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Esprit de Corps

Beginning my studies the first step pleas'd me so much,
The mere fact consciousness, these forms, the power of motion,
The least insect or animal, the senses, eyesight, love,
The first step I say awed me and pleas'd me so much,
I have hardly gone and hardly wish'd to go any farther,
But stop and loiter all the time to sing it in ecstatic songs.

A son of the British Empire, Alan Turing's social origins lay just on the borderline between the landed gentry and the commercial classes. As merchants, soldiers and clergymen, his ancestors had been gentlemen, but not of the settled kind. Many of them had made their way through the expansion of British interests throughout the world.

The Turings could be traced back to Turins of Foveran, Aberdeenshire, in the fourteenth century. There was a baronetcy in the family, created in about 1638 for a John Turing, who left Scotland for England. *Audentes Fortuna Juvat* (Fortune Helps the Daring) was the motto of the Turings, but however brave, they were never very lucky. Sir John Turing backed the losing side in the English civil war, while Foveran was sacked by the Covenanters. Denied compensation after the Restoration, the Turings languished in obscurity during the eighteenth century, as the family history, the *Lay of the Turings*[1], was to describe:

Walter, and James and John have known,
Not the vain honours of a crown,
  But calm and peaceful life –
Life, brightened by the hallowing store
Derived from pure religion's lore!
And thus their quiet days passed by;
And Foveran's honours dormant lie,
Till good Sir Robert pleads his claim
To give once more the line to fame:
Banff's castled towers ring loud and high
To kindly hospitality
And thronging friends around his board
Rejoice in TURING's line restored!

Sir Robert Turing brought back a fortune from India in 1792 and revived the title. But he, and all the senior branches of the family, died off without male heirs, and by 1911 there were but three small clusters of Turings in the world. The baronetcy was held by the 84-year-old eighth baronet, who had been British Consul in Rotterdam. Then there was his brother, and his descendants, who formed a Dutch branch of Turings. The junior branch consisted of the descendants of their cousin, John Robert Turing, who was Alan's grandfather.

John Robert Turing took a degree in mathematics at Trinity College, Cambridge, in 1848, and was placed eleventh in rank, but abandoned mathematics for ordination and a Cambridge curacy. In 1861 he married nineteen year old Fanny Boyd and left Cambridge for a living in Nottinghamshire, where he fathered ten children. Two died in infancy and the surviving four girls and four boys were brought up in a regime of respectable poverty on a clerical stipend. Soon after the birth of his youngest son, John Robert suffered a stroke and resigned his living. He died in 1883.

As his widow was an invalid, the care of the family fell upon the eldest sister Jean, who ruled with a rod of iron. The family had moved to Bedford to take advantage of its grammar school, where the two elder boys were educated. Jean started her own school, and two of the other sisters went out as schoolteachers, and generally sacrificed themselves for the sake of advancing the boys. The eldest son, Arthur, was another Turing whom fortune did not help: he was commissioned in the Indian Army, but was ambushed and killed on the North-West Frontier in 1899. The third son Harvey[2] emigrated to Canada, and took up engineering, though he was to return for the First World War and then turn to genteel journalism, becoming editor of the *Salmon and Trout Magazine* and fishing editor of *The Field*. The fourth son Alick became a solicitor. Of the daughters only Jean was to marry: her husband was Sir Herbert Trustram Eve, a Bedford estate agent who became the foremost rating surveyor of his day. The formidable Lady Eve, Alan's Aunt Jean, became a moving spirit of the London County Council Parks Committee. Of the three unmarried aunts, kindly Sybil became a Deaconess and took the Gospel to the obstinate subjects of the Raj. And true to this Victorian story, Alan's grandmother Fanny Turing succumbed to consumption in 1902.

Julius Mathison Turing, Alan's father, was the second son, born on 9 November 1873. Devoid of his father's mathematical ability, he was an able student of literature and history, and won a scholarship to Corpus Christi College, Oxford, from where he graduated with a BA in 1894. He never forgot his early life of enforced economy, and typically never paid the 'farcical' three guineas to convert the BA into an MA. But he never spoke of the miseries of his childhood, too proud to moan of what he had left behind and risen above, for his life as a young man was a model of success. He

entered for the Indian Civil Service, which had been thrown open to entry by competitive examination in the great liberal reform of 1853, and which enjoyed a reputation surpassing even that of the Foreign Office. He was placed seventh out of 154 in the open examination of August 1895[3]. His studies of the various branches of Indian law, the Tamil language and the history of British India then won him seventh place again in the Final ICS examination of 1896.

He was posted to the administration of the Presidency of Madras, which included most of southern India, reporting for duty on 7 December 1896, the senior in rank of seven new recruits to that province. British India had changed since Sir Robert left it in 1792. Fortune no longer helped the daring; fortune awaited the civil servant who could endure the climate for forty years. And while (as a contemporary writer put it) the district officer was 'glad of every opportunity to cultivate intercourse with the natives,' the Victorian reforms had ensured that 'the doubtful alliances which in old days assisted our countrymen to learn the languages' were 'no longer tolerated by morality and society.' The Empire had become respectable.

With the help of a £100 loan from a family friend he bought his pony and saddlery, and was sent off into the interior. For ten years he served in the districts of Bellary, Kurnool and Vizigapatam as Assistant Collector and Magistrate. There he rode from village to village, reporting upon agriculture, sanitation, irrigation, vaccination, auditing accounts, and overseeing the native magistracy. He added the Telugu language to his repertoire, and became Head Assistant Collector in 1906. In April 1907 he made a first return to England. It was the traditional point for the rising man, after a decade of lonely labour, to seek a wife. It was on the voyage home that he met Ethel Stoney.

Alan's mother[4] was also the product of generations of empire-builders, being descended from a Yorkshireman, Thomas Stoney (1675–1726) who as a young man acquired lands in England's oldest colony after the 1688 revolution, and who became one of the Protestant landowners of Catholic Ireland. His estates in Tipperary passed down to his great-great-grandson Thomas George Stoney (1808–1886), who had five sons, the eldest inheriting the lands and the rest dispersing to various parts of the expanding empire. The third son was a hydraulic engineer, who designed sluices for the Thames, the Manchester Ship Canal and the Nile; the fifth emigrated to New Zealand, and the fourth, Edward Waller Stoney (1844–1931), Alan's maternal grandfather, went to India as an engineer. There he amassed a considerable fortune, becoming chief engineer of the Madras and Southern Mahratta Railway, responsible for the construction of the Tangabudra bridge, and the invention of Stoney's Patent Silent Punkah-Wheel.

A hard-headed, grumpy man, Edward Stoney married Sarah Crawford from another Anglo-Irish family, and they had two sons and two daughters. Of these, Richard followed his father as an engineer in India, Edward

Crawford was a Major in the Royal Army Medical Corps, and Evelyn married an Anglo-Irish Major Kirwan of the Indian Army. Alan's mother, Ethel Sara Stoney, was born at Podanur, Madras, on 18 November 1881.

Although the Stoney family did not lack for funds, her early life was as grim as that of Julius Turing. All four Stoney children were sent back to Ireland to be educated. It was a pattern familiar to British India, whose children's loveless lives were part of the price of the Empire. They were landed upon their uncle William Crawford, a bank manager of County Clare, with two children of his own by a first marriage and four by a second. It was not a place for affection or attention. The Crawfords moved to Dublin in 1891, where Ethel dutifully went to school each day on the horse-bus, crushed by a regimen that permitted her a mean threepence for lunch. At seventeen, she was transferred to Cheltenham Ladies College, 'to get rid of her brogue,' and there she endured the legendary Miss Beale and Miss Buss, and the indignity of being the Irish product of the railway and the bank among the offspring of the English gentry. There remained a flickering dream of culture and freedom in Ethel Stoney's heart and for six months she was sent, at her own request, to study music and art at the Sorbonne. The brief experiment was vitiated by the discovery that French snobbery and Grundyism could equal that of the British Isles. So when in 1900 she returned with her elder sister Evie to her parents' grand bungalow in Coonoor, it was to an India which represented an end to petty privation, but left her knowing that there was a world of knowledge from which she had been forever excluded.

For seven years, Ethel and Evie led the life of young ladies of Coonoor – driving out in carriages to leave visiting cards, painting in water-colours, appearing in amateur theatricals and attending formal dinners and balls in the lavish and stifling manner of the day. Once her father took the family on holiday to Kashmir, where Ethel fell in love with a missionary doctor, and he with her. But the match was forbidden, for the missionary had no money. Duty triumphed over love, and she remained in the marriage market. And thus the scene was set, in the spring of 1907, for the meeting of Julius Turing and Ethel Stoney on board the homebound ship.

They had taken the Pacific route, and the romance was under way before they reached Japan. Here Julius took her out to dinner and wickedly instructed the Japanese waiter to 'bring beer and keep on bringing beer until I tell you to stop.' Though an abstemious man, he knew when to live it up. He made a formal proposal to Edward Stoney for Ethel's hand, and this time, he being a proud, impressive young man in the 'heaven-born' ICS, it was successful. The beer story, however, did not impress his future father-in-law, who lectured Ethel upon the prospect of life with a reckless drunkard. Together they crossed the Pacific and the United States, where they spent some time in the Yellowstone National Park, shocked by the familiarity of the young American guide. The wedding took place on 1

October 1907 in Dublin. (There remained a certain edge to the relationship between Mr Turing and the commercial Mr Stoney, with an argument over who was to pay for the wedding carpet rankling for years.) In January 1908 they returned to India, and their first child John was born on 1 September at the Stoney bungalow at Coonoor. Mr Turing's postings then took them on long travels around Madras: to Parvatipuram, Vizigapatam, Anantapur, Bezwada, Chicacole, Kurnool and Chatrapur, where they arrived in March 1911.

