APPENDIX A
THE LIFE OF GALOIS

Évariste Galois was born on 25th October 1811 near Paris. Until he was 12 he studied the classics at home with his mother. Then in 1823 he entered the Lycée Louis-le-Grand, a famous school in Paris that has provided the education to many famous people and still exists today. At first he did well. But later he became bored and his work deteriorated. His interest in mathematics was awakened by Legendre's *Élements de Géométrie* and by the time he was 15 his grasp of mathematics was so deep that he could read and understand the recent developments. However he continued to do poorly at school. He twice sat and failed the entrance examination to the École Polytechnique where the best mathematical brains of the country were trained. It is said that at one of the oral examinations for entry to the school the examiner asked Galois the reasons for his answer. Galois became exasperated and said that it is obvious and threw the blackboard duster at the examiner!

At the age of 18 he submitted some excellent original work for the grand Prize in Mathematics of the academy of sciences. Fourier, the secretary of the Academy took the manuscript home to study it but he died before he had a chance to read it. The manuscript was not found among Fourier's papers and so Galois missed out

on the prize. This was the second time some of his work had gone astray. The previous year he had submitted some work on the zeros of polynomial equations to the Academy of Sciences. Cauchy, who had published in this area himself, was appointed to consider this and another memoir that Galois submitted at about the same time. He rejected both of them and the manuscripts were subsequently lost. Galois felt that more than carelessness lay behind the loss of his manuscripts.

By this time he was studying at the École Normale. In July 1830, Charles X issued an ordinance which suppressed the freedom of the Press. During the student demonstrations that followed, the students of the École Normale, Galois among them, were locked in by the director of the institution. Galois attacked him later in a letter to the *Gazette des Écoles*. Although he signed the letter, it was published without his name. However he was found out and was expelled for having written this 'anonymous letter'.

Now 19 he tried, not very successfully, to earn a living as a private tutor in mathematics. He sent another memoir, *On the conditions of solubility of equations by radicals* to the academy of Sciences. The referees this time were Poisson and Lacroix. He heard nothing for two months and when he wrote enquiring about it he had no reply. Then almost six months later, he received the news that it had been rejected. Poisson wrote that it was not sufficiently developed and the reasoning was not sufficiently clear for him to judge its correctness and,

referring to the fact that Galois claimed that his material was part of a more general theory, suggested that Galois publish the whole of his work as this might make it easier to understand. Galois had always been untidy and unsystematic and doing most of his mathematics in his head he found it difficult to set it down clearly on paper.

During this time, Galois joined the Republican National Guard but the organization was banned by Louis-Philippe who had succeeded Charles after the previous year's uprising. On 9th May 1831, a banquet was held in protest and during the rowdy proceedings, Galois stood up and proposed a toast to Louis-Philippe – clutching an unsheathed knife. This was taken to be a threat on the king's life and he was cheered by his Republican comrades. They poured out into the street shouting and dancing.

Alexandre Dumas, the author of *The Three Musketeers*, was one of the guests at this banquet and he records the disturbance in his memoirs. He wrote that he didn't want to get caught up in riot that was sure to follow and that he jumped out of the window.

The next day, Galois was arrested. He admitted at his trial to having made the toast but claimed that what he had said was "To Louis-Philippe – if he turns traitor" but that because of the cheering the last phrase had not been heard. He was acquitted and freed on 15th June.

He was not to remain free for long, however, for a month later he was arrested as he led a Republican demonstration and was sentenced to six months jail. He

used this time to continue his work on his mathematics. When he was freed he met and fell in love with a girl called Stephanie. Her surname appears in one of his letters but is heavily crossed out. It appears that she later rejected him, which hurt him deeply. This did not, however, prevent him from being challenged to a duel over his relationship with her. Alexandre Dumas claimed that the challenger was a political opponent, which suggests that there were political rather than private motives behind the challenge. However Galois indicated that the dispute was of a private nature as he wrote "I beg patriots and my friends not to reproach me for dying otherwise than for my country. I die the victim of an infamous coquette ... Oh! why die for so trivial a thing, for something so despicable!"

On 29th May, the day before the duel was to take place, he wrote a letter to Auguste Chevalier in which he outlined, among other things, his discoveries about the connection between groups and polynomial equations and stated that an equation is soluble by radicals when, and only when, its group is soluble. Towards the end of this pathetic document the writing became almost a scribble and was incomprehensible. He seemed conscious of the fact that time was running out and in the margin he scrawled "I have no time". The letter ended "I hope some people will find it to their advantage to decipher all this mess".

The duel took place the next day – pistols at 25 paces. Galois was hit in the stomach and died the

following day, 31st May 1832, of an infection of the stomach lining. The world had been robbed of a great mathematician five months before he would have turned 21.