The Chemist in Allegory: Augustus Vernon Harcourt and the White Knight

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In the realms of culture, science and literature have remained worlds apart. In 19th century England, however, a rare meeting of the two may have slipped by unobstrusively, to be found among the pages of one of the most popular books ever published, "Alice Through the Looking Glass." Though the story was written ostensibly to amuse children, its appeal has been universal. The tales of Alice's adventures in dreamland contain fascinating records of Victorian characters who lived and worked in the Oxford of her creator, Lewis Carroll. Among them was the distinguished chemist Augustus Vernon Harcourt.

Harcourt, born in 1834, came from a distinguished and priviledged family, with a history dating back to the medieval Duc d'Harcourt. Grandson of the Archbishop of York, and son of an admiral, after whose family Washington's Mount Vernon is named, Harcourt arrived in Oxford in 1854 to read Classics. His attention, however, soon turned to chemistry. Harcourt's chemical career at Oxford was long and fruitful, and he is remembered today as a pioneer in the field of physical chemistry, and especially of chemical kinetics (*1*). But an equally interesting aspect of Harcourt's long career at Oxford was his friendship with Charles Dodgson, fellow member of Christ Church and author (as Lewis Carroll) of the immortalized Alice Tales. Dodgson entered Christ Church in 1851, three years before Harcourt came to Oxford. The number of entries in Dodgson's diaries, now in the British Museum, dating from 1855 to just before his death in 1898, show clearly how frequently they spent time together, and with other Oxford figures like the Brodies and the Liddells.

Sir Benjamin Brodie was then Professor of chemistry at Oxford and Harcourt's mentor, and Alice Liddell was the young daughter of the Dean of Christ Church. During the first week of August in 1862, the diaries indicate that Dodgson and Harcourt had spent much of their free time together with the Brodie and Liddell children.

August 2nd 1862

> Mrs. Brodie brought her children over to be photographed in the morning . . . after which Margaret and Ida (the Brodie children) came down again to go with the Liddells, Harcourt and myself, on the water. Then back to croquet at the Deanery, and Harcourt and I went there again after dinner to escort the Brodie's home, the Liddells also insisting on walking there and back with us . . . .

It was around this time that the tales of Alice were born, for Dodgson wrote,

6 August 1862

> In the afternoon, Harcourt and I took the three Liddells up to Godstow, where we had tea: we tried the game of "The Ural Mountains" on the way, but it did not prove very successful and I had to go on with my interminable fairy tales of Alice's adventures. We got back soon after eight, and had supper in my rooms, the children coming over for a short while—a very enjoyable expedition . . . .

To generations of Alice fans, one of the mysteries surrounding the creation of Carroll's tales is the contradicting memories of a hot summer's day, as remembered by Alice herself many years later and recorded in the opening lines of the famous tale: "All in the golden afternoon, full leasurely we glide. . .", and the discovery that the weather, that particular day, Friday July 4th, near Oxford was "cool and rather wet," an unlikely occasion for the inspiration of such nostalgic happiness (*2*). It may be, perhaps, that it was this later trip to Godstow, with Harcourt and the Liddell children, that later memories were to recall. The diaries also record several other river trips to Nuneham, the home of Harcourt's uncle, William Vernon Harcourt, for tea. Alice Liddell, recalling the event in later years, wrote:

