William Charles Wells, 1757–1817

Eye physician

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London

Two hundred years ago—in the autumn of 1775—William Charles Wells sailed from Carolina to England. Wells explained his departure from America as follows:

A paper, called 'An Association' had been offered for signature to all the male inhabitants of Charlestown above sixteen years of age. The subscribers to this bound themselves to obey implicitly certain authorities unconnected with the government of the country. I was one of the very few who refused to put their names to it. I was determined that my entrance into manhood should not be marred by what appeared to me an act of treason and rebellion. I was consequently obliged to leave Carolina.

Wells was met by his father

whose conduct as a printer of a newspaper in Charlestown had become extremely offensive to the people of Carolina from his constantly maintaining the cause of royalty, and who found it prudent (a few years earlier) to leave that country and to return to Great Britain.

Shortly after arriving in England young Wells went to Edinburgh to begin his medical education.

The memoir, which Wells wrote at the end of his life, and his other writings are a rich source of biographical material (Wells, 1818).

The memoir begins with the following bare statement:

I was born in Charlestown, South Carolina, in May 1757, being the second son of Robert and Mary Wells, both natives of Scotland.

He tells us that at the age of 14 years he was placed as an apprentice with Dr Alexander Garden,

the chief practitioner of physic in Charlestown, who was also a well-known naturalist. Among the many plants indigenous to America which Garden had sent to Europe was a species of magnolia he wished to have named after himself—Gardenia. As this name had already been applied to a Cape Jasmine, Garden had to make do with *Gordonia*.

In the War of Independence Garden had supported the views of Great Britain and because of his loyalty he too had had to leave New England. In 1783 he settled in London in Cecil Street, Strand.

After passing the 'preparatory trials' for the degree of doctor in medicine in 1778, there followed in Wells's life years packed with adventure which only abated in 1785 when he returned to London and 'had the name of Dr Wells affixed upon the door of the lodging which I had hired'.

In 1779 he was offered and accepted a surgeoncy in a Scottish regiment in the service of Holland.

For some time I felt myself pleasantly situated in the regiment, but the colonel who had been promoted to his command, merely from being an officer in the Dutch guards and bearing a Scotch name, Hamilton, but scarcely able to speak English, soon began to find fault with my conduct and in consequence confined me several times in a military prison. This behaviour, it may well be supposed, could not be borne by a high-spirited Englishman. I therefore resigned my commission and upon the very day of receiving my dismissal from the service, I attacked him openly in the street, and dared him to fight me; he became furious and ordered a file of musqueteers to seize me and carry me to prison.

When a few days later it was established that surgeon Wells was no longer an officer in the service he was released.

There is no doubt that the natural warmth of my temper urged me to do what might have appeared to another person rash . . . Charlestown was now in the possession of His Majesty's forces, and I returned to it for the purpose of collecting the scattered remains of my father's fortune. While there, though exempt by my profession from military calls, I made an offer of my personal services to the commandant of the town and was appointed an officer in a body of volunteers who by performing a part of the duty of the garrison, enabled a greater number of the regular troops to take the field than could have done so, without such aid. When Charlestown was abandoned by the King's forces, I went to East Florida. Shortly after my arrival there, apprehension being entertained for the safety of the province, I requested permission from the governor to assist in its defence and I received from him the command of a Company

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of volunteers. In 1783 I received a letter from my father in which he requested me, now that preliminaries of peace were signed, to go again to Carolina for the purpose of looking after his affairs. I accordingly went to Charlestown, furnished with a flag of truce which in previous intercourse between the two countries during the war, had always been regarded as a sufficient security against any attempt upon the liberty of the person who bore it. Immediately upon my arrival in Charlestown I was arrested. I refused to give bail on the ground that this would be deserting the security I had obtained by the flag of truce. My refusal proved most fortunate. For the night after my committal to prison a numerous mob assembled before the house in which I had been staying, demanding that I should be surrendered to them. I remained in prison upward of three months during which time I was robbed by another prisoner, and in consequence of my complaint of this, was most grossly abused by my jailor in a publication which began thus: 'William Charles Wells, a political sinner of the first magnitude in this land, and now suffering but a very small proportion of those pains and penalties which his high crimes and misdemeanours have so justly deserved, in the common gaol of this metropolis' etc. Nature had not formed, nor education trained me to submit with silence to oppression. By means of money I got a letter inserted in one of Charlestown's newspapers.