It was at Chatrapur, in the autumn of 1911, that their second son, the future Alan Turing, was conceived. At this obscure imperial station, a port on the eastern coast, the first cells divided, broke their symmetry, and separated head from heart. But he was not to be born in British India. His father arranged his second period of leave in 1912, and the Turings sailed *en famille* for England.

This passage from India was a journey into a world of crisis. Strikes, suffragettes, and near civil war in Ireland had changed political Britain. The National Insurance Act, the Official Secrets Act, and what Churchill called 'the gigantic fleets and armies which impress and oppress the civilisation of our time,' all marked the death of Victorian certainties and the extended role of the state. The substance of Christian doctrine had long evaporated, and the authority of science held greater sway. Yet even science was feeling a new uncertainty. And new technology, enormously expanding the means of expression and communication, had opened up what Whitman had eulogised as the *Years of the Modern*, in which no one knew what might happen next – whether a 'divine general war' or a 'tremendous issuing forth against the idea of caste'.

But this conception of the modern world was not shared by the Turings, who were no dreamers of the World-City. Well insulated from the twentieth century, and unfamiliar even with modern Britain, they were content to make the best of what the nineteenth had offered them. Their second son, launched into an age of conflicts with which he would become helplessly entangled, was likewise to be sheltered for twenty years from the consequences of the world crisis.

He was born on 23 June 1912 in a nursing home in Paddington,* and was baptised Alan Mathison Turing on 7 July. His father extended his leave until March 1913, the family spending the winter in Italy. He then returned to take up a new posting, but Mrs Turing stayed on with the two boys, Alan a babe in arms and John now four, until September 1913. Then she too departed. Mr Turing had decided that his sons were to stay in England, so as not to risk their delicate health in the heat of Madras. So Alan never saw the kind Indian servants, nor the bright colours of the East. It was in the bracing sea winds of the English Channel that his childhood was to be spent, in an exile from exile.

* Warrington Lodge, now the Colonnade Hotel, Warrington Crescent, London W9. His baptism was at St Saviour's Church, immediately across the road.

Mr Turing had farmed out his sons with a retired Army couple, Colonel and Mrs Ward. They lived at St Leonards-on-Sea, the seaside town adjoining Hastings, in a large house called Baston Lodge just above the sea front. Across the road was the house of Sir Rider Haggard, the author of *King Solomon's Mines*, and once, when Alan was older and dawdling along the gutter in his usual way, he found a diamond and sapphire ring belonging to Lady Haggard, who rewarded him with two shillings.

The Wards were *not* the sort of people who dropped diamond rings in the street. Colonel Ward, ultimately kindly, was remote and gruff as God the Father. Mrs Ward believed in bringing up boys to be real men. Yet there was a twinkle in her eye and both boys became fond of 'Grannie'. In between lay Nanny Thompson, who ruled the nursery which was the boys' proper place, and the governess of the schoolroom. There were other children in the house, for the Wards had no fewer than four daughters of their own, as well as another boy boarder. Later they also took in the Turing boys' cousins, the three children of Major Kirwan. Alan was very fond of the Wards' second daughter Hazel, but hated the youngest Joan, who was intermediate in age between him and John.

Both Turing boys disappointed Mrs Ward, for they scorned fighting and toy weapons, even model Dreadnoughts. Indeed, Mrs Ward wrote to Mrs Turing complaining that John was a bookworm, and Mrs Turing loyally wrote to John chiding him. Walks on the windswept promenade, picnics on the stony beach, games at children's parties, and tea before a roaring fire in the nursery were the most that the Ward environment had to offer in the way of stimulation.

This was not home, but it had to do. The parents came to England as often as they could, but even when they did, that was not home either. When Mrs Turing returned in spring 1915, she took the boys into furnished and serviced rooms in St Leonards – gloomy places decorated by samplers embroidered with the more sacrificial kind of hymn. By this time Alan could talk, and proved himself the kind of little boy who could attract the attention of strangers with precocious, rather penetratingly high-pitched comments, but also a naughty and wilful one, in whom winning ways could rapidly give way to tantrums when he was thwarted. Experiment, as with planting his broken toy sailors in the ground, hoping they would grow afresh, was easily confused with naughtiness. Alan was slow to learn that indistinct line that separated initiative from disobedience and resisted the duties of his childhood. Late, untidy and cheeky, he had constant battles with his mother, Nanny and Mrs Ward.

Mrs Turing returned to India in the autumn of 1915, saying to Alan, 'You'll be a good boy, won't you?', to which Alan replied 'Yes, but sometimes I shall forget!' But this separation was only for six months, for in March 1916 Sahib and Memsahib together braved the U-boats, wearing lifebelts all the way from Suez to Southampton. Mr Turing took his family

for a holiday in the Western Highlands, where they stayed in an hotel at Kimelfort, and John was introduced to trout fishing. At the end of his leave, in August 1916, they decided not to risk travelling together again, but instead to separate for the next three-year period. Alan's father returned to India, and his mother resumed a double exile at St Leonards.

The Great War had remarkably little direct impact on the Turing family. The year 1917, with the mechanised slaughter, the U-boat siege, the air raids, the appearance of America and the Russian revolution, set up the pattern which was to be the newborn generation's inheritance. But it had no private meaning except in keeping Mrs Turing in England. John was packed off to a preparatory school called Hazelhurst near Tunbridge Wells in Kent in May of that year, and thereafter Mrs Turing had only Alan about her. Church-going was one of her favourite pastimes, and in St Leonards she adopted a certain very high Anglican church, where Alan was dragged every Sunday for the communion service. He did not like the incense, and called it 'the church with the bad smells'. Mrs Turing also pressed on with her water-colours, for which she enjoyed a definite talent. She took Alan out on her sketching parties where, with big eyes and sailor hat, and with quaint expressions of his own like 'quockling' for the screech of seagulls, he delighted the lady art students.

Alan taught himself to read in about three weeks from a book called *Reading without Tears*. He was quicker, however, to recognise figures, and had an infuriating habit of stopping at every lamp post to identify its serial number. He was one of those many people without a natural sense of left and right, and he made a little red spot on his left thumb, which he called 'the knowing spot'.

He would say that he wanted to be a doctor when he grew up – an ambition that would have been agreeable to the Turings, for his father would approve of the fees, and his mother of the distinguished clients and the practice of good works. But he could not learn to be a doctor on his own. It was time for some education. And so in the summer of 1918 Mrs Turing sent him to a private day school called St Michael's, to learn Latin.

George Orwell, who was born nine years earlier but likewise to an ICS father, described himself[5] as from 'what you might describe as the lower-upper-middle-class.' Before the war, he wrote:

> you were either a gentleman or not a gentleman, and if you were a gentleman you struggled to behave as such, whatever your income might be. . . . Probably the distinguishing mark of the upper-middle class was that its traditions were not to any extent commercial, but mainly military, official, and professional. People in this class owned no land, but they felt that they were landowners in the sight of God and kept up a semi-aristocratic outlook by going into the professions and the fighting services rather than into trade. Small boys used to count the plum stones

> on their plates and foretell their destiny by chanting 'Army, Navy, Church, Medicine, Law'.

The Turings were in this position. There was nothing grand about the life of their sons, except perhaps on the few Scottish holidays. Their luxuries were the cinema, the ice rink, and watching the stunt-man dive off the pier on a bicycle. But in the Ward establishment there was an incessant washing away of sins, washing away of smells, to distinguish them from the other children of the town. 'I was very young, not much more than six,' recalled Orwell, 'when I first became aware of class-distinctions. Before that age my chief heroes had generally been working-class people, because they always seemed to do such interesting things, such as being fishermen and blacksmiths and bricklayers. . . . But it was not long before I was forbidden to play with the plumber's children; they were "common" and I was told to keep away from them. This was snobbish, if you like, but it was also necessary, for middle-class people cannot afford to let their children grow up with vulgar accents.'

The Turings could afford very little, since even in the well paid ICS it was always necessary to save for the future. What they *had* to afford could be summed up in two words: public school. In this respect the war, the inflation, the talk of revolution changed nothing. The Turing boys had to go to public schools, and everything had to be subordinated to this demand. Never, indeed, would Mr Turing allow his sons to forget the debt they owed him for a public school education. Alan's duty was to go through with the system without causing trouble, and in particular to learn Latin, which was required for entrance to a public school.

So as Germany collapsed, and the bitter armistice began, Alan was set to work on copy-books and Latin primers. He later told a joke against his own first exercise, in which he translated 'the table' as *omit mensa* because of the cryptic footnote 'omit' attached to the word 'the'. He was not interested in Latin, and for that matter he had great difficulty in writing. His brain seemed barely coordinated with his hand. A whole decade of fighting with scratchy nibs and leaking fountain-pens was to begin, in which nothing he wrote was free from crossings-out, blots, and irregular script which veered from stilted to depraved.

But at this stage he was still the bright, jolly little boy. On Christmas visits to the Trustram Eves in Earls Court, his uncle Bertie liked making Alan the butt of his practical jokes because of his innocent giggly humour. These occasions were more of a trial for John, who was now considered to be responsible for his younger brother's appearance and behaviour – a responsibility that no human being would ever lightly shoulder. To make matters worse, as John saw it,[6]

> he was dressed in sailor suits, according to the convention of the day (they suited him well); I know nothing in the whole range of the cussedness of inanimate

> objects to compete with a sailor suit. Out of the boxes there erupted collars and ties and neckerchiefs and cummerbunds and oblong pieces of flannel with lengthy tapes attached; but how one put these pieces together, and in what order, was beyond the wit of man. Not that my brother cared a button – an apt phrase, many seemed to be off – for it was all the same thing to him which shoe was on which foot or that it was only three minutes to the fatal breakfast gong. Somehow or another I managed by skimping such trumpery details as Alan's teeth, ears, etc., but I was exhausted by these nursery attentions and it was only when we were taken off to the pantomime that I was able to forget my fraternal cares. Even then Alan was quite a nuisance, complaining loudly of the scene of green dragons and other monsters in 'Where the Rainbow Ends'. . . .

