I have tried to avert by every means. I repent in having told the hateful truth to those who could not listen to it with dispassion. But to the end I told the truth. I go to the grave with a conscience free from patriots' blood.

I would like to have given my life for the public good.

Forgive those who kill me for they are of good faith.<sup>77</sup>

Galois also writes another, similar letter to two republican friends, Napoleon Lebon and V. Delauney:

My good friends,

I have been provoked by two patriots . . . It is impossible for me to refuse.

I beg your forgiveness for not having told you.

But my adversaries have put me on my word of honor not to inform any patriot.

Your task is simple: prove that I am fighting against my will, having exhausted all possible means of reconciliation; say whether I am capable of lying even in the most trivial matters.

Please remember me since fate did not give me enough of a life to be remembered by my country.

I die your friend.<sup>78</sup>

We will return to Galois's activities during this last night in due time. For now we discuss a few of the many theories which purport to explain the cause of this celebrated duel. There is perhaps enough in the two letters to raise suspicions of foul play. The attempts to make Galois the victim of royalists, a female agent provocateur, a prostitute, or a government conspiracy doubtlessly stem from these letters, for there is no other direct evidence in existence. Thus, we have the origin of Bell's assertion:

What happened on May 29th is not definitely known. Extracts from two letters suggest what is usually accepted as the truth: Galois had run afoul of political enemies immediately after his release.<sup>79</sup>

The first statement is accurate, the second is not. Dupuy certainly believes the exact opposite, as will be seen shortly. Dupuy does mention that Alfred Galois, unjustifiably in his view, did maintain that his older brother was murdered. Because Bell "followed" Dupuy exclusively, one can only conclude that he took Alfred's position and termed it widely accepted or that he invented the whole thing.

Although Bell may have invented the theory, or merely propagated it to previously unattained heights, he is not its chief advocate. Infeld goes further. He assumes the "infamous coquette" was a female agent provocateur who set up Galois for the duel with a police agent. Infeld's evidence is by admission circumstantial. In addition to the bullet episode at Sainte-Pélagie it consists of the following:<sup>80</sup> the police were known to have used spies; the police broke up a meeting of the Society of Friends of the People the night before Galois's funeral; Police Chief M. Gisquet wrote in 1840 that Galois "had been killed by a friend"; police spies were unmasked in 1848, at which time a claim appeared in a journal that Galois "had been murdered in a so-called duel of honor"; Galois's brother Alfred always maintained that Evariste had been murdered; Galois was abandoned by his adversaries and his seconds and found by a peasant.

It should be noted that this evidence is consistent and does not contradict known facts. However, necessity does not follow from consistency. The bullet episode has already been discussed. It is true that the police used spies and that they were unmasked in 1848. We will return to this point below. Infeld does not mention that the newspapers announced Galois's funeral *before* the fact and explicitly named him as a member of both the Artillery of the National Guard and the Friends of the People. In any event, his membership in these organizations must have been widely known. One must weigh for oneself whether it is remarkable that police knew of republican meetings. Infeld finds it suspicious that the police chief, eight years after the fact, knew Galois had been "killed by a friend." He does not find it suspicious that Dumas knew more—precisely who that friend was. Dupuy feels that Alfred's position was the result of justifiable anger over his brother's death and points out some unlikely details Alfred attributed to the duel, such as stating that Evariste would have fired into the air. The assertion that Galois was abandoned to die, another of Alfred's claims, is also open to dispute. Dupuy mentions that one of the witnesses went to Galois's mother the following day to explain what had happened.<sup>81</sup> He feels, then, it was more likely that the witnesses were searching for a doctor when the peasant happened along. This explanation may be weak; nonetheless Infeld fails to mention that Mme. Galois was informed.