'Charlestown
in Gaol
July 17 1783.

For a freeman to be deprived of his liberty, and lodged in a common gaol; to be kept constantly locked up in a room whose ceiling is in that condition that the rain pervades it in every shower, sometimes in such quantity that it must be carried out in pails, and whose only window which is not being glazed, obliges him to exclude the cheerful light of day, at the same time that he shuts out the storm; lastly to be without friends whom the dread of popular resentment prevents from visiting him; if these sufferings are but a small portion of what he is to bear he can look forward to nothing but death. Grant him but the choice of the mode, and he will thank Heaven for the opportunity of demonstrating his attachment to his sovereign'.

A government vessel then arrived at Charlestown bringing a commissioner to demand my release. As soon as this affair was terminated I embarked with the commissioner in the vessel which had brought him to Charlestown and proceeded to St Augustine. The master ran his vessel aground upon rocks which had previously occasioned the loss of many vessels. She immediately bulged, and lost her mast and it was expected that her deck would separate from her ribs and be carried out to sea. With some other of the passengers, I had stripped myself completely naked and lashed myself to the capstan in order not to be washed away by the waves. The wind, however, became moderate and the accident which was dreaded did not happen.

A few hours after he was taken off the rocks

the vessel went entirely to pieces.

I embarked at St Augustine for Great Britain in the month of May 1784.

In the following year Wells established himself in Serjeants' Inn, Fleet Street.

I soon found that I was a good deal unfit for early success in my profession in London; for I entertained a very high notion of its dignity, and felt a great contempt for most of the apothecaries with whom I became accidentally acquainted; in consequence I passed several years almost without taking a single fee. In 1790 I was fortunately chosen as one of the physicians to the Finsbury Dispensary; for I was now furnished with the means of studying medicine practically and received from the institution a gratuity of £50 annually. In 1795 I was elected assistant physician to St Thomas's Hospital, and in 1800 I became one of the physicians of it.

The quotations presented from his writings reveal Wells as a high-minded person who was also impatient and impetuous. He himself admitted to having a temper which was 'passionate and violent'. Wells noted another feature of his character: 'a practice of swearing when my feelings have been agitated and even sometimes when no excuse of this kind has existed'. Wells attributed this practice to which he was given since childhood, to the fact that he had lived up to the age of 11 years 'close upon the harbour of a large sea-port in America and by this means associated much with blackguard sailor boys'. This life-long tendency to compulsive utterances, often unprovoked, has some affinity to Gilles de la Tourette's syndrome.

Wells was admitted into the Royal Society one year after the publication in 1792 of his *Essay on Vision*. Wells, as well as his medical contemporaries, regarded it as a major contribution to science. Even as recently as 1928 (James, 1928) the essay was published almost in its entirety. The only comment made at the time was: 'Wells is chiefly to be remembered for his essay on single vision with the two eyes'.

Wells began the second part of his essay by stating: 'accidents often lead to discoveries which reason alone might not easily have reached'. He stumbled upon the discovery while carrying out numerous experiments on himself involving the induction of binocular after images. This involved looking steadily for some time at a flame of a candle so that when the gaze was then directed upon a white object, a coloured spot appeared upon it.

I shall now relate some observations respecting the apparent directions of the spot.

1. The spot is always seen single, whether the surface, upon which it is projected, be touching the face or at the greatest distance from us. The fact indeed is so open to observation that I should

scarcely have thought of mentioning it had not Dr Darwin lately told us that the spot is seen double as often as the eyes are directed to an object more or less distant than the luminous body which gave rise to it. I shall only say, that I have made the experiment, I believe, upward of an hundred times, uniformly with same result.

2. The spot not only appears single in every ordinary position of the optic axes, but cannot even be made to appear double by any means whatsoever. If it be projected, for example, upon a piece of white paper on pressing one eye upward or downward or to either side, the spot will appear single and to possess its former place on the paper, as seen by the eye, which is not disturbed. Before I knew the result of this experiment, I had imagined, that, the position of one eye being forcibly altered, the external situation of the spot would likewise be altered and the spot by consequence be seen double.

The third part of his essay is devoted to the formulation of a theory to explain these observations

which reason alone might not have reached.

The ingenious theory need not be subjected to further scrutiny since the clue to Wells's preposterous observations is to be found in his

'Experiments and observations on several subjects in optics'.