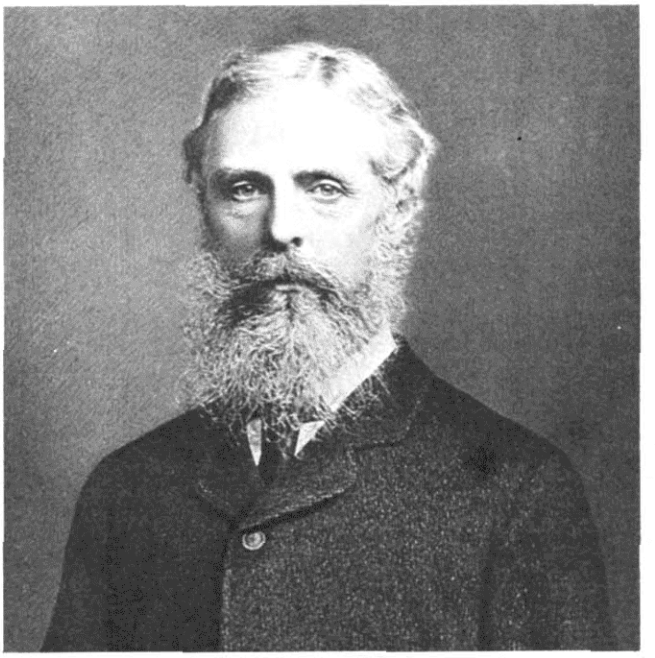

Figure 1. Portrait of Augustus G. Vernon Harcourt (1834–1919).

> Most of Mr. Dodgson's stories were told to us on river expeditions to Nuneham or Godstow, near Oxford. . . . I believe the beginning of Alice was told one summer's afternoon when the sun was so burning hot that we had landed in the meadows down the river, deserting the boat to take refuge. . . (*3*).

W. H. Auden has called the golden afternoon on which Alice's adventures were first inspired, purported to be 4th July, "as memorable a day in the history of literature as it is in American history." Perchance for the history of literature that, in fact, it was 6th August 1862 that Dodgson was to recall many years later with the poignant words:

> A tale begun in other days,
> When summer suns were glowing
> A simple chime, that served to time
> The rhythm of our rowing—
> Whose echoes live in memory yet,
> Though envious years would say forget.

With the publication of "Alice Through the Looking Glass" in 1871, however, the envious years were to bring the opposite. The tales begun in other days became etched upon the memories of millions.

Figure 2. The Oxford University Museum, from the Oxford Almanac of 1860. This was the first building erected in Oxford specifically for the study of science. Harcourt was among the first generation of chemists to take up residence in the new chemical laboratories.

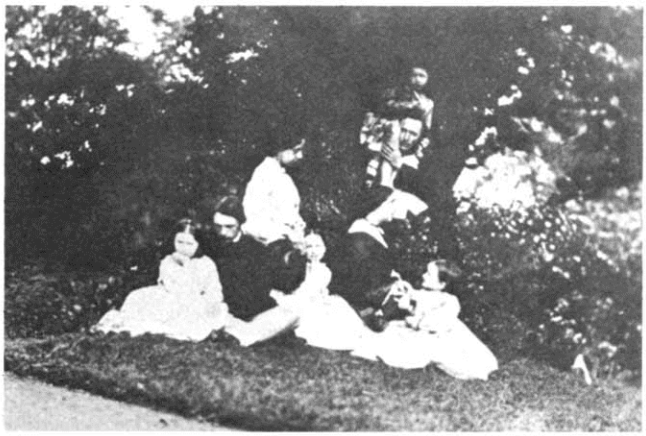

Figure 3. A group portrait of the young Harcourt (on left) with his University mentor, Professor Sir Benjamin Brodie and his family.

But the link between Harcourt, Dodgson and Alice is a closer one than that they merely knew each other. Enthusiasts of the Dodgson tales have always accepted that the characters in the Alice books relate to personalities associated with real lives in 19th century Oxford, though Dodgson no doubt took some care to disguise the more irreverent of his caricatures. Surrounded as they were by the most select of the university dons, as well as many notables of the day, including the Prince of Wales, Dean Liddell's children must have spent many an enjoyable hour matching the storybook characters with those they knew. The Red Queen in "Through the Looking Glass," for instance, was probably the Liddell children's governess, Miss Prickett, known as "Pricks," because she was one of the "thorny" kind (*4*). Another character that Alice meets in her journey through the looking glass is the eccentric White Knight.

The White Knight as Inventor

Dodgson's White Knight was a great inventor, as he tells us.

> The Knight went on again. "I'm a great hand at inventing things. Now I dare say you noticed, the last time you picked me up, that I was looking rather thoughtful."
> "You were a little grave," said Alice.
> "Well, just then, I was inventing a new way of getting over a gate—would you like to hear it?"
> "Very much indeed," said Alice politely.
> "I'll tell you how I came to think of it," said the Knight. "You see, I said to myself, 'The only difficulty is with the feet: the head is high enough already.' Now, first I put my head on the top of the gate—then the head's high enough—then I stand on my head—then the feet are high enough, you see—then I'm over, you see."
> "Yes, I suppose you'd be over when that was done," Alice said thoughtfully, "but don't you think it would be rather hard?"
> "I haven't tried it yet," the Knight said gravely; "so I can't tell for certain—but I'm afraid it would be a little hard."

