VISUAL REVELATIONS

Howard Wainer, Column Editor

Who Was Playfair?

Ian Spence and Howard Wainer

The Cartesian tradition of graphical representation of mathematical functions worked against the use of graphs to depict empirical regularities. The switch to the view that a graph can help us formulate an understanding of nature by plotting data points and looking for patterns required, in Thomas Kuhn's terms, a change in paradigm. A person who might affect such a change would not only have to be in the right place at the right time, but would also have to be an iconoclast. We believe that in all aspects William Playfair fits the bill. In this biographical essay, we sketch some of the events of his life with the aim of convincing you of this. The essay concludes with a previously unpublished short memoir of Playfair's that, as well as any, characterizes his personality, courage, and sense of values.

William Playfair was born in 1759 in Scotland during the Enlightenment—a Golden Age in the arts, sciences, industry, and commerce. He died in London in 1823 after an eventful life, though it was unmarked by any apparently significant or memorable contribution. He made little impression in his native land, and his impact was only slightly greater in England and France. Yet he is responsible for inventions familiar and useful to us all: He was the first to devise and publish all of the common statistical graphs—the pie chart, the bar chart, and the statistical line graph. He invented a universal language useful to science and commerce alike and, though his contemporaries failed to grasp the significance of his contribution, Playfair himself had no doubt that he had forever changed the way we would look at data. It was almost a century after his death before his invention was fully accepted, however.

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Despite the importance of Playfair's innovations, his name is largely unknown, even to professional statisticians, and those who have heard of him know little of his life. One might expect a life of the inventor of statistical graphs to make dull reading, but Playfair pursued a variety of careers with such passion, ambition, industry, and optimism that even without his great inventions he would be judged a colorful figure. He was, in turn, millwright, engineer, draftsman, accountant, inventor, silversmith, merchant, investment broker, economist, statistician, pamphleteer, translator, publicist, land speculator, convict, banker, ardent royalist, editor, blackmailer, and journalist. Some of his business activities were questionable, if not downright illegal, and it may fairly be said that he was something of a rogue and scoundrel.

William Playfair was the fourth son of the Reverend James Playfair of the parish of Liff & Benvie near the city of Dundee, Scotland. His father died in 1772, leaving the eldest brother John to care for the family. John was subsequently to become one of Britain's foremost mathematicians and scientists as professor of natural philosophy, mathematics, and geology at Edinburgh University. After an apprenticeship with Andrew Meikle, the inventor of the threshing machine, William became draftsman and personal assistant to the great James Watt at the steam engine manufactory of Boulton & Watt at Birmingham in 1777. Thus, William's scientific and engineering training was at the hands of the leading figures of the Enlightenment and Industrial Revolution. On leaving Boulton & Watt in 1782, Playfair set up a silversmithing business and shop in London, but the venture failed. Seeking his fortune and hoping to apply his engineering skills to better effect in a developing French economy, Playfair moved to Paris in 1787. He was involved in more than just business in a Paris that was about to undergo revolutionary change. Playfair was one of the approximately 1,200 inhabitants of the St. Antoine quarter who formed themselves into a militia and assisted in the storming and capture of the Bastille (Lecocq, *Prise de la Bastille*).

In February of 1791 he rescued the well-known ex-judge Duval d'Esprémesnil from the mob in the Palais Royal Gardens. As well as being a friend, Duval was a subscriber to the Compagnie du Scioto in which Playfair was a principal. This doomed American-French scheme was devised to settle

European migrants at the confluence of the Ohio and Scioto Rivers. Playfair was accused of embezzlement and thus accelerating the collapse but it is just as likely that simple bungling on the part of Playfair and Joel Barlow, the American representative who led the French company, caused the failure. As the Revolution became more violent, lurching toward the Reign of Terror, Playfair became increasingly and vocally disenchanted with the revolutionaries and was forced to quit Paris, narrowly escaping the wrath of Barére and who knows what fate.

In 1793, while in Frankfurt, he heard a description of the semaphore telegraph from a French émigré. The following day he built a model of the apparatus and sent it to the Duke of York. He thereafter claimed to have introduced the semaphore into England, although it seems that his major contribution was the introduction of a new alphabet for the device.

When he returned to London, Playfair and his partner Hartsinck opened the Security Bank in the Cornhill modeling its business practices on schemes that he had seen introduced in Paris. These freewheeling ways were not tolerated by the conservative London establishment, and the venture soon collapsed after a conflict with the Bank of England.