The remarks above are admittedly as circumstantial as the evidence. There is, however, more concrete evidence which weighs very heavily against the political conspiracy theorists: the identity of Pescheux d'Herbenville. More is known about him than his anonymity. He was, in fact, one of the nineteen republicans who were acquitted on charges of conspiring to overthrow the government in the trial spoken of earlier. Is there any reason to suspect the d'Herbenville was a police agent? The historian Louis Blanc, in his exhaustive *History of Ten Years*, writes:

The trial gave rise to highly interesting scenes. In the sittings of the 7th of April, the president having reproached M. Pescheux d'Herbenville, one of the accused, with having had arms by him and with having distributed them, "Yes," replied the prisoner, "I have had arms, a great many arms, and I will tell you how I came by them." Then, relating the part he had taken in the three days, he told how, followed by his comrades, he had disarmed posts, and sustained glorious conflicts; and how, though not wealthy, he had equipped national guards at his own cost. There still burned in the hearts of the people some of the fire kindled by the revolution of July; such recitals as this fanned the embers. The young man himself, as he concluded his brief defense, wore a face radiant with enthusiasm and his eyes filled with tears.<sup>82</sup>

In addition, Blanc mentions the appearance of General Lafayette during the trial:

The old general came to give his testimony in favor of the accused, almost all of whom he knew, and all saluted him from their places with looks and gestures of regard.<sup>83</sup>

D'Herbenville, it seems, was one of the heroes of the hour. After the acquittal, the crowd pulled his coach through the streets of Paris "amid shouts of rapturous applause."

Bell, by not mentioning d'Herbenville at all, relieves himself of the difficulty of explaining why Galois should be killed in a political duel with a fellow republican or why d'Herbenville should be considered a political enemy. Infeld is in a more difficult position. Having acknowledged d'Herbenville's existence, he must explain why neither Dumas nor Blanc, both republicans, nor evidently the extremely liberal Lafayette\* (assuming he knew d'Herbenville personally), nor, one would gather from Blanc's account, any republican in Paris, ever held any suspicions that d'Herbenville was an agent. Infeld talks at length about the 1848 unmasking of the police spies, but he does not mention the following extract from Dupuy:

Pescheux was certainly not a "false-brother": all the men who acted as police agents during the reign of Louis-Phillipe were revealed in 1848 when Caussidière became chief of police, as witness Lucien de la Hodde.<sup>†</sup> If Pescheux were suspect, he would certainly not have been nominated as curator of the palace of Fontainebleau. It is absolutely necessary to discard the idea of police intervention and of a framed assassination.<sup>84</sup>

Thus there are some serious difficulties with the political enemies scenario. Infeld gets around this problem in characteristic fashion: in his bibliography he cites both Blanc and Dupuy as primary sources but *quotes neither*. In his Afterword, Infeld goes so far as to admit, "There is no reason to believe Pescheux d'Herbenville was a police agent." But then he goes on to say: "I believe there is enough circumstantial evidence to prove that the intervention of the secret police sealed Galois's fate. I do not believe it is possible to fit all the known facts without assuming Galois was murdered."<sup>85</sup>

It is left as an exercise for the reader to form a rebuttal to this statement. But in order to see just how far "known facts" can be stretched, we turn to Hoyle's version of the event. He writes:

Such are the bare bones of the story of the life and death of Evariste Galois. The classical biography of Galois [he then references Dupuy], in an attempt to add flesh to these bones, suggests that he was done to death by royalist enemies, as does E. T. Bell in his book *Men of Mathematics*. There are dark hints that the release from prison was but a device for encompassing his death, a necessary preliminary to his being matched against a highly skilled assailant in royalist pay. But why should Galois feel it critical to his honor that he should accept the challenge of a right-wing agent, especially if the agent were a known marksman? Gallic logic suggests on account of a girl . . .<sup>86</sup>

\*Lafayette had been considered republican enough to see his post of Commander of the National Guard dissolved after the events of December 1830.

<sup>†</sup>Hodde was a "republican" who was unmasked as a spy in 1848.

