Joseph Crabtree: A Complex Number

Distinguished Chairman, Elders, Scholars, Neophytes!

The T-shirt I am wearing proclaims a slogan [**Subvert the Dominant Paradigm**] that I feel Crabtree would have applauded and one that I propose to implement tonight. Indeed, it may be that my address will be seen by some as subverting the dominant paradigm of what a Crabtree oration should be.

Nonetheless a voice has spoken and has chosen me as this year's orator. How these things happen I know not; when I find out, I shall no doubt write a learned paper on the matter. But I am asked to walk in the shoes of the many eminent orators who have gone before me. The shoes of my predecessors are large ones indeed, and it seems strange that a simple barefoot mathematician should be asked to fill them. I feel deeply honored by the trust placed upon me, and, as sports-men and -women are wont to say, "humble", when what they really mean is "mighty proud". It is in the best traditions of Crabtree scholarship that each orator stands on the giant shoulders (as well as in the large shoes) of those who have gone before, and so hopes to see further and to discern through the mists of time and undeserved academic neglect the details of one more aspect of the life of our hero: that paragon whose likeness we have before us and who presides in silent judgment of our endeavors.

Now it may well be that the elders in their collective wisdom considered that an oration by a mathematician would cast some light on Crabtree's contribution to that discipline. And so it shall be; but before I address myself to this task, consider a methodological point. *That* Crabtree contributed to Mathematics is axiomatic. But conversely, Mathematics and the mathematical cast of mind may equally well contribute to Crabtree scholarship. Let us begin in this vein.

We remind ourselves that although Crabtree excelled in all he did, in every aspect of his long and productive life, and so *of course* made important contributions to Mathematics, we nonetheless do injustice to our hero if we do not bear in mind the priorities that he himself embraced. Crabtree was first and foremost a *poet*. Take the two principal quantitative canons of historical research and apply them to the case in hand: the earliest of the Crabtree revelations are the most secure, and the most frequently attested stories are the most reliable.

So, we search the early canonical literature for recurring themes, and when we do, we discover that Crabtree was *indeed* first and foremost a poet, and a consummate one. It was in return for services rendered to the then impoverished Crabtree over a matter of a paternity suit, that one William Wordsworth was permitted to publish much of Crabtree's oeuvre under *his* name – in fact, *all* of the best verse usually attributed to Wordsworth is actually by Crabtree. Wordsworth's unaided efforts were of the "Spade! with which Wilkinson hath tilled his lands" variety.

But above and beyond these pirated works are the great Crabtree poems, mostly now lost. There are two principal ones: the *Ars salutandi* and the *Ode to Claret*. A little below these in critical acclaim lies another, sometimes referred to as *Crabtree's Marching Song* and sometimes as *Crabtree's Drinking Song*, and then there are various somewhat lesser pieces, a few of which have even been published, although rarely in full in the canonical literature.

So, bearing all this in mind, it occurred to me that a quantitatively informed approach, addressing itself to the problem of Crabtree's verse, might be capable of shedding some light on these murky corners of Crabtree scholarship. And so it has proved to be.

A reconstruction of *Ars salutandi* or *Ode to Claret* is a task beyond me, I am afraid. But the *Marching Song* is another story.

I begin by reminding scholars of what is already known. We have the opening words:

> We march we know not whither …

and the refrain

> Great unaffected vampires and the moon.

This much was revealed by the Immortal Memory in his address to the parent chapter in 1955, and despite much scholarly puzzlement in the subsequent half-century and more, there has been no further progress. That is all we have. The task of reconstruction is thus no easy one. The entire remainder must be the product of diligent research.

From the one complete line that we have (the refrain), we see that the work is written in iambic pentameter, as indeed were both *Ars salutandi* and *Ode to Claret*, and we can thus deduce that the opening line is three syllables short.

So we must find a three-syllable phrase to complete it. And where else would we look but in the Wordsworth oeuvre? Anything that Wordsworth filched from Crabtree would of course find a place among the more admired of Wordsworth's efforts, and once we realize this, the search narrows considerably. We must take the best of the verse attributed to Wordsworth and seek a three-syllable phrase that has somehow been shoehorned into a context where it doesn't quite fit.