The Christmas pantomime was the high spot of the year, although Alan himself later recalled of Christmas 'that as a small child I was quite unable to predict when it would fall, I didn't even realise that it came at regular intervals.' Back at dreary Baston Lodge, his head was buried in maps. He asked for an atlas as a birthday present and pored over it by the hour. He also liked recipes and formulae, and wrote down the ingredients for a dock-leaf concoction for the cure of nettle-stings. The only books he had were little nature-study notebooks, supplemented by his mother reading *The Pilgrim's Progress* aloud. Once she cheated by leaving out a long theological dissertation, but that made him very cross. 'You spoil the *whole thing*,' he shouted, and ran up to his bedroom. Perhaps he was responding to the uncompromising note of Bunyan's plain-speaking Englishman. But once the rules were agreed then they must be followed to the bitter end, without bending or cheating. His Nanny found the same when playing with him:[7]

> The thing that stands out most in my mind was his *integrity* and his *intelligence* for a child so young as he then was, also you couldn't camouflage anything from him. I remember one day Alan and I playing together. I played so that he should win, but he spotted it. There was commotion for a few minutes. . . .

In February 1919, Mr Turing returned after three years' separation. It was not easy for him to re-establish his authority with Alan, who had a good line in answering back. He told Alan once to untwist his boot-tongues. 'They should be flat as a pancake,' he said. 'Pancakes are generally rolled up,' piped back Alan. If Alan had an opinion, he said that he *knew*, or that he *always knew*; he always knew that the forbidden fruit of the Garden of Eden was not an apple but a plum. In the summer, Mr Turing took them for a holiday at Ullapool, in the far north-west of Scotland, this time a distinctly posh holiday, complete with gillie. While Mr Turing and John lured the trout, and Mrs Turing sketched the loch, Alan gambolled in the heather. He had the bright idea of gathering the wild bees' honey for their picnic tea. As the bees buzzed past, he observed their flight-paths and by plotting the intersection point located the nest. The Turings were vividly impressed by this direction-finding, more than by the murky honey he retrieved.

But that December his parents steamed away and Alan was left again with the Wards, while John returned to Hazelhurst. Their father was transferred at last to the metropolis of Madras to serve in the Revenue Department, but Alan stagnated in the deathly ennui of St Leonards-on-Sea, concocting recipes. His development was so held back that he had not even learnt how to do long division by the time of his mother's return in 1921, when he was nearly nine.

His mother perceived him as changed from 'extremely vivacious – even mercurial – making friends with everyone' to being 'unsociable and dreamy'. There was a wistful, withdrawn expression in photographs of his ten-year-old face. She took him away from St Leonards and, after a summer holiday in Brittany, somewhat spoilt by the constant counting of francs, she taught him herself in London, where he alarmed her by looking for iron filings in the gutter with a magnet. Mr Turing, who in May 1921 had again been promoted to be Secretary to the Madras Government Development Department, responsible for agriculture and commerce throughout the Presidency, returned once more in December and they all went to St Moritz, where Alan learnt to ski.

Miss Taylor, the headmistress of St Michael's, had said that Alan 'had genius', but this diagnosis was not allowed to modify the programme. In the new year of 1922, Alan was launched on the next stage of the process and was sent off to Hazelhurst like his brother.

Hazelhurst was a small establishment of thirty-six boys of ages from nine to thirteen, run by the headmaster Mr Darlington, a Mr Blenkins who taught mathematics, Miss Gillett who taught drawing and music of a Moodey and Sankey variety, and the Matron. John had loved his time there, and now in his last term was head boy. His younger brother proved to be a thorn in the flesh, for Alan found the Hazelhurst regime a distraction. It 'deprived him of his usual occupations,' as his mother saw it. Now that the whole day was organised into classes, games and meal-times, he had but odd minutes in which to indulge his interests. He arrived with a craze for paper-folding, and when he had shown the other boys what to do, John found himself confronted everywhere with paper frogs and paper boats. Another humiliation followed when Alan's passion for maps was discovered by Mr Darlington. This inspired him to set a geography test to the whole school, in which Alan came sixth, beating his brother, who found geography very boring. On another occasion Alan sat in the back row at a school concert, choking himself with laughter while John sang *Land of Hope and Glory* as a solo.

John left Hazelhurst at Easter for Marlborough, his public school. In the summer, Mr Turing again took the family to Scotland, this time to Lochinver. Alan exercised his knowledge of maps on the mountain paths,

and they fished in the loch, Alan now competing with John. The brothers had a good line in non-violent rivalry, as for instance when they played a game to alleviate the awfulness of their grandfather Stoney's visits. This depended upon winning points by leading him on, or heading him away from one of his well-rehearsed club bore stories. And at Lochinver Alan defeated his family in what Mrs Turing considered the rather vulgar after-dinner sport of throwing discarded gooseberry skins as far as possible. Cleverly inflating them, he made them soar over the hedge.

Life when off duty, in this early afternoon of the Empire, could be very agreeable. But in September his parents saw Alan back to Hazelhurst, and as they drove away in their taxi, Alan rushed back along the school drive with arms flung wide in pursuit. They had to bite their lips and sail away to Madras. Alan continued to maintain his detached view of the Hazelhurst regime. He gained average marks in class, and in turn held an unflattering view of the instruction. Mr Blenkins initiated his class into elementary algebra, and Alan reported to John, 'He gave a *quite false impression* of what is meant by x.'

Although he enjoyed the feeble little plays and debates, he hated and feared the gym class and the afternoon games. The boys played hockey in winter, and Alan later claimed that it was the necessity of avoiding the ball that had taught him to run fast. He did enjoy being linesman, judging precisely where the ball had crossed the line. In an end-of-term sing-song, the following couplet described him:

> Turing's fond of the football field
> For geometric problems the touch-lines yield

Later another verse had him 'watching the daisies grow' during hockey, an image which inspired his mother to a whimsical pencil sketch. And although intended as a joke against his dreamy passivity, there might have been a truth in the observation. For something new had happened.

At the end of 1922, some unknown benefactor had given him a book, called *Natural Wonders Every Child Should Know*.[8] Alan told his mother later that this book had opened his eyes to science. Indeed, it must have been the first time that he became conscious that such a kind of knowledge as 'science' existed. But more than that, it opened the book of life. If anything at all can be said to have influenced him, it was this book which, like so many new things, came from the United States.

The book had first appeared in 1912 and its author, Edwin Tenney Brewster, had described it as

> ... the first attempt to set before young readers some knowledge of certain loosely related but very modern topics, commonly grouped together under the name, General Physiology. It is, in short, an attempt to lead children of eight or ten, first to ask and then to answer, the question: What have I in common with other living things, and how do I differ from them? Incidentally, in addition, I

> have attempted to provide a foundation on which a perplexed but serious-minded parent can himself base an answer to several puzzling questions which all children ask – most especially to that most difficult of them all: By what process of becoming did I myself finally appear in this world?

In other words, it was about sex and science, starting off with 'How the Chicken got inside the Egg', rambling through 'Some Other Sorts of Eggs' until arriving at 'What Little Boys and Girls are Made Of'. Brewster quoted 'the old nursery rhyme' and said that:

> It has this much truth in it, that little boys and little girls are far from being alike, and it isn't worth while trying to make either one over into the other.

The precise nature of this difference was not revealed, and only after a skilful diversion on to the subject of the eggs of starfish and sea-urchins did Brewster eventually arrive back at the human body:

> So we are not built like a cement or a wooden house, but like a brick one. We are made of little living bricks. When we grow it is because these living bricks divide into half bricks, and then grow into whole ones again. But how they find out when and where to grow fast, and when and where to grow slowly, and when and where not to grow at all, is precisely what nobody has yet made the smallest beginning at finding out.

The process of biological growth was the principal scientific theme of E.T. Brewster's book. Yet science had no explanations, only descriptions. In fact on 1 October 1911, when Alan Turing's 'living bricks' were first dividing and redividing, Professor D'Arcy Thompson was telling the British Association that 'the ultimate problems of biology are as inscrutable as of old.'

But equally inscrutable, *Natural Wonders* conspicuously failed to describe where the *first* cell in the human process came from, only dropping the elusive hint that 'the egg itself arose by the splitting of still another cell which, of course, was part of the parent's body.' The secret was left for the 'perplexed but serious-minded parent' to explain. Mrs Turing's way of dealing with the thorny topic was, in fact, highly consonant with Brewster's, for John at least was the recipient at Hazelhurst of a special letter starting with the birds and the bees, and ending with instructions 'not to go off the rails'. Presumably Alan was informed in the same way.

In other ways, however, *Natural Wonders* was indeed 'very modern', and certainly no little 'nature book'. It conveyed the idea that there had to be a reason for the way things were, and that the reason came not from God but from science. Long passages explained why little boys liked throwing things and little girls liked babies, and derived from the pattern of the living world the ideal of a Daddy to go out to work at the office and a Mama to stay at home. This picture of respectable American life was rather remote from the training of the sons of Indian civil servants, but more relevant to Alan was a picture of the brain:

> Do you see now why you have to go to school five hours a day, and sit on a hard seat studying still harder lessons, when you would much rather sneak off and go in swimming? It is so that you may build up these thinking spots in your brains. . . . We begin young, while the brain is still growing. With years and years of work and study, we slowly form the thinking spots over our left ears, which we are to use the rest of our days. When we are grown up, we can no more form new thinking places. . . .

So even school was justified by science. The old world of divine authority was reduced to a vague allusion in which Brewster, having described evolution, said that 'why it all happens or what it is all for' was precisely 'one of those things that no fellah can find out.' Brewster's living things were unequivocally *machines*:

> For, of course, the body is a machine. It is a vastly complex machine, many, many times more complicated than any machine ever made with hands; but still after all a machine. It has been likened to a steam engine. But that was before we knew as much about the way it works as we know now. It really is a gas engine; like the engine of an automobile, a motor boat, or a flying machine.