The vision of my left eye becomes imperfect if the object be moved to a greater distance than that of nineteen inches. I have by my right eye imperfect vision of all objects unless their distance is so great that the rays proceeding from them may be regarded as parallel.

There is, therefore, evidence of anisometropia of the type favouring the development of alternating vision, so that his right eye would have been used for distant vision and the left for near work. This functional defect would, of course, explain the absence of diplopia in the experiments he described.

It must be emphasized that, utilizing the same technique of binocular after-images, Wells made some extremely important observations.

During a slight fit of giddiness I was accidentally seized with, a coloured spot occasioned by looking steadily at a luminous body, and upon which I happened at that moment to be making an experiment, was moved in a manner altogether independent of the positions of my eyes. I again produced the spot by looking some time at the flame of a candle; then turning myself round till I became giddy, I suddenly discontinued this motion, and directed my eyes to the middle of a sheet of paper fixed upon the wall of my chamber. The spot now appeared upon the paper, but only for a moment; for it immediately after seemed to move to one side, and the paper to the other, notwithstanding I conceived the position of my eyes to be in the meanwhile unchanged. To go on with the experiment, when the paper and

spot had proceeded to a certain distance from each other they suddenly came together again; and this separation and conjunction were alternately repeated a number of times; the limits of the separation gradually becoming less till at length the paper and spot both appeared to be at rest and the latter to be projected upon the middle of the former, I found also that when I had turned myself from left to right, the spot moved from left to right; but when I had turned from right to left the spot would move from right to left.

These are observations which represent accurately the oculogyric illusions upon deceleration after rotation.

I observed these appearances while I stood erect. When, however, I inclined my head in such a manner as to bring the side of my face parallel to the horizon the spot and paper would then move from each other, one upward and the other downward. But all these phenomena demonstrated, that there was a real motion in my eyes at the time I imagined them to be at rest.

Among the problems of visual perception which engrossed Wells was Priestley's observation that 'common air brightens the colour of blood'. Wells questioned Priestley's opinion that blood was

fitted both to imbibe and to part with phlogiston, becoming black when charged with this principle but highly florid when freed from it.

Wells conjectured that the change in colour must be due to some change in the state of the 'red globules' of the blood. Wells proposed that the colour of the blood 'brightened' as a result of a change analogous to that which occurred

to cinnabar in making vermilion. This pigment, it is known, is formed from cinnabar merely by subjecting it to a minute mechanical division. But the effect of this division is, to interpose among its particles, an infinite number of molecules of air which now acting as opaque matter, increase the reflection of light from the interior parts of the heap, and by this means occasion the whole difference of appearance which is observed between those two states of the same chemical body (Wells, 1797).

Wells communicated his most important discovery to the Royal Society on 4 July 1811 (Wells, 1811).

I was consulted upon a disease of vision, which, as far as I know, has not hitherto been mentioned by any author. The subject of it was a gentleman about 35 years old. About a month before I saw him, he had been attacked with a catarrh, and as this was leaving him he was seized with a slight stupor, and a feeling of weight in his forehead. He began at the same time to see less distinctly than formerly with his right eye, and to lose the power of moving its upper lid. The pupil of the same eye was now also observed to be dilated. In a few days, the left eye became similarly affected with the right, but in a less

degree. Previously to his present ailment his sight had always been so good, that he had never used glasses of any kind to improve it. On examining his eyes myself, I could not discover in them any other appearance of disease, than that their pupils, the right particularly, were much too large, and that their size was little affected by the quantity of light which passed through them. At first, I thought that their dilatation was occasioned by a defect of sensibility in the retinas; but I was quickly obliged to abandon this opinion, as the patient assured me, that his sensation of light was as strong as it had ever been during any former period of his life. I next inquired whether objects at different distances appeared to him equally distinct. He answered that he saw distant objects accurately, and in proof told me what the hour was by a remote public clock; but he added that the letters of a book seemed to him so confused that it was with difficulty he could make out the words which they composed. He was now desired to look at a page of a printed book through spectacles with convex glasses. He did so and found that he could read it with ease. From these circumstances it was very plain that this gentleman at the same time that his pupils had become dilated and his upper eye-lids paralytic, had acquired the sight of an old man, by losing suddenly the command of the muscles by which the eye is enabled to see near objects distinctly . . .