Looking back in hindsight through the retrospectoscope, I realize that I should have come upon the answer much sooner than I did. Many were the fruitless hours I spent in quest of a phrase that is so well-known that I should have found it immediately. In the sonnet *The World is too much with us*, immediately following these opening words, we find a shift of focus: "late and soon". So now Crabtree's first stanza may be seen to read:

> We march we know not whither; late and soon
> [and now I only need a second line
> and after that a third, before we reach]
> Great unaffected vampires and the moon.

Here we have progress! We see that the rhyme-scheme is ABBA (whereas both *Ars salutandi* and *Ode to Claret* are believed to have used ABAB).

The next step is not nearly so difficult. We need only reflect that Wordsworth would hardly have been content with a theft of a mere three syllables. Of course he wasn't; the entire next line is also stolen – it is pure Crabtree. So now we have:

> We march we know not whither; late and soon,
> Getting and spending, we lay waste our powers
> [and now we only need a single line]

Great unaffected vampires and the moon.

At this point, I got stuck for many months, but eventually I realized that so high was the regard in which Crabtree was held, and so reluctant was he to accept personal credit for his work, that he made himself easy prey for *any* potential plagiarist. And plagiarists there were, a-plenty! It was Lord Byron who published Crabtree's third line as his own. And re-inserting it in its proper place enables us to write out the entire first stanza:

We march we know not whither; late and soon,
Getting and spending, we lay waste our powers,
[Ignoring] as we chase the glowing hours
Great unaffected vampires and the moon.

Before I move on, I pause to ask you to admire the honesty of those square brackets! We have no vouch for the word "Ignoring". This I have supplied myself, and in the best traditions of scholarship, I flag this fact. Perhaps Crabtree actually wrote "Neglecting", perhaps "O'erlooking", perhaps something else. We do not know. So "Ignoring" will have to stand in for all these possibilities.

The entire poem is four stanzas long. I will not trouble scholars with the nuts and bolts of the remaining reconstruction. I trust that my methodology is now clear. The second stanza reads:

We march. We know not whether greybeard loon
May yet detain us, telling how with cross-
Bow cruel he shot: an albatross,
Great unaffected vampires and the moon.

The influence on another poet is manifest; his pilferings are blatant. All I need offer is a single comment in elucidation. The shooting of vampires is a highly skilled art, involving silver bullets, especially consecrated stakes and much other vampire-specific paraphernalia. Small wonder that these vampires were "unaffected" by a simple shot from a crossbow and small wonder also that the mariner saw best to "shoot the moon", or as we Aussies would say "shoot through".

The poem continues to a third stanza:

We march; we know not wherefore. Summer noon
Fades to the evening. Then gleam on our sight,
In place of lovely phantoms of delight,
Great unaffected vampires and the moon.

And a fourth:

We march we know not whither. Every June
Only but briefly do we not remember
Dreary-nighted dark and dank December,
Great unaffected vampires and the moon.

It is a sad reflection on Crabtree's contemporaries that of all the plagiarists involved, only Keats had the grace at least to invert the image.

Now that we have the entire poem before us, we can see the reason for the confusion about its title. It is clearly about marching, yet, unlike other marching songs, it cannot be said to extol that activity. Rather, it gives a distinct impression of that maudlin stage reached toward the end of a bout of heavy drinking!

But I have another brief, and perhaps I stray too long away from it; I must also explore Crabtree's contributions to Mathematics. So to these let us turn.

In the early years of Crabtree's life, the great scandal besetting Mathematics was the inadequate logical status of the differential calculus, the *infinitesimal calculus* as it was then known.

As one twentieth century author (W. W. Sawyer) recounted matters: "In dealing with small changes [infinitesimals], mathematicians followed their own convenience: at one moment they said, '[this infinitesimal] is very small, it will be convenient to regard it as being equal to 0.' A little later they wanted to divide by [it], so they said, 'If [it] is 0 we cannot divide by it: we will suppose it to be very small, but not quite 0.' "

This was clearly an unsatisfactory state of affairs, and it drew trenchant criticism from the philosopher and cleric, Bishop Berkeley, whose 1734 book *The Analyst* derided the use of such infinitesimals (which he called "evanescent increments") in forceful fashion: "And what are [they]? … . May we not call them ghosts of departed quantities?"