Human beings were 'more intelligent' than the other animals, but were not accorded a mention of 'soul'. The process of cellular division and differentiation was something no one had *yet* begun to understand – but there was no suggestion that it required the interference of angels. So if Alan was indeed 'watching the daisies grow', he could have been thinking that while it looked as though the daisy knew what to do, it really depended upon a system of cells working like a machine. And what about himself? How did *he* know what to do? There was plenty to dream about while the hockey ball whizzed past.

Besides watching the daisies, Alan liked inventing things. On 11 February 1923 he wrote:[9]

> Dear Mother and Daddy,
>
> I have got a lovely cinema kind of thing Micheal* sills gave it to me and you can draw new films for it and I am making a copy of it for you for an easter present I am sending it in another envelope if you want any more films for it write for them there are 16 pictures in each but I worked out that I could draw 'The boy stood at the tea table' you know the Rhyme made up from casabianca I was 2nd this week again. Matron sends her love GB said that as I wrote so thick I was to get some new nibs from T. Wells and I am writing with them now there is a lecture tomorrow Wainwright was next to bottom this week this is my patent ink

There was nothing about science, inventions, or the modern world in the Common Entrance examination – the public school admission test, which was the *raison d'être* of schools like Hazelhurst. *Casabianca* was nearer the

* Alan's spelling and punctuation, here and throughout, is faithfully reproduced.

mark. In the American *Natural Wonders* everything had to have a reason. But the British system was building different 'thinking spots' – the virtue of Casabianca, the boy on the burning deck, was that he carried out his instructions literally, losing his life in the process.

The masters did their best to discourage Alan's irrelevant interest in science, but could not stop his inventions – in particular, machines to help him in the writing problems that still plagued him:

> April 1 (fool's day)
>
> Guess what I am writing with. It is an invention of my own it is a fountain pen like this:—[*crude diagram*] you see to fill it scweeze E [*'squishy end of fountain pen filler'*] and let go and the ink is sucked up and it is full. I have arranged it so that when I press a little of the ink comes down but it keeps on getting clogged.
>
> I wonder if John has seen Joan of Arc's Statue yet coz it is in Rouen. Last monday we had scouts v cubs it was rather exiting there was no weeks order this week I hope John likes Rouen I don't feel much like writing much today sorry. Matron says John sent something.

This provoked another couplet, about a fountain pen that 'leaked enough for four'. Another letter in July, written in green ink which was (predictably) forbidden, described an exceedingly crude idea for a typewriter.

John's stay in Rouen was part of a general alteration in the Turing family arrangements. Before going to Marlborough, he had told his father that he would like a change from the Wards, and this was agreed. The parents found a Hertfordshire vicarage to be their home as from the summer of 1923. Meanwhile, at Easter, John had parted from his brother for the first time, going to stay with a Mme Godier in Rouen. This went quite well, and in the summer Alan ('simply longing to go there') went with him to imbibe the culture and civilisation of France for a few weeks. Alan made a great impression on the *petit-bourgeoise* Mme Godier. It was *'comme il est charmant'* when he had been persuaded to wash behind the ears, and a telling-off for John if he had not. John loathed Mme Godier, and her fawning on Alan came as a relief, enabling him to slip off to the cinema. Both Turing boys, in fact, were singularly good-looking, with a subtle, vulnerable appeal; John rather the sharper, and Alan dreamier. The stay was not a great success. John had refused to take his bicycle this time because of the prospect of navigating wobbly Alan through the cobbled Rouen streets. So they were marooned listlessly in the *maison Godier*, or were obliged to take long walks. *'Il marche comme un escargot*,' declared Mme Godier of Alan, an observation which fitted Alan's snail-like progress along the gutter, but also the Turing family's picture of itself – that of the slow Turings, the gloomy Turings, always fighting on the losing side, and coming in last if not least.

Much happier was the new home in Hertfordshire, to which the boys

went for the rest of the summer. It was the Georgian red-brick rectory at Watton-at-Stone, seat of the old Archdeacon Rollo Meyer, a charming and mellow man whose environment was that of the rose-bed and the tennis court, rather than the well-scrubbed, brisk discipline of the Wards. John and Alan both responded with joy, John to girls on the tennis court (he being fifteen and decidedly interested), Alan to being left alone, allowed to cycle in the woods and make his own mess as he pleased as long as he met minimum standards in the house. Alan's standing also went up in Mrs Meyer's eyes when a gypsy fortune teller at the church fête said that he would be a genius.

The Meyers' guardianship was shortlived, for Mr Turing suddenly decided to resign from the Indian Civil Service. He was angry at his rival, a certain Campbell who had come out with him in 1896 and had obtained a lower grade in the entrance examination, being promoted to be Chief Secretary to the Madras Government. So he abandoned his own chances of further advancement, and Alan's parents never returned as Sir Julius and Lady Turing,* though they had the more tangible benefit of a £1000 per annum pension.

It was not a return to England, for Alan's father adopted a new role as tax exile. The Inland Revenue allowed him to escape the income tax if he spent only six weeks in the United Kingdom each year, so the Turings installed themselves in the French resort of Dinard, opposite St Malo on the Brittany coast. Henceforward the boys were to travel to France for Christmas and Easter vacations, while the parents would come to England for the summer.

Technically, Mr Turing did not resign until 12 July 1926, and in the meantime he was on leave, the development of Madras somehow continuing without him. But he lost no time in establishing a new sense of economy. Mrs Turing had to submit accounts detailing the housekeeping expenses to the centime. Holidays in St Moritz and Scotland were declared henceforth out of the question.

In many ways his premature retirement was a disaster. Both sons felt it was a mistake. Alan was to imitate in a particularly droll manner the huffy comments that his father would pass on 'XYZ Campbell', and his brother later wrote:[10]

> I doubt if I should have found my father an easy superior or subordinate for by all accounts he cared nothing for the hierarchy nor his own future in the Indian Civil Service and spoke his mind regardless of the consequences. One example will suffice. For a while he acted as principal private secretary to mild Lord Willingdon in the Madras Presidency and when a difference of opinion developed between them my father remarked 'After all you are not the Government of India'. Such thumping, suicidal indiscretion one can but admire from a safe distance.

* Unlike Sir Archibald Campbell.

This particular incident was always held against Mr Turing by his wife, the more so as she was particularly in awe of Lady Willingdon. The truth perhaps was that despite all the endless talk of duty, the qualities required in a district officer were very different from those of rule-book-keeping and deference to rank. Governing millions of people spread over an area equal to that of Wales called for an independent judgment and force of personality which were less welcome in the more courtly circles of metropolitan Madras. They were certainly little needed in his retirement, in which the busy intrigue of India assumed a retrospective appeal. His remaining years were dogged by a sense of loss, disillusion, and an intense boredom which fishing and bridge parties could never alleviate. He was aggravated by the fact that his younger wife found the return to Europe an opportunity to emerge from the constricting mental atmosphere of Dublin and Coonoor. For he had little regard for her more intellectual ambitions, combined as they were with a rather nervous, fussy domesticity; while she suffered from his obsessive penny-pinching and sense of being betrayed. They were both emotionally demanding, but neither met the other's demands, and they came to communicate in little but planning the garden.

One result of the new arrangement was that Alan now saw some point to learning French, and it became Alan's favourite school subject. But he also liked it as a sort of code, in which he naively wrote a postcard to his mother about *'la revolution'* at Hazelhurst that Mr Darlington was not supposed to be able to read. (The joke was on their Breton maid at Dinard, who often spoke of a socialist revolution being imminent.)

But it was science that entranced him, as his parents discovered when they arrived back to find him clutching *Natural Wonders*. Their reaction was not entirely negative. Mrs Turing's grandfather's second cousin, George Johnstone Stoney (1826–1911), had been a famous Irish scientist whom she had once met as a girl in Dublin. He was best known as the inventor of the word 'electron' which he coined in 1894 before the atomicity of electric charge had been established. Mrs Turing was very proud of having a Fellow of the Royal Society in her family, for ranks and titles made a great impression upon her. She would also show Alan the picture of Pasteur on the French postage stamps, which suggested the prospect of Alan as a benefactor of humanity. Perhaps she recalled that doctor missionary in Kashmir, all those years ago! – but there was also the simple fact that although she herself pressed her ideas into a suitably ladylike form, she still represented the Stoneys who had married applied science to the expanding empire. Alan's father, however, could well have pointed out that a scientist could expect no more than £500 a year, even in the Civil Service.

But he also helped Alan in his own way, for when back at school in May 1924 Alan wrote:

> ... You (Daddy) were telling me about surveying in the train, I have found out or rather read how they find out the heights of trees, widths of rivers, valley's etc.

by a combination of both I found out how they find heights of mountains without climbing them.

Alan had also read about how to draw a geographical section, and had added this accomplishment to 'family tree, chess, maps etc. (gennerally my own amusements)'. In the summer of 1924 the family stayed for a time at Oxford – a nostalgic exercise on Mr Turing's part – and then in September they holidayed at a boarding house in North Wales. The parents stayed on awhile when Alan went back by himself to Hazelhurst ('I tipped the porter all right and the taxi too . . . I did not tip the Frant chap but that was not expected of me. Was it?') where he made his own maps of the Snowdonia mountains. ('Will you compare my map with the Ordnance one and send it back.')

Maps were an old interest: family trees he also liked, and the particularly awkward Turing genealogy, with its leaps of the baronetcy from bough to bough and its enormous Victorian families, exercised his ingenuity. Chess was the most social of his activities:

> There was not going to be any Chess Tournament because Mr Darlington had not seen many people playing but he said that if I asked everyone who could play and made a list of everyone who had played this term we would have it. I managed to get enough people so we are having it.