One thing that Augustus Vernon Harcourt was not afraid of was hard scientific work. The story, still told in Oxford scientific circles today, is that the White Knight's flair for invention, as recounted in "Through the Looking Glass," was a reflection on Harcourt, who was, without a doubt, a highly innovative and successful inventor. Sometime during his long scientific career, Harcourt was responsible for the chloroform inhaler which was adopted by the British Medical Association as satisfying the minimum dose necessary to secure anesthesia during operations without endangering life. In another sphere, his interest in the properties of gases led to his appointment as one of the three "Metropolitan Gas Referees" responsible for testing the safety and levels of purity of gas used in London; this led to the introduction of the Harcourt pentane-lamp as the official British Standard of Light, a standard which was

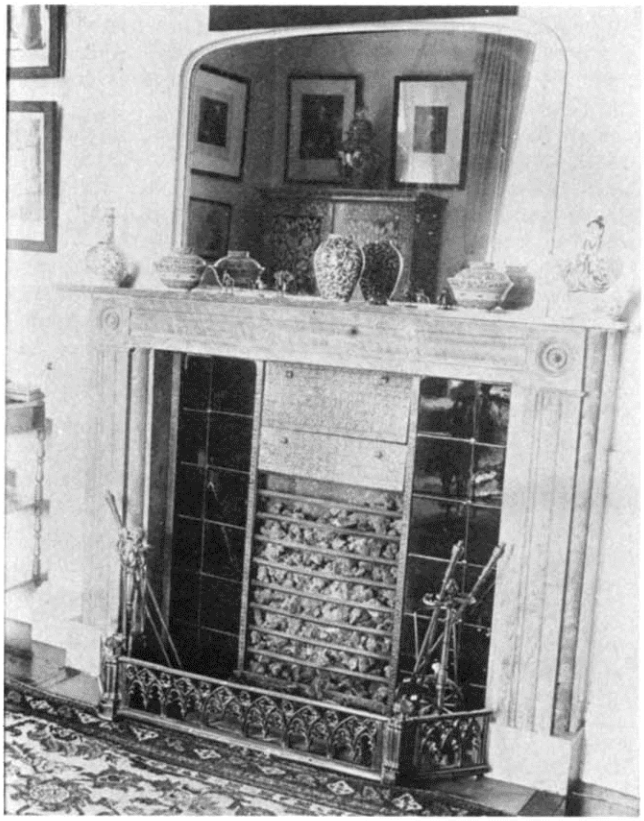

Figure 4. Photographs of the 'special fireplaces' invented by Harcourt to conserve fuel in the family home at Oxford, and later in their house on the Isle of Wight, where Harcourt retired. The Looking Glass fireplace is reminiscent of Tenniel's illustrations in the Alice tales.

to last until the 1930s. We know, too, that his family was also the recipient of several of his inventive ideas. At his home in Oxford, which he built over the River Cherwell, and which he reached conveniently by means of a punt, Harcourt built a squash-court, which doubled as a ballroom when the occasion called. For his children, of whom there were eleven, he built a hard, outdoor, tennis court, which, in the winter, could be flooded with water to form an ice rink. His family still recalls how Harcourt attempted to apply logic to their domestic economy, including the building of a special fireplace. This was high though not very deep, and the coke was laid in layers separated by metal and asbestos plates. On the top of this was laid the ordinary firewood, and when lit, the fire would burn like a timepiece, exposing each layer in turn. In front of this fireplace, which closely resembles the Tenniel illustration of Alice's Looking Glass fireplace, the children would hold his

letters, written in invisible ink, and thrill to see the contents exposed (*5*).