We first note the complete misrepresentation of Dupuy's position. If Hoyle is challenging Bell, and admittedly this is unclear, it seems to be on the extremely naive assumption that Galois would have known his opponent was a right-wing agent. Hoyle then goes on to dispose of the "infamous coquette" and propose his own theory:

It is possible that the "infamous coquette" was the source of a purely personal quarrel, but it is the normal biological rule among mammals that sexual quarrels between two males cease as soon as one side seeks "accommodation." It is the normal rule that either party to such fights can simply walk away, which is just what Galois seems to have attempted to do.

The more likely possibility is that Galois's habit of working mathematical problems in his head, his ability to think in parallel, caused serious animosities, and perhaps suspicions, to develop during the six months of imprisonment. There may have been suspicions that Galois was not wholly for the "cause," or even that he was an *agent provocateur* . . .<sup>87</sup>

Lincoln's remark comes to mind: "You can fool some of the people some of the time . . ." To suggest as Hoyle does that any republican in Paris suspected Galois after his expulsion from l'Ecole Normale, his Artillery activities, his threat to the King, his arrests, trials, sentencings, resencings, and prison activities borders on the fantastical. This is in addition to the fact that two or three thousand republicans later attended the funeral of this supposed agent provocateur. One might equally well claim Lenin had been suspected of being a Menshevik.

As to Hoyle's bio-sociological theories, he is contradicted by the historical record. The greatest Russian poet, Alexander Pushkin, was killed in 1837 at the age of 37 in a duel over his wife. England's Lord Camelford was killed in a duel over a prostitute. As late as 1838 members of the American legislature were engaging in similar duels. Toward the end of the eighteenth century, during election season, approximately 23 duels *per day* were fought in Ireland *alone*, unlikely just for political reasons. In the last decades of the nineteenth century, Paris newspapers carried notices of the daily duels and their terms. These practices continued until World War I. The cause of such "affairs of honor" ranged from geese, to insults, to politics, to women.<sup>88</sup> Dupuy himself mentions that nothing was more common at the time in question than duels between republicans, and I think one may safely infer from his remarks that no one paid the slightest attention to them.<sup>89</sup>

However, argument by analogy is generally a weak policy when dealing with a specific case, and Hoyle's expansive pronouncements on the sexual behavior of mammals bring to mind further evidence with which anyone wishing to invoke a political cause for Galois's death must contend. This evidence consists primarily of two fragmentary letters written to Galois by one Mademoiselle Stéphanie D., who is none other than the "infamous coquette" over whom the duel was fought. Most authors have assumed her identity to be an absolute mystery and that she, like d'Herbinville, is an anonymous casualty of history. Dupuy apparently was unaware of the letters or chose not to publish them. Bell and Hoyle never mention her name. Infeld calls her Eve Sorel (perhaps inspired by Stendhal). This is a strange state of affairs, for the letters were published in Tannery's 1908 edition of Galois's papers. Tannery does not affix a name to the author of these fragments; it is left for the 1962 edition of Bourgne and Azra to attempt an identification. One can understand why Bell and Infeld did not mention her name since Tannery did not provide it. Hoyle does not have such an excuse, his book being published in 1977. One cannot understand why these letters are never mentioned by anyone, especially by Bell and Infeld who cite Tannery as a major source for Galois's manuscripts.

The letters, as they exist, are copies made by Galois himself on the back of one of his papers.<sup>90</sup> The copies contain gaps, which may indicate he had previously torn up the originals and could not completely reconstruct them. More likely, Galois purposely omitted any incriminating or personally distasteful segments. I say this because some words in the French versions are broken in half; one generally does not remember only half a word. Galois has certainly obliterated Stéphanie's last name in a fit of anger. Due to the fragmentary nature of these letters their translation has proved difficult and may be uncertain in places. Where impossible to translate we have allowed the original French to stand. Letter I:

Please let us break up this affair. I do not have the wit to follow a correspondence of this nature but I will try to have enough to converse with you as I did before anything happened. Here is Mr. the *en a qui doit vous qu'a* me and do not think about those things which did not exist and which never would have existed.