This then was the principal challenge of the time. Quite how far Crabtree got with *The Synthesist*, his reply to Berkeley, is not quite clear, but I will speculate later that in fact his work went a long way towards a resolution of the problem, and was, as we now would put it, a triumph of lateral thinking. But that is to get ahead of myself. Other events intervened and led to Crabtree's contributing to Mathematics in quite another way.

Our distinguished chairman, last year's orator, recounted how Crabtree accompanied Elizabeth Chudleigh Hervey/Pierrepont, the Duchess of Kingston, in her flight from the rough "justice" ordained by the House of Lords. The duchess ultimately arrived in St Petersburg, but not before spending some time in Paris. Orator Cummins naturally but perhaps naively assumed that Crabtree continued to accompany the duchess on the second leg of her journey. However, in this he erred. It was only much later, when the duchess made a subsequent trip to the French capital, that Joseph resumed his interrupted voyage and so arrived in Russia and into the service (in more senses than one) of Catherine the Great.

What detained Crabtree was his meeting with the lady who was to become the love of his life. We do not know her name in full. Her pet name for Joseph was "Cree", which we easily recognize as an abbreviation of "Crabtree"; his for her was "Lall", and so we may speculate that her surname was most likely "Lavalle". Their romance was short, but intense. Although it is quite unlikely that Crabtree was ever able entirely to devote his prodigious sexual energies to the service of any one woman, we may perhaps allow him the grace of assuming that in this instance he did his best. The lack of any mention in the canonical literature of any competing claim on his affections in the late years of the 1770s speaks volumes.

The young couple were besotted with one another, and their love was not only deep but also public. Although always short of money, they nonetheless managed several trips backwards and forwards between England and France. It was on one of their trips to England that their idyll came to the attention of the painter Thomas Gainsborough. He included the pair in one of his landscapes, and here it is [Plate 1]. The year of its composition is said to be a little uncertain, but it will be revealed tonight that it was 1778.

The love between Crabtree and Mlle Lavalle, intense as it was, was also sadly short-lived. The lady died in childbirth, as in those days women often did, on March 11, 1780. Grief-stricken as he was, Crabtree saw that the most urgent matter before him was the care and raising of his infant son, whom the dying woman had named August Leopold. Crabtree possessed many skills, but the tending of the young was not among them. Perforce taking the child with him, he traveled extensively seeking a solution to his dilemma, until in the Prussian town of Eichwerden he met a humble craftsman, a builder named Christian Gottfried Crelle, whose wife had given birth to a stillborn son on exactly the same day that young August Leopold was born. In these sad circumstances the builder offered to adopt the young August Leopold.

It seemed to Crabtree that the hand of providence had intervened, for not only was the immediate practical problem resolved, but the child would grow to manhood with the name A. L. CRELLE. The eight letters of his name constituted a precise anagram of those forming the pet names CREE and LALL of his parents. As I shall later demonstrate, such intertwining of names was a common fancy of lovers of that time, and what better way so to indicate the parentage of the child of so intense a union?

The young August Leopold grew to manhood in the very humble circumstances of his adoptive family. There was no money for a formal education, but the youth read voraciously. He achieved employment as an engineer, but his passion was Mathematics. He devoted enough of his spare time to its study to receive a doctorate in that discipline from the University of Heidelberg – this without ever attending any of their classes.

Here is surely the true Crabtree spirit revealed; like father, like son. Furthermore there is extant a portrait of the young August Leopold at about the age of 20. Here it is [Plate 2], and I ask scholars to compare it with *the likeness*. The age of the sitter is of course different, but the choice of costume is remarkably alike, as is the attitude of the head. But most telling of all is the top of the head. In Joseph, the baldness is more advanced; in the younger August Leopold, it is incipient, yet evident to the careful eye. I remind scholars that baldness is a strongly inherited trait.

But the father-son similarities go much deeper than mere surface appearance. August Leopold's biography on the MacTutor website of mathematical lives has this to say:

> "[He] was certainly not a great original mathematician, but he had three qualities which made him as important for the subject as any great researcher might have been. These three qualities were firstly his great enthusiasm for the subject, secondly his organizational ability, and thirdly his ability to spot exceptional talent in young mathematicians."