Dodgson, himself, was also fond of inventing things, as many writers have pointed out (*6*). Among the inventions which Dodgson talks of, are a travelling chess set, with holes to hold the pegged pieces, and countless games and toys for his many young friends. He also shared many of his inventive interests, such as photography, with his friend Harcourt. Dodgson, who was a remarkably gifted photographer, depended on Harcourt for much early assistance, as this previously unpublished letter shows (*7*):

Mar. 5th 1872

O come to me at two today
Harcourt, come to me!
And show me how my dark room may
Illuminated be,
Though gondolas may lightly glide
For me, unless you come,
No friend remains but cyanide
Of pale potassium!

Though maidens sing sweet Barcaroles
(Whatever they may be)
To captivate Lee's Readers' souls,
Yet Harcourt, come to me!
Yes, come to me at two today
Or else at two tomorrow,
Nor leave thy friend to pine away
In photographic sorrow.

C. L. D.

Dodgson and Harcourt were also, sometimes, competitors for inventions. In his diaries of 1871, Dodgson wrote:

Nov. 22nd,

The cards (were) deemed to be a success and won much praise (I find Harcourt belives them to be his invention also. My record, May 12, written May 22 looks as if I then believed it to be mine. I cannot now remember, and it matters little which is right.)

Commonly, scholars of Dodgson's work believe that the White Knight is, in fact, a caricature of Dodgson himself, not only because of his obvious knack for inventions but also because of the special relationship between the Knight and Alice. As Martin Gardner points out in his "Annotated Alice," for instance, of all the characters Alice meets in her two dream adventures, only the White Knight seems to be genuinely fond of her and to offer her special assistance. The Knight is also the figure that Alice herself remembers best in retrospect:

> Of all the strange things that Alice saw in her journey Through the Looking Glass, this was the one she always remembered most clearly. Years afterwards she could bring back again as if it were yesterday—the mild blue eyes and kindly smile of the Knight, the setting sun gleaming through his hair, and shining on his armour in a blaze of light that quite dazzled her. . . .

Dodgson wrote in a letter that the character of the White Knight—"whose hair was whiter than the snow, whose face was very like a crow, with eyes, like cinders, all aglow"—was meant to suit the speaker in the poem itself, and who was, undoubtedly, an eccentric inventor. Such a description neither perfectly fits Harcourt the chemist, nor the highly imaginative and mathematical Dodgson. Harcourt, however, was sometimes absentminded, as Dodgson recorded;

> Harcourt had asked me to come and dine with him and Mrs. H. I arrived at the hour fixed (7½), and had a very pleasant chat with Mrs H. till past 9! when Harcourt arrived, having forgotten all about it, and gone on in the laboratory (*8*).

Some authors have, in fact, read a multitude of allegorical meanings into Dodgson's White Knight and The Aged Aged Man, the character in the song which the Knight sings to Alice. Alexander Taylor, for instance, discerns a dual purpose to Dodgson's parodies; to imitate some well-known personality, and, at the same time, to express some definite ideas of his own. As Taylor put it, "Here are two voices, both apparently talking nonsense. They are, however, clearly distinguishable; it is impossible to mistake one for the other. The Aged Aged Man takes the wonders of nature, subjects them to some ridiculous process or other and gains some insignificant reward. The other is an irritable but preoccupied voice, the voice of one who has suddenly noticed something inexplicable, and is attempting to force an explanation from it while attending to more important matters . . . it seems quite clear to me through all the nonsense that the White Knight is *Pure Science*, and the Aged Aged man is *Applied Science*" (*9*).

The Course of Chemical Change

But it is in the *chemical* parallels between Harcourt and the White Knight that the temptation to draw an analogy is greatest. Harcourt's contribution to chemistry was unique in many ways. The point which he constantly raised was that the study of chemistry involved two factors: not merely the *result* of the chemical reaction but also the *course* of the chemical change. These ideas were vital ones, for they amounted to a criticism of chemistry as it was then practiced in Britain, in the second half of the 19th century. The problems which Harcourt considered the chemist had yet to resolve concerned the careful study of actual processes; those relating to the *rates* at which chemical changes occurred, and under what conditions. Were the changes simple, or multiple? and were these changes independent, successive, or simultaneous?