Mademoiselle Stéphanie D  
14 May 183—

## Letter II:

I have followed your advice and I have thought over what has happened on whichever denomination it may have happened between us. In any case, Sir, be assured there never would have been more. You're assuming wrongly and your regrets have no foundation. True friendship exists nearly only between people of the same sex particularly of friends. full in the *vacuum* that the absence of all feeling of this kind . . . my trust . . . but it has been very wounded . . . you have seen me sad you have asked the reason; I answered you that I had sorrows that one had inflicted upon me. I had thought that you would take this as anyone in front of whom one drops a word for these one is not The calm of my thoughts leaves me to judge the persons that I usually see without much reflection; this is the reason that I rarely regret having been wrong in my judgment of a person. I am not of your opinion *les sen plus que les a exiger ni se* thank you sincerely for all those who you would bring down in my favor.

These are highly tantalizing morsels, but is there anything else known about the author? Indeed there is. C. A. Infantozzi has examined the original of the first letter.<sup>91</sup> With the help of a magnifying glass he was able to discern Stéphanie's full signature under Galois's erasures: Stéphanie Dumotel. Further archival investigation by Infantozzi shows she was Stéphanie-Félicie Poterin du Motel, daughter of Jean-Louis Auguste Poterin du Motel, a resident physician at the Sieur Faultrier, where Galois stayed the last months of his life. In 1840 Stéphanie married Oscar-Théodore Barrieu, a language professor. Any presumption that she was a prostitute must at this point be discarded as a complete figment of Bell's imagination.

The establishment of Stéphanie's identity unfortunately does not conclusively establish what in actuality did occur. From Stéphanie's second letter it is not difficult to infer that Galois took some song of sorrows on her part too seriously and himself provoked the duel. On face value she certainly seems an unwilling participant in whatever transpired. On the other hand, we have a curious passage from Dupuy, once again not quoted by the other authors. During the course of his researches, Dupuy had asked Galois's cousin if he knew the cause of the duel.

His cousin, M. Gabriel Demante, writes me that at a last meeting [with Stéphanie?] Galois found himself in the presence of a supposed uncle and a supposed fiancé, each of whom provoked the duel.<sup>92</sup>

It is difficult to say in which direction this passage points, but in weighing its importance, one should keep in mind Dupuy's own skepticism of anything the Galois family said concerning the duel.

With this passage, all the evidence pertaining to the duel which I have found to date has been presented. One can read the circumstantial evidence as Infeld does to arrive at a conspiracy. No known facts conclusively refute this interpretation. But it must be reemphasized that there is absolutely no direct evidence that such is the case. Furthermore, there is the testimony of several men, two of whom were republicans, that d'Herbinville was *not* a police agent. In addition, there is the identity of Stéphanie, who was simply the daughter of a physician who happened to live and work at the pension where Galois was staying. To suggest she was an agent provocateur somehow planted there to entrap Galois becomes a baroque, if not byzantine, invention.

If one chooses to reject the conspiracy theory, a fairly consistent picture of a personal quarrel emerges. We have Galois's unhappy letter to Chevalier of May 25. His famous cry, "I am the victim of an infamous coquette and her two dupes," may mean exactly what it says, with suitable allowances for Galois's usual withering tone. The excerpt from Dupuy quoted above is certainly consistent with "two dupes." Galois himself writes, "Forgive those who kill me for they are of good faith," i.e., they are not political enemies. And we must remember, in his own eyes, Galois

was exceedingly honest. If he felt any treachery were involved, we can be sure he would have said as much. The two letters from Stéphanie are perhaps the strongest argument for a personal quarrel. Those dissenting could of course take the extreme position that she was a very good actress.