He also found the work in class Ib to be 'much more interesting'. But all this paled before chemistry. Alan had always liked recipes, strange brews, and patent inks, and had tried clay-firing in the wood when staying with the Meyers. The idea of chemical processes would not have been strange to him. And in the summer holidays at Oxford, his parents had allowed him to play with a box of chemicals for the first time.

Natural Wonders did not have much to say about chemistry, except in terms of poisons. A strong defence of Temperance, not to say Prohibition, flowed from Brewster's scientific pen:

> The life of any creature, man, animal or plant, is one long fight against being poisoned. The poisons get us in all sorts of ways . . . like alcohol, ether, chloroform, the various alkaloids, such as strychnin and atropin and cocain, which we use as medicines, and nicotin, which is the alkaloid of tobacco, the poisons of many toadstools, caffein which we get in tea and coffee. . . .

There was another section headed 'Of Sugar and Other Poisons', explaining the effect of carbon dioxide in the blood, causing fatigue, and the action of the brain:

> When the nerve center in the neck tastes a little carbon dioxid, it doesn't say anything. But the moment the taste begins to get strong (which is in less than a quarter minute after one starts running hard) it telephones over the nerves to the lungs:
>
> 'Here, here, here! What is the matter with you fellows Get busy. Breathe hard. This blood is fairly sizzling with burnt up sugar!'

All this was grist to Alan's mill, although at this point what interested him was the more sober claim that:

> The carbon dioxid becomes in the blood ordinary cooking soda; the blood carries the soda to the lungs, and there it changes to carbon dioxid again, exactly as it does when, as cooking soda, or baking powder, you add it to flour and use it to raise cake.

There was nothing in *Natural Wonders* to explain chemical names or chemical change, but he must have picked up the ideas from somewhere else, for on arriving back at school on 21 September 1924 his letter reminded his parents 'Don't forget the science book I was to have instead of the Children's Encyclopedia,' and also:

> In Natural wonders every child should know it says that the Carbon dioxide is changed to cooking soda in the blood and back to carbon dioxide in the lungs. If you can will you send me the chemical name of cooking soda or the formula better still so that I can see how it does it.

Presumably he had seen the *Children's Encyclopedia*, if only to reject it as too childish and vague, and could well have learnt the basic ideas of chemistry from its multitude of little 'experiments' with household substances. The prophetic spark of enquiry lay in his trying to combine the ideas of chemical formulae on the one hand with the mechanistic description of the body on the other.

Chemistry was not the Turing parents' *forte*, but in November he found a more reliable source of information: 'I have come into great luck here: there is an Encyclopedia that is 1st form property.' And at Christmas 1924 he was given a set of chemicals, crucibles and test-tubes, and allowed to use them in the cellar of *Ker Sammy*, their villa in the Rue du Casino. He heaved great quantities of sea-weed back from the beach in order to extract a minute amount of iodine. This was much to the amazement of John, who with different eyes saw Dinard as an expatriate English colony of the bright 1920s, and spent his time on tennis, golf, dancing and flirting in the Casino.

There was an English schoolmaster in the neighbourhood, whom Alan's parents employed to coach Alan for the Common Entrance examination, who found himself plied with questions about science. In March 1925, back at school, Alan wrote:

> I came out in the same place in Common Entrance* this term as last with 53% average. I got 69% in French.

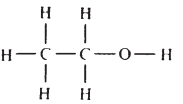
But it was the chemistry that mattered:

> I wonder whether I could get an earthenware retort anywhere for some high-heat actions. I have been trying to learn some Organic Chemistry, when I began if I saw something like this
>
> $$H(CH_2)_{17}CO_2H(CH_2)_2C$$

* These were practice papers.

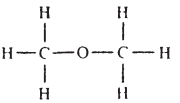
I would try and work it out like this $C_{21}H_{40}O_2$ which might be all sorts of things it is a kind of oil. I find the Graphic formulae help too, thus Alcohol is

$H(CH_2)_2OH$ or C_2H_6O is



while Methyl ether $HCH_2.O.CH_2H$ or C_2H_6O

is



you see they shew the molecular arrangement.

And then a week later:

> ... The earthenware retort takes the place of a crucible when the essential product is a gas which is very common at high temperatures. I am making a collection of experiments in the order I mean to do them in. I always seem to want to make things from the thing that is commonest in nature and with the least waste in energy.

For Alan was now conscious of his own ruling passion. The longing for the simple and ordinary which would later emerge in so many ways was not for him a mere 'back to nature' hobby, a holiday from the realities of civilisation. To him it was life itself, a civilisation from which everything else came as a distraction.

To his parents the priorities were the other way round. Mr Turing was not at all the man for airs and graces; a man who would insist on walking rather than take a taxi, there was a touch of the desert island mentality in his character. But nothing altered the fact that chemistry was merely the amusement allowed to Alan on his holidays and that what mattered was that at thirteen he had to go on to a public school. In the autumn of 1925 Alan sat the Common Entrance for Marlborough, and to the surprise of all did rather well. (He had not been allowed to try for a scholarship.) But at this point John played a decisive part in the life of his strange brother. 'For God's sake don't send him here,' he said, 'it will crush the life out of him.'

Alan posed a difficult problem. It was not in question that he must adapt to public school life. But what public school would cater best for a boy whose principal concern was to do experiments with muddy jam jars in the coal cellar? It was a contradiction in terms. As Mrs Turing saw it,[11]

> Though he had been loved and understood in the narrower homely circle of his preparatory school, it was because I foresaw the possible difficulties for the staff and himself at a public school that I was at such pains to find the right one for

him, lest if he failed in adaptation to public school life he might become a mere intellectual crank.

Her pains were not prolonged. She had a friend called Mrs Gervis, the wife of a science master at Sherborne School, a public school in Dorset. In spring 1926 Alan took the examination again, and was accepted by Sherborne.

Sherborne was one of the original English public schools, whose origins[12] lay in the abbey which itself was one of the first sites of English Christianity and in a charter of 1550 establishing the school for local education. In 1869, however, Sherborne had fallen into line as a boarding school on Dr Arnold's model. After a period of low repute, it had revived in 1909 when a Nowell Smith was appointed headmaster. By 1926 Nowell Smith had doubled the roll from two hundred to four hundred, and had established Sherborne as a moderately distinguished public school.

Mrs Turing paid a visit to Sherborne before Alan went there and was able to see the headmaster's wife. She gave Mrs Nowell Smith 'some hints about what to expect' and Mrs Nowell Smith 'contrasted her description with the more favourable accounts given by other parents of their boys.' It was probably at her suggestion that Alan was put down to board at Westcott House, whose housemaster was Geoffrey O'Hanlon.

The summer term was due to start on Monday 3 May 1926 which was, it so happened, the first day of the general strike. On the ferry from St Malo Alan heard that only the milk trains would be running. But he knew he could cycle the sixty miles west from Southampton to Sherborne:

> so I cycled as programme left luggage with baggage master started out of docks about 11 o'clock got map for 3/- including Southampton missing Sherborne by about 3 miles. Noted where Sherborne was just outside. With an awful strive, found General Post Office, sent wire O'Hanlon 1/-. Found cycle shop, had things done 6d. Left 12 o'clock had lunch 7 miles out 3/6 went on to Lyndhurst 3 miles got apple 2d. went on to Beerley 8 miles pedal a bit wrong had it done 6d. went on Ringwood 4 miles.
>
> The streets in Southampton were full of people who had struck. Had a lovely ride through the New Forest and then over a sort of moor into Ringwood and quite flat again to Wimborne.

Alan stayed overnight at the best hotel in Blandford Forum – an expedient that would hardly have been approved by his father. (Alan had to account for every penny that he spent: no mere figure of speech, for his letter ended 'Sending back £1-0-1 in £ note and penny stamp.') But the proprietors only charged a nominal amount and saw him off in the morning. Then:

> Just near Blandford some nice downs and suddenly merely undulating near all the way here but the last mile was all downhill.

From West Hill he could see his destination: the little Georgian town of Sherborne and the school itself by the abbey.

For a boy of his class to improvise a solution without a fuss was not at all the expected thing. The bicycle journey was regarded with astonishment, and was reported in the local newspaper.[13] While Winston Churchill called for the 'unconditional surrender' of the 'enemy' miners, Alan had made the most of the general strike for himself. He had enjoyed two days of freedom outside the usual system. But they were over very quickly. There was a book[14] about life at Sherborne, *The Loom of Youth* by Alec Waugh, and this described the sensations:

> The new boy's first week at a Public School is probably the most wretched he will ever pass in his life. It is not that he is bullied . . . it is merely that he is utterly lonely, is in constant fear of making mistakes, and so makes for himself troubles that do not exist.

When his hero wrote home at the end of his second day, 'it did not need a very clever mother to read between the lines and see her son was hopelessly miserable.' It was worse for Alan, for he could not even merge inconspicuously while all his belongings were stuck at Southampton by the strike. At the end of his first week:

> Its an awful nuisance here without any of my clothes or anything. . . . It's rather hard getting settled down. Do write soon. There was no work on Wednesday except for 'Hall' or prep. And then its a business finding my classrooms what books to get but I will be more or less settled after a week or so . . .

But a week later Alan was not much better off:

> I am getting more and more settled down. But I won't be quite right until my things come. Fagging starts for us next Teusday. It is run on the same principle as the Gallic councils that tortured and killed the last man to arrive; here one fagmaster calls and all his fags run the last to arrive getting the job. You have to have cold showers in the morning here like cold baths at Marlborough. We have tea at 6.30 here on Mon., Wed., Frid. I manage to go without food from lunch to then. . . . The general strike had a part of it as a printer's strike the result of that is that 'Bennetts' booksellers had none of the books ordered and I am without a lot of them. As in most public schools new boys have to sing some song. The time has not yet come. I am not sure what to sing anyhow it won't be 'buttercup'. . . . The amount of work we are given for Hall here is sometimes absurdly small e.g. Read Acts chapters 3 and 4 and that is for ¾hr.
>
> Yr loving son Alan

There was indeed a song-singing and another ceremony in which he was kicked up and down the day room in a waste paper basket. However, if *his* mother read between the lines, she subordinated sympathy to her sense of duty. Her comment on this letter was that it displayed Alan's 'whimsical sense of humour'.