From the mid-1790s onward he made his living principally as a writer and pamphleteer although he also did some engineering work as a gun carriage maker, developing the occasional new mechanical invention. Disenchanted by his experiences in Paris, he argued vehemently against the excesses of the French Revolution and wrote frequently on the topic of British policy toward France. He claimed credit for warning of Napoleon's escape from Elba—a warning that the British government unfortunately chose to ignore. His illustrated *British Family Antiquity* was a massive nine volume undertaking in which he catalogued the peerage and baronetage of the United Kingdom—a work principally designed to raise money by subscription. He dabbled in journalism, editing more than one periodical, the best known of which may be the *Tomahawk*. After the restoration of the Bourbons he returned to Paris as editor of the periodical *Galignani's Messenger*, but in 1818 his comments on a duel between Colonel Duffay and Comte de St. Morys were held to be libelous by the widow and daughter of the latter and led to prosecution. Playfair was sentenced to three months imprisonment and to pay a fine and damages. To avoid incarceration he fled France and spent his few remaining years in London writing pamphlets and doing translations.

The last two years of his life saw a renewed interest in economics, and his final publications contain several charts, including one or two rather fine examples that combined the line graph, bar chart, and chronological diagram in a single chart. His interest in agricultural matters was the stimulus for his last two works, which examined the difficulties experienced by English farmers in the early nineteenth century.

A trait that exposed itself as a common theme throughout Playfair's life was his practical inventiveness. He took out several patents, mostly involving machines for metal working, but he also proposed such things as modifications to the bows of ships to make them faster, and he is on record as the inventor of the first mass-produced silverplated spoon. When he was confronted by a problem, he would often offer a practical solution. Of equal importance was his insistence on recording his invention. For example, about his arrival in Germany in 1793 he wrote,

> When I was in Germany I was surprised that in a country where the milk is excellent the butter was little better than common grease without anything either of the colour or taste that good butter possesses. But one day in changing horses where the post master spoke a little French and had a farm I asked to see the dairy when I found that the milk was kept in deep narrow jars about three feet deep and eight or nine inches wide. The cream that rose to the top was about three inches in depth before it was taken off and though not quite rancid had a disagreeable smell. I advised him to get wide shallow vessels and keep them very clean but he smiled as if I knew nothing of the business. I asked him if the Dutch butter was not better than theirs. He owned it was. I apprised him that the Dutch milk was not so good as the German and that the excellence of the Dutch butter proceeded from the better mode of keeping the milk. He did not attempt to answer my reasoning but gave his head a significant shake and no doubt unless the French soldiers carried them into a better method in Germany they still persist in the same.

In his political and economic writings he often used numerical examples and calculations to make a point. He found that making sense of empirical information was aided enormously by the use of statistical graphics. He used, refined, and adapted those graphical forms that were known to him and invented others. His contributions to the development and demonstrations of the use of statistical graphics remain his life's principal accomplishment.

In 1786 he published his *Atlas*, which contained 44 graphs (and no maps). This was the first description of his graphical inventions and is the first major work of any kind to contain statistical graphs. It met with limited initial success in England, but fared quite differently in France. Playfair reports,

> When I went to France in 1787, I found several copies there, and amongst others, one which had been sent by an English nobleman to the Monsieur de Vergennes, which copy he presented to the king, who being well acquainted with the study of geography, understood it readily, and expressed great satisfaction. This circumstance was of service to me, when I afterwards solicited an exclusive privilege for a certain manufactory, which I obtained. The work was translated into French, and the Academy of Sciences, testified its approbation of this application of geometry to accounts, and gave me a general invitation to attend its meetings in the Louvre; and at the same time did me the honour of seating me by the president during that sitting. [Page iv of the pamphlet *For the Use of the Enemies of England: A Real Statement of the Finances and Resources of Great Britain* (1796); repeated verbatim on page 6 of the introduction to *Lineal Arithmetic* in 1798, and again on page ix in the Introduction to the Third Edition of his *Commercial and Political Atlas* (1801); he was obviously very fond of the royal treatment he received in France.]

In his unpublished memoirs, Playfair added, "As his majesty made Geography a study, he at once understood the charts and was highly pleased. He said they spoke all languages and were very clear and easily understood."

Playfair was survived by four children, one of whom, Andrew William, emigrated to Canada, where he enjoyed a successful career in the military and in business, eventually founding the town of Playfairville, Ontario. He persuaded his older brother John to join him in Canada, and their

descendants have prospered and spread throughout the country. His great-great-great-great grandson John Lawrence Playfair (1944–) is an accountant in Toronto. In his possession is a manuscript of 36 handwritten pages written by William Playfair that has been passed down through the family. The contents were written between June 13, 1821, and February 11, 1823. We believe this to be Playfair's final manuscript, the publication of which was forestalled by the author's death.