In addition, there is the more difficult question of psychology. Galois's writings are at times unquestionably violent, and equally violent erasures are preserved on his manuscripts. He was arrested twice for dangerous actions which might have easily been avoided by a more prudent individual, or perhaps in a more prudent age. Raspail writes that Galois attempted suicide in prison, and of course there is Galois's own prophecy, not inconceivably self-fulfilling, that he would be killed in an affair of honor. It is not terribly difficult to believe that such a troubled young man in such a turbulent time could have ended his life in a duel.

In this scenario, the role of Pescheux d'Herbinville admittedly remains unclear. Was he a "supposed" fiancé or a real fiancé whom Galois's cousin took for supposed? Did Galois's cousin invent this epithet, or was d'Herbinville simply involved in a stupid quarrel? I have no answers to these questions.

The point I wish to make now for the interested historian is that, although in 1982 Galois will have been dead 150 years, the investigation of his death has been closed prematurely. D'Herbinville should be traced to see if any letters exist which might shed some light on the matter.\* If he was in prison with Galois, a background for the quarrel might be established. Letters of Stéphanie or her husband might be extant and could conceivably mention the duel. Dupuy remarks cryptically that Raspail as well as all the republicans knew the cause of the duel. Raspail became a famous politician. Perhaps there is a clue in his correspondence.

These avenues are still open for those who are interested. They have been neglected only because of the intentional or unintentional omission of information by those who have previously written on Galois. We will return to the question of scholarship after disposing of the remaining myths concerning the night before the duel.

## VI. The Last Night

We saw in the introduction how Bell all but states outright that Galois committed his theory of equations to paper the night before he was shot. James R. Newman repeats this as an assertion, and the vision of the doomed boy, sitting by candlelight, feverishly bringing group theory into the world seems to be the major myth which most scientists harbor concerning Galois. This is again due to Bell's embellishment of Dupuy, who in this instance is sufficiently romantic of his own accord. But as has already been detailed at great length, Galois had been submitting papers on the subject since the age of 17. The term "group," used in the sense of "group of permutations" is used in all of them. During the night before the duel, in addition to the letters already quoted, Galois wrote a long letter to his friend Chevalier.<sup>93</sup> He begins:

My Dear Friend,

I have made some new discoveries in analysis.

The first concern the theory of equations, the others integral functions.

In the theory of equations I have researched the conditions for the solvability of equations by radicals; this has given me the occasion to deepen this theory and describe all the transformations possible on an equation even though it is not solvable by radicals.

All this will be found here in three memoirs.

Galois then goes on to describe and elucidate the contents of the memoir which was rejected by Poisson, as well as subsequent work. Galois had indeed created a field which would keep mathematicians busy for hundreds of years, but not "in those last desperate hours before the dawn." During the course of the night he annotated and made corrections on some of his papers. He comes across a note that Poisson had left in the margin of his rejected memoir:<sup>94</sup>

\*A perusal of the standard biographical encyclopedias has failed to reveal any further information on d'Herbinville.

The proof of this lemma is not sufficient. But it is true according to Lagrange's paper, No. 100, Berlin 1775.

Galois writes directly beneath it:

This proof is a textual transcription of that which we gave for this lemma in a memoir presented in 1830. We leave as an historic document the above note which M. Poisson felt obliged to insert. (Author's note.)

A few pages later,<sup>95</sup> Galois scrawls next to a theorem:

There are a few things left to be completed in this proof. I have not the time. (Author's note.)

Galois penned this famous inscription only once during the course of the night. It is unfortunate he tarnished some of the romance by including his parenthetical "Author's note." Galois ends his letter to Chevalier with the following request:

In my life I have often dared to advance propositions about which I was not sure. But all I have written down here has been clear in my head for over a year, and it would not be in my interest to leave myself open to the suspicion that I announce theorems of which I do not have complete proof.