How very Crabtree! And we may go further. From orator Hudson's (1983) address to this chapter and orator Murray's of 1990, we know that Joseph had great skills as an engineer; so too did his son. We also know that Crabtree's very best gifts were literary rather than mathematical. So also with his son. August Leopold is best remembered as the founder and first editor of the very first journal (properly so called) of research Mathematics, *Journal für die reine und angewandte Mathematik*, still referred to today simply as "Crelle".

So the son flourished and indeed prospered, due in large measure to the genetic inheritance from the father. But what of that father?

We may well picture the poor man as quite bereft. In several ways. He had lost Mlle Lavalle, and had had to relinquish his son. Moreover what little money he had possessed, he had made over to the good builder and his wife. Emotionally forlorn, absolutely destitute, he faced the urgent need to earn basic sustenance. His poetry was no path to riches, it isn't now and it wasn't then. Similarly with his Mathematics.

Eventually he realized the operation here of Gresham's Law (bad currency drives out good): that what the public wanted was not Mathematics, but Numerology. To keep the wolf from the door, he was reduced to the role of a mountebank numerologist, and in this guise he earned enough to ensure a meager frugal living.

Among the clients who came to his humble door was an abbess, a large and powerful woman from whom Crabtree had high hopes of some more than mediocre remuneration. Her problem was straightforward, or so Crabtree saw matters. She had charge of a convent of some 40 souls, young and often flighty women fleeing the blandishments of the world at large, and dedicating themselves to the search for the higher life.

The convent had, however, been attacked by a disturbance, an epidemic of insomnia, and this affliction had led the abbess to seek Crabtree's help. You will certainly agree with me that he was equal to such a task, but you may well inquire what evidence I have for the revelation that follows.

However I anticipate the question. We will repeat tonight the precise method adopted by Crabtree in his determination of the abbess's case. It will depend on the discovery of three numbers, and this august gathering will be guided by the spirit of Crabtree himself to those very same three numbers and to their dramatic sequel.

Crabtree began, as he always did, by writing out the ten basic digits of the decimal system.

0 1 2 3 4 5 6 7 8 9

Notice, by the way, that Crabtree anticipated modern developments by beginning the count at zero. He always was ahead of his time.

Addressing the abbess, he then said that the problem seemed to devolve upon the question of SLEEP at NIGHT. To this diagnosis she agreed.

So now Crabtree modified his table to read:

0	1	2	3	4	5	6	7	8	9
S	L	E	E	P	N	I	G	H	T

He then asked the abbess to choose three of the numbers from the list. I will now ask the members of this august gathering to do the same, using this set of icosahedral dice, and so to replicate the choice made by the abbess. [Ordinary dice, with their six faces, are quite incapable of generating the full range of our decimal digits; icosahedral dice, by contrast, have 20 faces and so generate each of the digits (twice over, but this is no matter).]

[The numbers chosen were 4, 1 and 8.] Taking these three numbers, Crabtree arranged them in descending order, thus 841. He next arranged them in ascending order, thus 148. He placed the second set of digits below the first, thus

$$\begin{array}{r} 841 \\ \underline{148} \end{array}$$

and subtracted.

In this way, he found a new three-digit number 693.
Next he reversed the digits and so reached 396.
This time he added
to find the number 1089.

Then, turning to the abbess, he put it to her that not only were there 40 young nuns in her care, but also that the problem involved their inability to "catch 40 winks". When the abbess agreed that this was indeed the case, Crabtree declared, "Your problem is indeed multiplied 40-fold!" And so he multiplied by 40: $1089 \times 40 = 43560$. Then, turning to the abbess, he declared, "There is the answer to your problem!"

The abbess was quick of wit. She could read downwards as well as sideways, and so was able immediately to apprehend the thrust of Crabtree's solution to her problem. In order to understand what happened next, recall that she had undertaken vows of poverty, chastity and obedience. Let us consider these in reverse order.

So formidable a woman was the abbess that she commanded obedience from all who encountered her. She *expected* obedience from the members of her convent. For her own part, however, she had reached such an eminence that she *owed* obedience to no-one on earth, save, presumably, the pope (who, far away in Rome, had probably never heard of her).