One of us (IS) uncovered the existence of this manuscript and asked John Lawrence Playfair if he might borrow it. On arriving at Playfair's 25th-floor office in the Ernst & Young Tower on Bay Street in the financial center of Toronto, Spence found Playfair surrounded by graphs and charts detailing the performance of the various companies he was studying. Interestingly and ironically, although John Lawrence Playfair certainly knew that graphs appeared in William's publications, he did not know that these were original with his forebear.

These *Memoirs of William Playfair* focus primarily on his time in France, both before and after the Revolution, and provide further insights into what sort of a man it took to invent statistical graphics. The full reproduction of the memoirs must take place elsewhere, but let us convey some of their flavor with a brief extract.

The event described takes place in July of 1791 and concerns the rescue of Duval d'Esprémesil mentioned earlier. Duval was a member of the French Parliament and a leader in the opposition to the court. Because of his opposition he was temporarily banished, but upon his return he discovered that things had gone too far and he joined the royal party. He was a friend of Playfair's and was much admired by him.

Memoir V by William Playfair
(Edited and Annotated by Ian Spence)

About the end of July, coming from Beauvilliers, where I had dined in the Palais Royal, I saw an immense crowd on the other side of the garden with much noise and confusion. I asked of some persons running past what was the matter when the answer was that the people had caught d'Esprémesil and were going to cut off his head. I ran across to where the crowd was and found d'Esprémesil sitting naked and covered with blood, his tongue hanging out of his mouth and his eyes rolling with an insensible sort of stare. All the shutters of the shops were put up in haste and the doors closed as the Nation, for they so termed the mob, inspired terror wherever it went, and if it carried off or broke anything there was no redress.

As there was no place of refuge or safety there I asked if anyone would help me take him to where I lived. "Where do you live?" was asked by twenty people at once. I approached thrice to try to raise him from the ground to lead him along but was pushed off by the people. At last a man in a National uniform came and said he would help me. We took each one arm and led him along with the intention of taking him to where I lived. Some of the keepers of the garden had the presence of mind to lock the iron gates that separate the arcade from the body of the garden so that we got on very slowly but quietly, the mob not being able to follow.

When we got up to the passage to the Rue Neuve des Petits Champs we were about to turn to the right, where I lived, but the mob had got round by that side of the garden and we were obliged to turn to the left and with great difficulty got across the street to the gate of the Royal then National Treasury. We had still greater difficulty of getting admittance, however we got in just as the mob began to be outrageous.

When within we found a guard of about 50 men and the poor bleeding d'Esprémesil was laid upon some straw in a state of insensibility. He was no sooner laid down than I was pushed out of the place into the court when a voice called out, "Go home you aristocrat and hide yourself forever. Be thankful we let you go." As they wanted to turn me into the street, where I should very likely have been murdered by the mob, which was knocking loudly at the gate and calling for a victim, I knew there was no time to lose. "No," said I, "never will I go out. If I must be murdered, let it be here by you, who as you wear the National uniform, will do nothing that is wrong." This saved me. "Go then," said they, "to the other side of the court to the Corps de Garde, and conceal yourself."

I took their advice and lay covered up on a bed, the noise still continuing at the gate with cries for the head of d'Esprémesil. At last Pétion, the Mayor of Paris arrived and about 1200 cavalry, so that by degrees the mob was obliged to quit the place.

By the time Pétion arrived d'Esprémesil had recovered his senses and as they had both been members at the First Assembly and were both remarkable men though opposite in politics d'Esprémesil bleeding and stretched on the straw said, "Ah, Pétion, I was once the idol of the people, as you are now, and see where I lie." Pétion fainted, or pretended to faint, and d'Esprémesil, getting some covering, was taken away in the carriage of the mayor and for safety was placed in a prison in the Fauxbourg St. Germain.

When I found myself on the bed in the Corps de Garde I began to think that I had run some risk, but when I was conducting my friend to a place of safety I thought nothing but of what I was about. I saw a boy in the place who seemed to be a sort of messenger and I asked him if he could get me some wine. He said the Swiss sold excellent wine at 15 sols. I desired him to fetch a dozen and I found it was the best common wine I ever tasted. I then sent for two dozen more and asked all the soldiers to drink. In return their onion soup, which had come along before but which they had been prevented from eating by the disturbance that had taken place, was offered to me and I ate of it with amazing appetite.

I had dined at Beauvilliers, a famous traiteur in the Palais Royal, and had scarcely ate anything, but now I was ravenously hungry. The disturbance being all over we enjoyed the wine. The soldiers on guard drank with good will to the health of the King of England but declined drinking to that of the King of France. About eight o'clock in the evening a very stout man, a National guard, came in and addressing himself to me he said he had come on purpose to conduct me safe home. I was so surprised at this and, first saying there was no occasion, asked who he was that intended me such kindness.