After I had reflected upon this case it occurred to me that, as the juice of the herb Belladonna, when applied to the eye, occasions the pupil to dilate considerably, and so become unalterable by light, an effect might at the same time be produced by it upon vision, similar to that which I have just described. I had, indeed, in the course of a few years applied Belladonna several times to my own eyes, without observing any change in my sight, beyond what I referred to the increased size of the pupils; but as I had not looked for any other, I thought it possible that some additional one might have happened without my having perceived it.

Because of his presbyopia Wells regarded his own eyes unfit 'for the experiments which I wished to be made with Belladonna'. He therefore applied 'the juice of Belladonna' to Dr Cutting's* left eye.

Half an hour after when his pupil was but little dilated perfect vision commenced at a distance of seven inches; in fifteen minutes more it began at the distance of three feet and a half. When his pupil had acquired its greatest enlargement the distance was eight feet. This state of vision continued in its greatest extent to the following day; and it was not till the ninth day that he completely recovered the power of adapting his eyes to near objects. Dr Cutting remarked that after his pupil had nearly returned to its former size, his capacity of adapting the eye to different distances was still very limited. A great degree of dilatation may take place in the pupil without total want of power to adapt the eye to different distances. Though I could not doubt the accuracy of Dr Cutting's observations, yet as he was

*Described by Wells as a 'young physician'

the first person who ever applied Belladonna to his eyes for the purpose which has been mentioned, and as the results were remarkable, I requested him to repeat the experiment with the other eye. He complied with my desire and found that the appearances which followed were similar. As the action of the external muscles of the eye has been frequently resorted to for an explanation of its capacity to see objects perfectly at different distances, I requested Dr Cutting to attend to this matter. He accordingly ascertained while his eye was in a natural state, the distance from his face of the nearest point at which he could make the two axes meet, this being the greatest trial of strength to which those muscles can be exposed. While in consequence of the application of Belladonna he was without power of adapting his eyes to different distances, he found that the strength of these muscles was not diminished. It follows therefore that the external muscles have little or no concern in fitting the eye to see distinctly at different distances.

The only other part of the eye or its appendages which remains for enabling us to see equally well at very different distances is the crystalline; and that it does produce this effect either wholly or very nearly so is manifest from the necessity even young persons are under who have lost it, of using glasses of very different convexities for near and remote objects. But in what way this important office is performed by it seems still unknown. The learned Dr Young† indeed has supposed that the crystalline has the power of altering its figure; but the proof hitherto given in favour of this opinion appears very defective.

In 1794 I attempted to submit its justness to the test of direct experiments by applying to the crystalline of oxen which had been felled from thirty seconds to a minute before, chemical and mechanical stimuli, and those of Galvanism and electricity; but in no instance was any alteration of figure or other indication of muscular power observed.

The mydriatic property of belladonna was, of course, well recognized for centuries, but Wells must be credited with the important discovery of its cycloplegic action. He fully appreciated that these two effects of belladonna were distinct as they 'were not inseparably connected'.

Wells was also first to give a correct explanation for the deposition of dew. This was based on many observations and experiments which were described in his 'Essay on Dew', for which he was awarded the Rumford Medal by the Royal Society. His writings reveal him as an acute observer, always striving to submit his theories to critical tests.

Sir Benjamin Brodie, one of his ablest medical contemporaries (Brodie, 1865), paid the following generous tribute to Wells:

'Dr Wells was one of the most remarkable persons with whom it has been my lot to be personally acquainted'. Although he admired Wells's intellect, Brodie could not refrain from noting his

†Dr Thomas Young, 1773-1829

'dry and, in general society, ungracious manners' and tendency to 'take offence where no offence was intended. Yet he had great kindness and warmth of heart mixed up with these less amiable qualities'. His circle of intimates, which was very small, included David Hume,

He was never married, but lived by himself with only a single maid-servant in a small house in Serjeants' Inn, Fleet Street, a house in which he died in the evening of 18 September 1817.

At his request his body was deposited in Lady Jersey's vault in St Bride's Church, Fleet Street.

References

- BRODIE, SIR BENJAMIN (1865) 'Collected Works', vol. 1, p. 59. Longman, Green, Longman, Roberts & Green, London
 JAMES, R. R. (1928) *Brit. J. Ophthal.*, **12**, 561
 WELLS, W. C. (1797) *Phil. Trans. B*, **87**, 416
 ——— (1811) *Ibid.*, **101**, 378
 ——— (1818) 'Two Essays one upon Single Vision with Two Eyes and the other on Dew'. Longman, Hurst, Rees, Orme, Brown & Hurst, Robinson & Co, London