In retrospect, the history of chemical development shows us how unequally the two aspects of chemical reactions—the *products* of the chemical change and the *course* by which they were attained—had been pursued up until that time. As Harcourt pointed out, the study of the *results* of chemical action had engrossed the attention of chemists almost to the exclusion of the study of their course (*10*). Yet, only by paying closer attention to the methods and means by which chemical changes actually took place, could the laws of chemistry eventually be understood and formulated.

Harcourt, not infrequently, contrasted the result of generations of chemists' appetite for ever-new material compounds with the attitude of physicists toward understanding the forces of nature at their disposal. The different number of forces known, such as gravity, electricity, magnetism, heat and light were relatively small in number. But supposing, he said, that these forces consisted of a large number and were capable of being converted, not only into each other, but also into an infinite number of other different forms of distinct forces—would experimental physicists have spent their time transmuting one form to another, neglecting the study of the laws governing their existence? Harcourt believed that physics had advanced because experimentalists had taken care, before all else, to comprehend the conditions under which the known existing forces were produced, by first formulating their laws of behavior.

However, Harcourt pointed out, there were reasons as to why chemists had neglected the study of the *course* of chemical change. Such studies were beset with difficulties—both theoretical and experimental in nature. For, despite the vast number of chemical reactions known, few existed which were capable of close observation over its entire *course* of change. The time factor was a vital one in understanding how chemical changes occurred, but in practice the velocity with which the majority of reactions took place prohibited close scrutiny. This was particularly true for simple type reactions, which would have facilitated investigations. The problem for chemists, as Harcourt saw it, was either to find means by which very great reaction speeds could be estimated—as had been done in physics by the measurement of the speed of light—or it was essential to search for a chemical change whose speed permitted experimental observation.

The foundation of these ideas was laid at the very beginning of Harcourt's long career at Oxford, but he was to spend the

subsequent 50 years perfecting his technique. Together with the mathematician, and his lifelong friend, William Esson, Harcourt was to labor ". . . shoulder to shoulder . . . Harcourt planning the experiments, both checking one another's observations of time intervals, Esson doing the calculations . . . it was pioneering work, flawless in execution, and mathematically sound, its method prevails till this day," a later Fellow of the Royal Society was to write. Forty-seven years were to pass between the first paper by Harcourt and Esson in the *Proceedings of the Royal Society* in 1865 and their last paper together in *Philosophical Transactions* of 1913.

Throughout his long years of chemical teaching at Oxford, Harcourt was to take his own admonishments with true zeal, searching endlessly for a suitable chemical system to demonstrate the hidden complexities within the process of chemical change. In 1896, speaking as President of the Chemical Society, he lamented the loss to chemistry due to lack of understanding of the nature of chemical change at a deeper, more significant level. Recalling the original aims of the Chemical Society to furnish gradually a Museum of Chemistry from a collection of chemical specimens, which were, however, dispersed when the society moved its location from the ground floor of the Burlington House building, he wrote: "many other specimens had succumbed to the property of slow chemical change, a property existing, no doubt, in a number of substances which, in our hurried way, we deal with before the year is out, and we are not content to watch. It might by now have been of great interest to examine some of the decomposed specimens of this miscellaneous collection" (*11*).

It is not difficult, and all too tempting, to see a parody of the chemist laboring in the laboratory, with his motley collection of doubtful substances, pursuing unlikely ends, in Dodgson's witty lines on the exploits of the White Knight. Dodgson's characteristic play on words is illustrated here with the use of "course," which was also one of Harcourt's most frequently used chemical expressions:

> "Now the cleverest thing of the sort that I ever did," he went on after a pause, "was inventing a new pudding during the meat course."
> "In time to have it cooked for the next course?", said Alice. "Well, that *was* quick work, certainly."
> "Well, not the next *course*," the Knight said in a slow thoughtful tone: "no, certainly not the next *course*."
> "Then it would have to be the next day. I suppose you wouldn't have two pudding courses in one dinner."
> "Well, not the next day," the Knight repeated as before, "not the next *day*."
> "In fact," he went on, holding his head down, and his voice getting lower and lower, "I don't believe that pudding ever was cooked. In fact I don't believe that pudding ever *will* be cooked. And it was a very clever pudding to invent."
> "What did you mean it to be made of," Alice asked, hoping to cheer him up, for the poor Knight seemed quite low-spirited about it.
> "It began with blotting paper," the Knight answered with a groan,
> "That wouldn't be very nice, I'm afraid. . . ."
> "Not very nice *alone*," he interrupted, quite eagerly, "but you've no idea what a difference it makes, mixing it with other things—such as gunpowder and sealing wax. . . ."