Make a public request of Jacobi or Gauss to give their opinions not as to the truth but as to the importance of these theorems.

After that, I hope some men will find it profitable to sort out this mess.

I embrace you with effusion. E. Galois.<sup>96</sup>

And that was the end. The funeral was to be held on June 2. During the previous evening, the police broke up a meeting of the Society of Friends of the People on the pretext that the republicans were planning a demonstration for Galois's funeral. Thirty of those present were arrested. The next day, two or three thousand republicans were present at the services. Galois's body was interred in a common burial ground of which no trace remains today.

Later, Evariste's brother Alfred and his devoted friend Chevalier would laboriously recopy the mathematical papers and submit them to Gauss, Jacobi, and others. By 1843 the manuscripts had found their way to Liouville, who, after spending several months in the attempt to understand them, became convinced of their importance. He published the papers in 1846.

There exist many fragments which indicate Galois carried on his mathematical researches, not only while in prison, but right up until the time of his death. The fact that he could work through such a turbulent life is testimony to the extraordinary fertility of his imagination. There is no question that Galois was a great mathematician who developed one of the most original ideas in the history of mathematics. The invention of legends does not make him any greater.

## VII. Harsher Words

The account of Galois's life given here has not been entirely complete. There are more documents, letters, and events. No doubt I will shortly be exposed for having selectively presented evidence. The purpose of this paper, however, has not been one of completeness, nor entirely one of biography. No, the purpose has been to show that something is wrong. Two highly respected physicists and an equally well-known mathematician have invented history.

Bell's account, by far the most famous, is also the most fictitious. It is a myth devoid of such complications as a protagonist who is faulted as well as gifted. It is myth based on the stereotype of the misunderstood genius whom the conservative hierarchy is out to conquer. As if the befuddled hierarchy is generally organized well enough for persecution. It is a myth based on a misunderstanding of the method by which a scientist works: as if a great theory could be written down coherently in a single night.

It is unclear how far one can go in forgiving Bell. Surely all his mistakes could not result from a poor knowledge of French. No, I believe consciously or unconsciously Bell saw his opportunity to create a legend. The details which are absent in his account, such as Dumas at the banquet, such as d'Herbinville, such as the suicide attempt and Raspail, are those details which lend a concreteness and a humanness to Galois's life which a legend must not have. Unfortunately, if this was Bell's intent, he succeeded. After hearing of my investigation, physicists and mathematicians

all open conversations with me with the same question: "Did Galois really invent group theory the night before he was killed?" No, he didn't.

Infeld presents far more details. He is not interested in making Galois a legend. He does intend to make Galois a hero of the people. Politics is the guiding principle for Infeld. His book might be termed the proletarian interpretation of Galois; certainly parts of it read like the local Workers' Party publication. Infeld is very good at covering his tracks. To delete a phrase here, a paragraph there, a counterargument in between, is all that is necessary to create conspiracy from chaos.

As to Hoyle's motives, we can only take him at his word: He describes at length how as a child he was taught arithmetic by his mother, how he became proficient at mathematics, and how school for him became an excruciating bore. Hoyle was forced to learn to "think in parallel" in order to fool the teacher into believing he paid attention in class. He then writes, "I mention these personal details because I believe they cast some light on the mysterious death of the French mathematician Evariste Galois." Further comment seems unnecessary.

Dupuy seems to have less of a vested interest. I assume he included all the documents known to him at the time. If not, then he too should be scrutinized more carefully. He does seem *a priori* unwilling to accept conspiracy theory.

At the very least, the three twentieth-century authors are guilty of distorting Dupuy's account and even falsifying it. In each case the story of Galois has been used to put a stamp of approval on the author's personal theories. Indeed, all history is interpretive. But if we do not approve, we understand the liberty: Galois, like Einstein, has passed into the public domain. No act or anecdote attributed to him is too outrageous to be given consideration. There is a closer analogy from farther afield. The Russian composer Reinhold Glière once wrote a symphony, his third, which ran well over an hour. Stokowski—the story goes—worked with Glière to edit the score down to manageable length. Since then, every conductor presents his own edition. I do not know if I have ever heard the original.