He was now at last being taught science, and reported:

> We do do Chemistry 2 hrs. a week. We have only got to about the stages of 'Properties of Matter', 'Physical and chemical change' etc. The master was quite amused by my Iodine making and I shewed him some samples. The headmaster is called 'Chief'. I seem to be doing Greek and not Hellenics. . . .

The master, Andrews, was no doubt 'amused' that Alan already knew so much. He had arrived 'delightfully ingenuous and unspoilt'. And the head boy of Westcott House, Arthur Harris, had rewarded Alan's cycling initiative by appointing him his 'fag', or servant. But neither scientific education nor initiative were exactly Sherborne priorities.

The headmaster used to expound the meaning of school life in his sermons.[15] Sherborne was not, he explained, entirely devoted to 'opening the mind', although 'historically . . . this was the primary meaning of school.' Indeed, said the headmaster, there was 'constantly a danger of forgetting the original object of school.' For the English public school had been consciously developed into what he called 'a nation in miniature'. With a savage realism, it dispensed with the lip service paid to such ideas as free speech, equal justice, and parliamentary democracy, and concentrated upon the fact of precedence and power. As the headmaster put it:

> In form-room and hall and dormitory, on the field and on parade, in your relations with us masters and in the scale of seniority among yourselves, you have become familiar with the ideas of authority and obedience, of cooperation and loyalty, of putting the house and the school above your personal desires . . .

The great theme of the 'scale of seniority' was the balance of privilege and duty, itself reflecting the more worthy side of the British Empire. But this was a theme to which 'opening the mind' came as at best an irrelevance.

The Victorian reforms had made their mark, and competitive examinations played a part in public school life. Those who came as scholars had an opportunity to take on the role of an intelligentsia in the 'nation in miniature', tolerated provided they interfered with nothing that mattered. But Alan, who did not belong to this group, was quick to note the 'absurdly small' amount expected of him. And in fact it was the organised team games of rugby football ('footer') and cricket which for most boys would dominate the years at Sherborne and through which the emotional lessons were taught. Nor had the social changes of the Great War made any difference to the total, introverted, self-conscious system of house life, with its continuous public scrutiny and control of every individual boy. These were the true priorities.

In one respect only a token concession had been made to Victorian reform. There had been a science master at Sherborne since 1873, but this was primarily for the sake of the medical profession. It was not for the Workshop of the World, stigmatised as too mundanely utilitarian in spirit to

occupy the time of a gentleman. The Stoneys might build the bridges of the Empire, but it was a higher caste which commanded them. Neither did science enjoy respect for its enquiry, irrespective of usefulness, into truth. Here again the public school had resisted the triumphant claims of nineteenth century science. Nowell Smith divided the intellectual world into Classical, Modern, and Science, in that order, and held that

> it is only the shallowest mind that can suppose that all the advance of discovery brings us appreciably nearer to the solution of the riddles of the universe which have haunted man from the beginning . . .

Such was the miniature, fossilised Britain, where masters and servants still knew their places, and where the miners were disloyal to their school. And while the boys were playing at being servants, loading the milk churns on to the trains until the strike was broken by the masters of their country, the shallow mind of Alan Turing had arrived in their midst. It was a mind that had no interest in the problems of would-be landowners, empire-builders, or administrators of the white man's burden; they belonged to a system that had no interest in him.

The word 'system', indeed, was one which was a constant refrain, and the system operated almost independently of individual personalities. Westcott House, which Alan joined, had taken its first boarders only in 1920, and yet already existed as though the traditional prefects and 'fags' and beatings in the washroom were laws of nature. This was true even though the housemaster, Geoffrey O'Hanlon, had a mind of his own. Then a bachelor in his forties, and nicknamed (rather snobbishly) Teacher, he had extended the original house building with his own private fortune derived from Lancashire cotton. He personally did not believe in moulding the boys to a common form, and failed to instil the religion of 'footer' with quite the enthusiasm of the other housemasters. His house enjoyed in consequence a dim reputation for 'slackness'. He encouraged music and art, disliked bullying, and stopped the song-singing initiation soon after Alan arrived. A Catholic classicist, he was the nearest thing to a liberal government in the 'nation in miniature'. Yet the system prevailed, in all but details. One could conform, rebel, or withdraw – and Alan withdrew.

'He appears self-contained and is apt to be solitary,' commented O'Hanlon.[16] 'This is not due to moroseness, but simply I think to a shy disposition.' Alan had no friend, and at least once in this year he was trapped underneath some loose floorboards in the house day-room by the other boys. He tried to continue chemistry experiments there, but this was doubly hated, as showing a swottish mentality, and producing nasty smells. 'Slightly less dirty and untidy in his habits,' wrote O'Hanlon at the end of 1926, 'rather more conscious of a duty to mend his ways. He has his own furrow to plough, and may not meet with general sympathy: he seems cheerful, though I'm not always certain he really is so.'

'His ways sometimes tempt persecution: though I don't think he is unhappy. Undeniably he is not a "normal" boy: not the worse for that, but probably less happy,' he wrote somewhat inconsistently at the end of the spring term of 1927. The headmaster commented more briskly:

> He should do very well when he finds his *métier*; but meanwhile he would do much better if he would try to do his best as a member of this school – he should have more *esprit de corps*.

Alan was not what Brewster called a 'proper boy', whose instincts, inherited from thousands of years of warfare, made him want to throw things at other people. In this respect he was more like his father, who had managed to escape games as a boy in Bedford. Mr Turing, who lacked his wife's excessive respect for schoolmasters, made a special request for Alan to be excused from cricket, and he was allowed by O'Hanlon to play golf instead. But he made himself 'a drip' by letting down his house contingent at the gym with his 'slackness'. He was also called *dirty*, thanks to his rather dark, greasy complexion, and a perpetual rash of ink stains. Fountain pens still seemed to spurt ink whenever his clumsy hands came near them. His hair, which naturally fell forward, refused to lie down in the required direction; his shirt moved out of his trousers, his tie out of his stiff collar. He still seemed unable to work out which coat button corresponded to which buttonhole. On the Officers Training Corps parade on Friday afternoons, he stood out with cap askew, hunched shoulders, ill-fitting uniform with puttees like lampshades winding up his legs. All his characteristics lent themselves to easy mockery, especially his shy, hesitant, high-pitched voice – not exactly stuttering, but hesitating, as if waiting for some laborious process to translate his thoughts into the form of human speech.

Mrs Turing saw the fulfilment of her worst fear, which was that Alan would not adapt to public school life. Nor was he the kind of boy who was unpopular in the house but pleased the masters in class. He failed there too. In his first term, he had been placed in a form called 'the Shell', with boys a year older than himself who were not good at the work. Then he was 'promoted', but only to the entrance form for those supposed of average ability. Alan took little notice. The masters streamed past – seventeen in those first four terms – and none understood the dreaming boy in a class of twenty-two. According to a classmate of the period:[17]

> he was the cruel butt of at least one master because he always managed to get ink on his collar so that the master could raise an easy laugh by saying 'Ink on your collar again, Turing!' A small and petty thing but it stuck in my mind as an example of how a sensitive and inoffensive boy . . . can have his life made hell at public school.

Reports were issued twice a term, and the unopened envelopes would lie accusingly on the breakfast table, while Mr Turing 'fortified himself with a couple of pipes and *The Times*.' Alan would say, unconvincingly, 'Daddy

expects school reports to be like after-dinner speeches,' or 'Daddy should see some of the other boys' reports.' But Daddy was not paying for the other boys, and was seeing the hard-won fees disappear without detectable effect.

Daddy did not mind his divergences from conventional behaviour, or at least regarded them with an amused tolerance. In fact both John and Alan took after their father, all three believing in speaking their mind and applying their ideas with a determination punctuated by moments of recklessness. Within the family, the voice of public opinion was supplied by Mama, whose tastes and judgments were thought insipidly provincial by the others. It was she, not her husband nor John, who felt called upon to reform Alan. However, Mr Turing's tolerance did not extend to the waste of a precious public school education. His finances were particularly tight at this point. He had finally tired of exile, and had taken a small house on the edge of Guildford in Surrey, but besides paying income tax he now had to launch John on a career. He had dissuaded his son from the ICS, predicting that the 1919 reforms, introducing Indian representation into provincial government, spelt the beginning of the end. John had spiritedly thought of going into publishing instead, and his father's pet idea was that he should go to South America to make money out of guano, but in the end it was Mrs Turing's safer suggestion that he should be a solicitor which won. Mr Turing was obliged to pay £450 for his son to be articled and to support him for five years.

But Alan could not see the point of the schooling so dearly won for him. Even in French, once a favourite, the master wrote 'His lack of interest is very depressing except when something amuses him.' He developed a particularly annoying way of ignoring the teaching during the term and then coming top in the examination. Greek, however, which he was supposed to learn for the first time at Sherborne, he ignored completely. He was placed at the bottom of the bottom set for three terms, after which the point was conceded and he was grudgingly allowed to abandon it. 'Having secured one privileged exemption,' O'Hanlon wrote, 'he is mistaken in acting as though idleness and indifference will procure release from uncongenial subjects.'

In mathematics and science the masters wrote more approving reports, but there was always something to complain about. In the summer of 1927, Alan showed to his mathematics teacher, a certain Randolph, some work he had done for himself. He had found the infinite series for the 'inverse tangent function', starting from the trigonometrical formula for $\tan \frac{1}{2}x$.* Randolph was appropriately amazed, and told Alan's form master that he was 'a genius'. But the news sank like a stone in the Sherborne pond. It

* The series is: $\tan^{-1} x = x - \frac{x^3}{3} + \frac{x^5}{5} - \frac{x^7}{7} \ldots$

It was a standard result in sixth form work, but the point was that he discovered it without the use of the elementary calculus. Perhaps the most remarkable thing was his seeing that such a series should exist at all.

merely saved Alan from a demotion, and even Randolph reported unfavourably:

> Not very good. He spends a good deal of time apparently in investigations in advanced mathematics to the neglect of elementary work. A sound groundwork is essential in any subject. His work is dirty.