Chastity had come easily to her. She had never had the slightest stirring of any temptation to behave otherwise. However, she was much exercised in this direction on behalf of her 40 charges, whose flighty nature has already been remarked. In return for their obedience to her, she waxed zealous in her concern for their chastity. She interpreted Crabtree's solution to her problem as a direct assault on the purity of these same charges and, moved to righteous anger, she smote Crabtree over the head with her umbrella.

Which brings me to poverty. Now, obedience is often acclaimed a virtue, especially by those in authority. Chastity, likewise, is reckoned among the virtues, although this was hardly an opinion entertained by Crabtree. However, poverty has never been regarded as a virtue, not on any list, cardinal, classical, intellectual, moral or theological. The corresponding virtue is *thrift*, and this the abbess exercised in abundance.

The incident I am recounting took place in the early 1780s, toward the end of the life of one Jonas Hanway who, following extensive travels in Persia, brought back the umbrella to Europe and popularized it there throughout his final 30 years. In fact in those days, an umbrella was usually referred to as a Hanway. The umbrella with which this thrifty abbess smote the hapless Crabtree was an early Hanway, carefully preserved over almost three decades.

I now quote from Mary Bellis's *History of the Umbrella.* "The early European umbrellas were made of wood or whalebone and covered with alpaca or oiled canvas. The artisans made the curved handles for the umbrellas out of hard woods like ebony."

Such was the heavy and powerful weapon used to attack the Crabtree person.

All of which brings me to a painful subject. In 1978, the hitherto cozily united world of Crabtree scholarship was rent by a calamitous schism. Arthur Tattersall, addressing the parent foundation in that year, claimed to have discovered that Crabtree suffered such dreadful injury to those appendages at the lower end of his torso that thereafter he became known as Josephine Crabtree. So shocking was this alleged revelation that by no means all of those gathered to hear it could bring themselves to accept it as genuine.

A deep division thus entered the area of Crabtree studies. On the one hand are the Tatters, those who accept Tattersall's alleged revelation as true coin, and believe that Crabtree's manhood was indeed reduced to tatters. On the other, there are the Nutters, who do not believe this. I align myself with the latter group. With Gordon Taylor, orator to this Chapter for 1985, I believe that Crabtree kept his nuts!

The source of Tattersall's confusion is, however, clear. It was not to the *lower* appendage of the Crabtree torso that damage was inflicted, but to the *upper*: to wit, the head. The damage done was internal to that extremity, and perhaps not immediately evident, but the moment we recognize it for what it was, we see at once how it goes a long way to explain many hitherto puzzling aspects of Crabtree's life.

The brain is composed of two hemispheres connected by a structure known as the *corpus callosum*. It was for determining the role of the *corpus callosum* that Roger Sperry shared the Nobel Prize for Physiology and Medicine in 1981. Its main function is to allow communication between the two halves of the brain. I quote from a press release issued in connection with Sperry's award. "[By studying patients whose *corpus callosum* had been damaged, Sperry was able] to show that each cerebral hemisphere had its own world of consciousness and was entirely independent of the other with regard to learning and retention. Moreover, each had its own world of perceptual experience, emotions, thoughts and memory completely out of reach of the other cerebral hemisphere."

The blow from the abbess's Hanway fractured Crabtree's *corpus callosum*, and thus Sperry's observations are directly applicable to his case. And so we now see how prescient Gordon Taylor and my father were when, in their orations to this chapter over 20 years ago, they each included the words: "There be two crabs in [that] tree." We likewise see the origin of those apparent attacks of bilocation so trenchantly remarked by orator O'Brien in 2005. While one hemisphere was bent on one task, the other's mind was quite elsewhere.

This research puts me very much in mind of the theory of complex numbers, those that involve the square root of −1. These contain both a real and an imaginary part. The "real part" is seen as an ordinary number, while the "imaginary part" was a new invention of the 16th Century Italian algebraist Rafael Bombelli. The imaginary numbers were so designated because they behave in somewhat different ways from the familiar real numbers; no real, ordinary, common or garden number could possibly serve as the square root of −1.

But now we enter deep ontological waters. As many might put it now, "a complex number has two parts; the second (although *labeled* imaginary) is just as real as the first, and the first (though *referred to* as real) is every bit as imaginary as the second." It depends on what you mean by "real"! (In what sense is any number *real*?)