Harcourt and Dodgson remained close friends during their long careers at Oxford. Certainly, Dodgson's extensive diaries record many visits to Harcourt's ancestral home at Nuneham and to London together with his friend, whose company he obviously enjoyed. It might be thought strange that so few letters between Harcourt and Dodgson exist among the many that have survived. But as Professor Morton Cohen points out in his edition of Dodgson's letters, this attests to the closeness of their friendship rather than the opposite (*12*). In the days when no telephones existed, every piece of communication was by paper, and a great deal more was recorded for posterity than today, except when meetings were frequent.

Whether the White Knight was Dodgson himself, or a caricature of his chemist friend Harcourt, or, more likely, a conglomeration of both and more besides, remains a fascinating conjecture. Harcourt was certainly there when the tales were being conceptualized, and was present at the end, to witness Dodgson's will.

"Ever drifting down the stream, Lingering in the Golden gleam, Life, what is it but a dream?", wrote Dodgson of those halcyon days. The quality of Harcourt's superb chemical labors of fifty years has been appreciated by many a chemist since, but no doubt, it is the chemical exploits of Alice's White Knight which will continue to intrigue.

Literature Cited

(1) For a brief account of some of Harcourt's chemical work, see M. C. King, *Ambix*, **28**, Part 2, July 1981, pp. 70–82; *Ambix*, **28**, Part 2, March 1982.
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(3) Collingwood, S., "The Life and Letters of Lewis Carroll," **1898.**
(4) "The Ann. Alice," **1965.**
(5) Recalled by Harcourt's surviving daughter, Mrs. W. Schiele.
(6) See the "Annotated Alice," **1965.**
(7) Unpublished letter from Dodgson to Harcourt in the possession of Robert Vernon Harcourt, grandson of Augustus Vernon Harcourt.
(8) The Dodgson Diaries, British Museum.
(9) Taylor, A. L., "The White Knight," **1952,** pp. 84, 116.
(10) See for example, Harcourt, A. V., "On the Rates at which Chemical Actions take Place," *Proc. Roy. Institution*, Vol. **5**, 305 (1868).
(11) Harcourt, A. V., *J. Chem. Soc.*, LXIX, 563 (1896).
(12) Cohen, M., *(Editor)*, "The Letters of Lewis Carroll," 2 Vols., London, **1979.**

Inauguration of the Center for History of Chemistry

The Center for History of Chemistry will be inaugurated on March 11, 1983. The Center—the first of its kind in the world—is co-sponsored by the American Chemical Society and the University of Pennsylvania. Both ACS and Penn have strong historic links to Joseph Priestley (1733–1804), the discoverer of oxygen and thus it is fitting that the Center's inauguration coincides with the 250th anniversary of Joseph Priestley's birth.

The celebrations will begin with the opening of a major exhibition devoted to "Joseph Priestley, Enlightened Chemist." Three symposia will also be held on subjects of contemporary and historical interest. There will be tours of the Chemistry Department's regional laser facility and synthetic metals laboratory, and of the Priestley exhibition. An honorary degree convocation honoring leading researchers will form one high-point of the program. Another will be the reception and dinner sponsored by the Philadelphia Section of ACS and the University Chemistry Department, as preludes to the annual Edgar Fahs Smith lecture.

On Saturday 12 March there will be a pilgrimmage to Joseph Priestley's home and grave in Northumberland, Pennsylvania. The actual date of Priestley's birth was 13 March 1733 in Yorkshire, England. Priestley fled to the United States in 1794, and was offered the professorship of chemistry at Pennsylvania. After some hesitation, he chose instead to join his son in a pioneering Utopian settlement on the banks of the Susquehanna. It was there—in Northumberland—that he built an extensive house, with its own laboratory, and lived until his death in 1804.