The headmaster issued a warning:

> I hope he will not fall between two stools. If he is to stay at a Public School, he must aim at becoming *educated*. If he is to be solely a *Scientific Specialist*, he is wasting his time at a Public School.

The hint of expulsion thudded on to the breakfast table, endangering all that Mr and Mrs Turing had worked and prayed for respectively. But Alan discovered a way to beat the system that Nowell Smith called 'the essential glory and function of the English Public School'. He spent the second half of the term isolated in the sanatorium with mumps. Emerging to perform as well as usual in the examinations, he won a prize. The headmaster commented:

> He owes his place and prize entirely to mathematics and science, but he shewed improvement on the literary side. If he goes on as he is doing now, he should do very well.

In the summer holiday the Turings stayed again at a boarding house in Wales, this time at Ffestiniog. Alan and his mother strode up the peaks. Back at the boarding house was a Mr Neild who took great interest in Alan and gave him a book on mountain climbing in which he wrote a long inscription treating Alan's climbs as symbolic of his eventually attaining intellectual heights. One person, for a brief moment, had taken him seriously.

The human body, *Natural Wonders* explained, was a 'Living Apothecary Shop'. It was Brewster's way of describing the effects of the recently discovered hormones, whereby the 'different parts of the body' could 'signal to one another' with 'chemical messages' rather than through the nervous system. It was during 1927, when he became fifteen, that Alan gained his height, and presumably the more interesting and exciting changes took place at the same time.

It was also time for the puberty rite of the Church of England. Alan was confirmed on 7 November 1927. Like the Officers Training Corps, confirmation was one of those duties for which everyone had to volunteer. But he did believe in it, or at least in something, as he knelt before the bishop of Salisbury and renounced for himself the world, the flesh and the devil. Nowell Smith, however, took advantage of the occasion to remark:

> I hope he takes his confirmation seriously. If he does, he will not be content to neglect obvious duties in order to indulge his own tastes, however good in themselves.

To Alan, the 'duties' to translate silly sentences into Latin, polish the buttons on his Corps tunic, and suchlike, were far from 'obvious'. He had his own kind of seriousness. The headmaster's words would more appropriately have been directed at the outward conformity that Alec Waugh had written about:

> As is the case with most boys, Confirmation had very little effect on Gordon. He was not an atheist; he accepted Christianity in much the same way as he accepted the Conservative party. All the best people believed in it, so it was bound to be right; but at the same time it had not the slightest influence over his actions. If he had any religion at this time it was House football. . . .

These were strong words for a book which had appeared in 1917 when Shirburnians were being sacrificed at the rate of one a week. It was because of such remarks that *The Loom of Youth* was forbidden at Sherborne, and any boy found with it was subject to an immediate beating.

Yet the renegade author had said little more, although in different language, than was revealed by the headmaster:

> Mind you, I am not attacking the Public School system. I believe in its enormous value, above all in the sense of duty and the loyalty and the law-abidingness which it inculcates. But it cannot escape the dangers attendant upon any system of discipline, the dangers of submitting to mere routine, of adopting ready-made sentiments at second-hand, of a slavish, or perhaps I should rather say a sheepish, want of independence of character.

'The system cannot escape these dangers,' he continued, 'but we individuals . . . can overcome them if we set the right way about it.' It was, however, very difficult for individuals to go against the grain of a total organisation. As Nowell Smith said, 'of all societies very few are so definite and easily understood as a school like this . . . we all here live under a common life, under a common discipline. Our life is organised with great thoroughness, and the organisation is directed to a definite aim. . . .' And the headmaster further observed that 'schoolboys, however much originality they may possess as individuals, are in their conduct to the highest degree conventional.' Nowell Smith was not a small-minded man and somehow managed to reconcile this system of education with his love of Wordsworth's poetry, of which he was an editor. Within the classicist there beat a romantic heart, and one which perhaps troubled him.

But the problem of inspiring 'independence of character' within a system of 'mere routine' arose principally in connection with what was called 'dirty talk', rather than with the more elevated questions treated by the romantic consciousness. The headmaster called upon individuals to show their true

patriotism to Sherborne by avoiding it, and appealed to the boy of independent character, who

> brought up in a civilised home, has an instinctive dislike of swearing and coarse jokes and vulgar innuendoes, and yet from sheer cowardice will conceal his dislike, and perhaps force a laugh, and even begin to learn the vile jargon!

In an all-male school there was only one kind of 'vulgar innuendo' possible. Contact between the boys was fraught with sexual potential, a fact which was reflected in the effective ban on associations between boys of different houses, or of different ages. These bans, and the 'gossip' or 'scandal' associated with them, were not part of the *official* life of a public school, but were no less real for that. Nowell Smith might condemn the fact that there was 'one kind of language suitable for home or for a master's ears, and another kind for the study or the dormitory,' but it was a fact of school life. *Natural Wonders* explained that

> We say commonly that we think with our brains. That is true; but it is by no means the whole story. The brain has two halves, just alike, exactly as the body has. In fact, the two sides of the brain are even more precisely alike than the two hands. Nevertheless, we do all our thinking with one side only.

It was Alec Waugh's accusation that Sherborne provided a training in – metaphorically speaking – using two halves of the brain independently. 'Thinking', or rather official thinking, went on in one hemisphere, and ordinary life in the other. It was not hypocrisy: it was that no one in his senses would confuse the two worlds. It worked very well, and only went wrong when something happened to bridge the gap. Then, as Waugh said with some feeling, the real crime was to be found out.

In 1927 the school had changed somewhat in its unofficial conventions. When the boys read *The Loom of Youth* (as of course they did, because it was forbidden) they were rather surprised at the tolerance shown, or at least suggested, of sexual friendships. When the games teams met their counterparts from other public schools, they were amazed at the latitude allowed at the rival establishments. Sherborne boys were at this period asserting a more puritanical, less cynical orthodoxy than that of Alec Waugh's 1914. Nowell Smith was no longer appealing to the independent boys to stamp out what he called 'filth'. But he had not prevented the chemical messages from flowing in four hundred budding 'living apothecary shops', and not even the cold baths had put a stop to 'dirty talk'.

Alan Turing was a boy of independent character, but this subject presented him with a problem which was the opposite of the headmaster's. To most boys 'scandal' would be a quickly-forgotten bantering, alleviating the monotony of school. But to him, it touched the centre of life itself. For although he had surely learnt by now about the birds and the bees, his heart was to be elsewhere. The secret of how the babies were born was hidden

well, but everyone knew there *was* a secret. He, however, had been made aware by Sherborne of a secret that in the outside world was not even supposed to exist. And it was *his* secret. For he was drawn by love and desire not only to 'the commonest in nature', but to his own sex.

He was a serious person, and not what Alec Waugh called 'the average boy'. He was not 'in the highest degree conventional', and he was suffering for it. For him there had to be a reason for everything; it had to make sense – and to make one sense, not two. But Sherborne was no help to him in this respect, except in making him more conscious of himself. To be independent he had to work his way through official and unofficial rules alike, and there were certainly no 'ready-made sentiments' for him. At Sherborne the two natural wonders of his life were 'Stinks' and 'Filth'.

If Nowell Smith sometimes had reservations about the public school system, no such doubts assailed Alan's form-master in the autumn of 1927, a certain A.H. Trelawny Ross. A man schooled at Sherborne, who had returned there immediately from Oxford in 1911, he learnt nothing and forgot nothing in his thirty years as a housemaster.[18] A stern foe of 'slackness', he shared none of the headmaster's qualms about slavishness. His style of English also contrasted with that of Nowell Smith, his 1928 'house letter' commencing thus:

> I have a bone to pick with my Captain of the Dayroom (height 4'11"). He has been telling people I am a woman-hater. This fib was started some years ago by a dame who did not find me gushing enough. My view actually is that a woman-hater has a mental kink, just as a female man-hater has, of whom there are plenty about. . . .

A narrow nationalist, who had not properly learnt the lesson of loyalty to school as well as to house, Ross was little interested in his form. However, he gave them the benefit of his knowledge and experience of life. He taught Latin translation for a week, Latin prose for a week, and English for a week, this consisting of spelling, 'how to start, write, and address a letter,' 'how to make a précis,' 'how a sonnet is built up, and by a typed summary of the main points, to show how to get good sensible, well-arranged written essays.'

In this respect Ross urged his sensible opinion that, 'As democracy advances, manners and morals recede', and urged the staff to read *The Rising Tide of Colour*. He held that the defeat of Germany had come about 'because she thought that Science and materialism were stronger than religious thought and observance.' He called the scientific subjects 'low cunning', and would sniff and say, 'This room smells of mathematics! Go out and fetch a disinfectant spray!'

Alan used the time on something he found more interesting. Ross caught

him doing algebra during time devoted to 'religious instruction', and wrote at half-term:

> I can forgive his writing, though it is the worst I have ever seen, and I try to view tolerantly his [*illegible*] inexactitude and slipshod, dirty, work, inconsistent though such inexactitude is in a utilitarian, but I cannot forgive the stupidity of his attitude towards sane discussion on the New Testament.
>
> He ought not to be in this form of course as far as form subjects go. He is ludicrously behind.