On this latter understanding, Bombelli's terminology is regarded as an archaic usage. As the mathematical historian G. B. Dantzig put it: "... these phantom creatures [the imaginary parts] were not phantoms at all, but had just as concrete existence as any real number. [The complex numbers] lead a sort of double existence."

A complex number behaves for almost every purpose just like an ordinary (real) number; in respect of its everyday algebraic properties, it is the same. So also with the so-called "split-brain individual". Applying this dual way of seeing matters, we can appreciate the situation with Crabtree. Those flights of fancy entertained by his right brain were, as we would say as external observers, imaginary, just like the second component of a complex number was for Bombelli. However to Crabtree, they were every bit as real as the different adventures of the left brain, just as, in Dantzig's view, the imaginary numbers are every bit as real as the real numbers themselves.

I quote again the Nobel citation for Sperry. "[The destruction of the corpus callosum entails] no obvious changes at all with regard to the patient's general behavior and reactions. Nor [can] one demonstrate with psychological test methods any impairment at all in the patient's ability to perceive and learn."

So, to all external appearances, Crabtree recovered from the blow to his head, although his life was actually subtly changed. While his left brain continued to act normally, to write poetry and to pursue Mathematics, his right brain, now completely unchecked, entertained those fantasies of which we have heard altogether too much in many recent orations. Thus, as Crabtree's left brain guided him through his round of diverse sexual encounters in his usual way, his right brain was fantasizing on how an *alter ego*, Josephine, might have experienced them. The *memories* Crabtree retained of these fancies were every bit as real as the memories of events that had actually occurred, even if the fancies were not themselves real.

For I here confess myself a hard-headed realist, and thus a follower of Bombelli rather than of Dantzig, and so, as my subject is Crabtree's contributions to Mathematics, I follow the adventures of Crabtree's left brain. (The meanderings of his right brain I leave to others. They are wonderfully entertaining, but to my mind they lie outside the realm of rigorous scholarship.)

Crabtree's greatest contribution to Mathematics was undoubtedly his fathering of August Leopold, but it was by no means his only one. Another was his encouragement of the hot-headed and impetuous young genius Évariste Galois. Much of this story has already been told by Sir James Lighthill in his 1986 oration to the parent foundation. Although I have some points of difference with Sir James, it is quite clear that Crabtree played a major role in the elucidation of the question of the solution of quintic and higher order algebraic equations; on this central point Sir James and I are as one.

With the availability of complex numbers, this area of algebra became a rich hunting ground for many eminent mathematicians. Much of the best of such research is now attributed to the young Galois. Lighthill regarded all these results as the product of Crabtree's fertile (left) brain, but perhaps in so attributing them he rather underestimated Galois. There are so many speculations about the life and work of this young genius, that I am inclined (although with due deference to Sir James) to think that Crabtree's role was more subtle, more a background influence. Just like his son August Leopold, Crabtree possessed in great measure the "ability to spot exceptional talent in young mathe-maticians". And he saw Galois as one outstandingly talented young mathematician, at a time when most others could not.

It was surely Crabtree who assisted the young Galois in the formulation of his ideas, and we may be assured that had Galois listened more intently to Crabtree, those ideas would have been expressed more clearly, and so have achieved publication within Galois's lifetime. But in two momentous matters, Galois spurned the advice of his mentor.

The first was his submission to the *Académie des Sciences* of a poorly written draft of his mathematical discoveries, which Crabtree would have edited into a more comprehensible form, had he been allowed the opportunity. When this less than satisfactory paper reached the *Académie*, it was refereed by the unforgiving Augustin-Louis Cauchy, whose reactionary politics were the direct opposite of Galois' well-known radical revolutionary fervor. The defects in the exposition were all the excuse Cauchy needed to reject the paper. Subsequent attempts to repair the damage met the same fate.

But Galois's refusal to heed Crabtree's advice led to an even more disastrous outcome. Whereas Crabtree's devotion to Mlle Lavalle was entirely reciprocated by the lady in question, poor Galois became infatuated with a quite "unworthy cocotte", as she was later to be described. We know *her* name in full; she was one Stéphanie-Félicie Poterin du Motel, an appellation as pretentious as the young lady was fickle.