The investigations of Galois discussed here have told us less about the man than about his biographers. The misfortune is that the biographers have been scientists. Because they appreciate his genius a century after its undisputed establishment, anyone who did not recognize it at the time is condemned. "In all the history of science," writes Bell, "there is no completer example of the triumph of crass stupidity over untamable genius." "Is it possible to avoid the obvious conclusion," asks Infeld, "that the regime of Louis-Phillipe was responsible for the early death of one of the greatest scientists who ever lived?" The underlying assumption is apparent: Galois was persecuted because he was a genius, and all scientists, to a greater or lesser degree, understand that genius is not tolerated by mediocrity. From this point of view, a genius must be recognized as such even when standing drunk on a banquet table with a dagger in his hand. Anyone who does not recognize him becomes a fool, an assassin, or a prostitute. This is a presumption of the highest arrogance. Scientists should not be so enamored of themselves.

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### Notes

1. Freeman Dyson, *Disturbing the Universe* (New York: Harper and Row, 1979), p. 14.
2. E. T. Bell, *Men of Mathematics* (New York: Simon and Schuster, 1937), p. 375.
3. James R. Newman, *The World of Mathematics* (New York: Simon and Schuster, 1956), vol. 3, p. 1534.
4. *Checklist of the Bullitt Collection of Mathematics* (University of Louisville, 1979).
5. Leopold Infeld, *Whom the Gods Love: The Story of Evariste Galois* (New York: Whittlesey House, 1948).
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7. Paul Dupuy, La Vie d'Evariste Galois, *Annales de l'Ecole Normale*, 13 (1896) 197–266.
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10. Robert Bourgne and J. P. Azra, eds., *Ecrits et Mémoires Mathématiques d'Evariste Galois: Edition Critique Intégrale de ses Manuscripts et Publications* (Paris: Gauthier-Villars, 1962).
11. Alexandre Dumas, *Mes Mémoires* (Paris: Editions Gallimard, 1967), vol. 4, Chap. 204.
12. François Vincent Raspail, *Lettres sur les Prisons de Paris* (Paris, 1839), vol. 2.
13. Bell, p. 362.
14. Bell, p. 363.
15. Dupuy, p. 203.
16. Bell, p. 364. Compare with Dupuy, p. 205.
17. Dupuy, pp. 255–256.
18. Dupuy, pp. 254–255.
19. Dupuy, p. 256.
20. Dupuy, p. 209; Bell, p. 368.
21. Infeld, p. 306.
22. René Taton, "Sur les relations scientifiques d'Augustin Cauchy et d'Evariste Galois," *Revue d'Histoire des Sciences*, 24 (1971) 123.
23. Bell, p. 368.
24. Bell, p. 369.
25. Dupuy, p. 211.
26. Bell, p. 371.
27. Dupuy, p. 217.
28. Bourgne and Azra, p. 27. See also pp. 21–25.
29. I assume here, as elsewhere, the chronology given by Bourgne and Azra, pp. xxvii–xxxi.
30. Bell, p. 370.
31. Taton, p. 134.
32. Taton, p. 139.
33. Bourgne and Azra, p. xxviii.
34. Taton, p. 138.
35. See, for example, Lilian Lieber, *Galois and the Theory of Groups* (1932).
36. Bourgne and Azra, p. xxviii.
37. Bell, p. 366.
38. Dupuy, p. 221, and Bourgne and Azra, p. xxix.
39. Bourgne and Azra, p. 462. Also Dupuy, p. 225. Translated in part by Infeld, p. 155.
40. Dupuy, pp. 227–228.
41. This account is based on information from Louis Blanc, *History of Ten Years* (London: Chapman and Hall, 1844). A consistent account, also based on Blanc, is given by Infeld, Chap. 5.
42. Dupuy, p. 234.
43. Bell, p. 372.
44. C. Henry, "Manuscripts de Sophie Germain," *Revue Philosophique*, 8 (1879) 631.
45. See, for example, his Afterword.
46. Infeld, p. 169.
47. Dumas, p. 331.
48. Bell, p. 372.
49. Dumas, pp. 332–333.
50. Dupuy, pp. 234–235.
51. Dupuy, p. 235.
52. Dupuy, p. 234.
53. Dupuy, p. 247.
54. Because of a change of libraries, this account of the trial is based on a different edition of Dumas's memoirs: Alexandre Dumas, *Mes Mémoires*, (Paris: Union Générale d'Editions), vol. 2, chap. 37. (No copyright date given.)
55. Infeld, p. 230.
56. See, for example, T. E. B. Howarth, *Citizen King: The Life of Louis-Phillipe* (London: Eyre & Spottiswoode, 1961).
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58. Bell, p. 378.
59. Dupuy, p. 238.
60. Dora B. Weiner, *Raspail: Scientist and Reformer* (New York: Columbia University Press, 1968).