The impassioned Galois would fancifully combine the names Évariste and Stéphanie into an attempted unity. Here are three examples [Plate 3], three among several still extant. It was the young man's pathetic attempt to convince himself that his infatuation was a replica of the great love between his mentor Crabtree and Mlle Lavalle. This misconception cost Galois dear. When told of Stéphanie's true character, he took umbrage, and challenged his informant to a duel. Crabtree tried vainly to deflect the young man from this disastrous course, but his advice was ignored. A little before his 21st birthday, Galois lay dead – the result of a gesture as futile as it was romantic, and as romantic as it was futile.

Crabtree tended to blame Cauchy for much of the young man's sad misfortune. He thought that had Cauchy not rejected so cavalierly the ill-expressed but deeply insightful Mathematics of Galois' paper, events might have turned out quite otherwise. He felt a deep animosity towards Cauchy, and it particularly pained him that Cauchy shared a first name and a set of initials with his own son August Leopold.

A lesser man than Crabtree would have had yet another reason for complaint against Cauchy. One of Cauchy's principal claims to our respect is the service he is supposed to have rendered in laying to rest those "ghosts of departed quantities" so savagely attacked by Bishop Berkeley. Every first-year Calculus course today follows Cauchy in using a formulation that does not say whether infinitesimals are zero or non-zero. Rather the concept is avoided entirely!

What a simple, but original, solution to the problem! How better to hoist the learned bishop (Berkeley) with his own petard? We can answer his rhetorical question by simply ignoring it! But is this solution to the, by then, century-old dilemma really Cauchy's? Doubts have been raised. Influentially. Here is one: Did Cauchy plagiarize Bolzano? [Plate 4]. The question has been much debated, some say yes, others say no. But *I* say the relevant question is: Did Cauchy plagiarize Crabtree?

An affirmative answer is well indicated by the "lateral thinking" nature of the solution to the problem. This, as we know, was almost the hallmark of Crabtree's genius. And now is the time to remind scholars of Crabtree's lost work *The Synthesist.* This was the research that Crabtree was pursuing when his attention was distracted by his romance with Mlle Lavalle and the subsequent birth of August Leopold.

Cauchy's work on the foundations of the calculus was published in 1821 in his *Cours d'analyse.* This was almost 30 years after Crabtree's agreement with Wordsworth, and in those 30 years Crabtree had allowed, or at least acquiesced in, the theft of much of his other material; his entire *Marching Song* had been mined for choice lines. Crabtree was therefore past resentment over Cauchy's theft of his solution of the problem of infinitesimals; he was quite philosophical on the matter. To Crabtree, Cauchy was simply one more in a long line of plagiarists whose activities no longer greatly troubled him; rather he saw them as silent tribute. As he much later (long after he had abandoned his pretense of knowing no French) remarked to the young Gustave Flaubert, "L'homme n'est rien, l'oeuvre c'est tout!" ["The author is irrelevant; the work is what matters!"] In this instance, the point was that Bishop Berkeley's critique of the calculus was rebutted. That this rebuttal bore the name *Cauchy* rather than *Crabtree* was a secondary matter, of minor importance.

What, however, continued to haunt our hero was the course his life had taken with the birth of August Leopold and the death of the boy's mother. But eventually here too he reached an accommodation of sorts. Recalling the Gainsborough portrait, he contrasted the activity of its composition with the enduring record of its outcome, and so penned a reluctant philosophical acceptance of the underlying and harsher reality. It was unearthed in an old bottle found lying on the now almost dry bed of Lake Charlegrark, on whose shores Crabtree made his Australian home for several years towards the end of his life.

To watch the landscape painter ply his brush
Is to see verbs solidify to facts,
As potencies are frozen into acts,
Butterflies preserved in spheres of glass.
The past's implacable givenness will not die;
Nothing can change, nor man nor God erase,
The patterns that were fixed in former days:
The painted clouds upon the painted sky.

Let us not then mourn what might have been,
Turns of events we scarcely understand,
But view this past we cannot recreate
And focus on two figures in the scene:
Ourselves, who side by side and hand in hand,
Rest in our timeless 1778.

Michael A. B. Deakin

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