61. Raspail, p. 84.
62. Raspail, p. 89.
63. Raspail, p. 90.
64. Bell, p. 374.
65. Dupuy, p. 245.
66. Bell, p. 374.
67. Raspail, pp. 117–118.
68. Raspail, p. 118. Also discussed in Dupuy, p. 243.
69. Infeld, p. 308.
70. From Joseph Bertrand, “La vie d’Evariste Galois par P. Dupuy,” *Eloges Académiques*, Paris, 1902, pp. 329–345. Here, I have quoted the letter as published by Infeld, p. 230.
71. Bell, p. 371.
72. Bourgne and Azra, pp. 3–11.
73. See again Bourgne and Azra, pp. 21–27.
74. Bourgne and Azra, facsimiles.
75. Bourgne and Azra, pp. 468–469.
76. Bourgne and Azra, p. 469.
77. Bourgne and Azra, p. 470.
78. Bourgne and Azra, p. 471.
79. Bell, p. 375.
80. Infeld, pp. 308–311.
81. Dupuy, pp. 247–248.
82. Blanc, p. 431.
83. Blanc, p. 431.
84. Dupuy, p. 247.
85. Infeld, p. 310.
86. Hoyle, p. 14.
87. Hoyle, p. 15.
88. See, for example, Charles Mackay, *Extraordinary Popular Delusions and the Madness of Crowds* (USA: Noonday Press, 1932), Chap. “Duels and Ordeals”; and Roger Shattuck, *The Banquet Years* (New York, Vintage Books, 1968), Chap. 1.
89. Dupuy, p. 247.
90. The letters and the description of them are in Bourgne and Azra, pp. 489–491.
91. C. A. Infanzozzi, “Sur la mort d’Evariste Galois,” *Revue d’Histoire des Sciences*, 21 (1968) 157.
92. Dupuy, p. 246.
93. Bourgne and Azra, p. 173.
94. Bourgne and Azra, p. 48 and facsimiles.
95. Bourgne and Azra, p. 54 and facsimiles.
96. Bourgne and Azra, p. 185.

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### MISCELLANEA

**67. *Simplicio*.** I am really beginning to understand that logic, although a most excellent instrument for organizing our reasoning, cannot match the acuteness of geometry in directing the mind toward discovery.

***Sagredo*.** It seems to me that logic can tell us whether arguments and proofs are conclusive; but that it can tell us how to discover conclusive arguments and proofs, that I really do not believe.

—Galileo Galilei, *Discorsi e dimostrazioni matematiche intorno à due nuove scienze* (1638). (*Le Opere di Galileo Galilei*, Edizione Nazionale, Firenze, 1898, vol. 8, p. 175.)