In December 1927, Ross placed him bottom in both English and Latin, attaching to the report an inky, blotted page which clearly indicated the negligible amount of energy conceded by Alan to the deeds of Marius and Sulla. Yet even Ross tempered his complaint with the comment 'I like him personally'. O'Hanlon wrote of his 'saving sense of humour'. At home, Alan's messy experiments might be tiresome, but he had a jolly way of coming out with scientific facts, and of telling jokes against his own clumsiness, naive and free from showing off, that it was hard not to like. He was certainly foolish in not making life easier for himself; lazy and perhaps arrogant in supposing he knew what was good for him; but he was not so much obstreperous as bewildered by demands which had nothing to do with his interests. Nor did he complain at home about Sherborne, for he seemed to regard it as the fact of life which indeed it was.

Anyone might like him personally, but as part of a system it was a very different story. At Christmas 1927 the headmaster wrote:

> He is the kind of boy who is bound to be rather a problem in any kind of school or community, being in some respects definitely anti-social. But I think in our community he has a good chance of developing his special gifts and at the same time learning some of the art of living.

With that judgment Nowell Smith suddenly retired, perhaps not sorry to relinquish the contradictions of his community, and the problem of Alan Turing's independent character.

The new year of 1928 marked a period of change for Sherborne. Nowell Smith's successor was a C.L.F. Boughey, who had been an assistant master at Marlborough. By chance, the headmaster's departure had coincided with the death of Carey, the school games master. Between them, as 'Chief' and 'The Bull', the two had divided the Sherborne world into *mens* and *corpus*, and ruled them respectively for twenty years. Carey was succeeded in his role by that bulldog figure Ross.

It also marked a change for Alan. His housemaster asked Blamey, an earnest and also rather isolated boy a year older than Alan, to share a two-boy study with him. Blamey was to try to make Alan more tidy, to 'help him conform, and try and show him there were other things in life besides mathematics.' In the first objective there was a lamentable failure; in the

second he came up against the difficulty that Alan 'had wonderful concentration, and would become absorbed in some abstruse problem.' Blamey would consider it his duty to 'interrupt and say it is time to go to chapel, to games, or afternoon classes' as the case might be, he being a well-meaning person, who believed in making the system run as smoothly as possible.[19] O'Hanlon had written at Christmas of Alan that

> No doubt he is very aggravating, and he should know by now that I don't care to find him boiling heaven knows what witches' brew by the aid of two guttering candles on a naked window sill. However, he has borne his afflictions very cheerfully, and undoubtedly has taken more trouble, e.g. with physical training. I am far from hopeless.

Alan's only regret regarding the 'witches' brew' was that O'Hanlon 'had missed seeing at their height the very fine colours produced by the ignition of the vapour produced by super-heated candle-grease.' Alan was still fascinated by chemistry, but not interested in doing it in a way that pleased anyone else. Mathematics and science reports such as '... marred by inaccuracy, untidiness, and bad style ... frightfully untidy both in written and experimental work ...' continued to reflect his lack of ability to communicate effectively, while admitting that he was 'very promising'. 'His manner of presenting work is still disgusting,' wrote O'Hanlon, 'and takes away much of the pleasure it should give.' 'He doesn't understand what bad manners bad writing and messy figures are.' Ross had passed him on to another form, but he was still placed nearly at the bottom in the spring of 1928. 'His mind seems rather chaotic at present and he finds great difficulty in expressing himself. He should read more,' wrote the master, perhaps more enlightened than Ross.

It was in doubt whether he could take the School Certificate and go on to the sixth form. O'Hanlon and the science masters wanted him to try, and the rest opposed it. The decision had to be made by the new headmaster, who knew nothing of Alan. Boughey had proved himself a new broom, upsetting sacred traditions of the school. The head of the Classical Sixth was no longer automatically the head of school. The prefects had been alienated when he lectured the whole school on 'dirty talk'. (They felt he was judging Sherborne by Marlborough standards.) The staff were horrified when he issued a *fiat*, in front of the school, that there would be no memorial to Carey in the chapel. This incident sealed his doom. The official history[20] would record that

> A natural shyness could give an impression of self-esteem and indifference to school affairs that had perhaps no great foundation in fact ... he had to fight against an ill health that was largely the result of war service and he found it increasingly hard to make the public appearances or even to provide the constant private accessibility which a headmaster's position inevitably demands.

Whether as cause or effect, he was 'poisoned', as Brewster would have put it, by alcohol. The school settled down to a power struggle between Ross and Boughey, and it was the fight between old and new that settled Alan's future, for Boughey over-ruled Ross on principle and allowed him to be entered for the School Certificate.

During the holidays, Alan's father coached him in English. Mr Turing had a great love of literature, although he did not have a mind for abstract ideas. He could recite from memory pages from the Bible, Kipling, and humorous Edwardian novels like *Three Men in a Boat*. All this was wasted on Alan, whose set work was *Hamlet*. For a brief moment he pleased his father by saying that at least there was one line he liked. The pleasure was dissipated when Alan explained it was the *last* line: 'Exeunt, bearing off the bodies. . . .'

For the summer term of 1928, Alan was moved to yet another form, that of the Reverend W.J. Bensly, to prepare for the examinations. He saw no reason to depart from his usual pattern, and continued to be placed at the bottom by Bensly, who rashly offered to donate a billion pounds to any charity named by Alan, should he pass in Latin. O'Hanlon, more perceptively, had predicted:

> He has as good brains as any boy that's been here. They are good enough for him to get through even in 'useless' subjects like Latin, French and English.

O'Hanlon saw some of the papers that Alan submitted. They were 'astonishingly legible and tidy'. He passed with credits in English, French, elementary mathematics, additional mathematics, physics, chemistry – and Latin. Bensly never paid up, authority having the privilege of being able to change the rules.

The School Certificate passed, the system allowed him a small part to play, that of the 'maths brain'. There was no mathematical sixth at Sherborne, as at some schools, notably Winchester. There was a science sixth for whom mathematics, Alan's best subject, was regarded as subsidiary. Nor was Alan promoted to the sixth form immediately; he was held back in the fifth for the autumn of 1928, but allowed to join the sixth form for their mathematics classes. These were taught by a young master, Eperson, just a year down from Oxford and a gentle, cultured person, the kind of master who would constantly be played up by the boys. Here was the chance for the system to redeem itself at last, the spirit breaking through the letter of the law. And in a negative way, Eperson did what Alan wanted, by leaving him alone:[21]

> All that I can claim is that my deliberate policy of leaving him largely to his own devices and standing by to assist when necessary, allowed his natural mathematical genius to progress uninhibited . . .

He found that Alan always preferred his own methods to those supplied

by the text book, and indeed Alan had gone his own way all the time, making few concessions to the school system. During the machinations over the School Certificate, or even before, he had been studying the theory of relativity from Einstein's own popular account.[22] This employed only elementary mathematics, but gave full rein to ideas which went far beyond anything in the school syllabus. For if *Natural Wonders* had introduced him to the post-Darwinian world, Einstein took him into the twentieth century revolution of physics. Alan produced a small red Memo Book of notes, which he gave to his mother.

'Einstein here throws doubt,' Alan commented, 'on whether Euclid's axioms, when applied to rigid bodies, hold. ... He therefore sets out to test ... the Galilei-Newtonian laws or axioms.' He had identified the crucial point, that Einstein *doubted the axioms*. Not for Alan the 'obvious duties', for nothing was obvious to him. His brother John, who by now regarded Alan with a rather patronising, but not hostile amusement, held that

> You could take a safe bet that if you ventured on some self-evident proposition, as for example that the earth was round, Alan would produce a great deal of incontrovertible evidence to prove that it was almost certainly flat, ovular, or much the same shape as a Siamese cat which had been boiled for fifteen minutes at a temperature of one thousand degrees Centigrade.

Cartesian doubt came as an incomprehensible intrusion into Alan's family and school environment, an intrusion that the English coped with more by laughter than by persecution. But doubt being a very difficult and rare state of mind, it had taken the whole intellectual world a very long time to ask whether the 'Galilei-Newtonian laws or axioms', apparently 'self-evident', were actually true. Only by the late nineteenth century was it recognised that they were inconsistent with the known laws of electricity and magnetism. The implications were frightening, and it had needed Einstein to take the step of saying that the assumed basis of mechanics was actually *incorrect*, thereby creating the Special Theory of Relativity in 1905. This then proved inconsistent with Newton's laws of gravity, and to remove these contradictions Einstein had gone even further, casting doubt even on Euclid's axioms of space to create the General Theory of Relativity in 1915. The point of what Einstein had done did not lie in this or that experiment. It lay, as Alan saw, in the ability to doubt, to take ideas seriously, and to follow them to a logical if upsetting conclusion. 'Now he has got his axioms,' wrote Alan, 'and is able to proceed with his logic, discarding the old ideas of time, space, etc.'

Alan also saw that Einstein avoided philosophical discussions of what space and time 'really were', and instead concentrated on something that could in principle be done. Einstein placed great emphasis on 'rods' and 'clocks' as part of an *operational* approach to physics, in which 'distance', for

instance, only had meaning in terms of some well-defined measuring operation, not as an absolute ideal. Alan wrote:

> It is meaningless to ask whether the two p[oin]ts are always the same distance apart, as you stipulate that that distance is your unit and your ideas have to go by that definition. . . . These ways of measuring are really conventions. You modify your laws to suit your method of measurement.

No respecter of persons, he preferred a piece of working of his own to that supplied by Einstein 'because in this way I think it should seem less "magicky".' He reached the very end of the book, and gave a masterly derivation of the law* which in General Relativity would supplant Newton's axiom, that a body subject to no external force would move in a straight line with constant speed:

> He has now got to find the general law of motion for bodies. It will have, of course, to satisfy the general Principle of Relativity. He does not actually give the law, which I think is a pity, so I will. It is: 'The separation between any two events in the history of a particle shall be a maximum or minimum when measured along its world line.'
>
> To prove it, he brings in the Principle of Equivalence, which says that: 'Any natural gravitational field is equivalent to some artificial one.' Suppose then that we substitute an artificial field for the natural one. Now as the field is artificial there is some system at that p[oin]t which is Galileian, and as it is Galileian the particle will be moving uniformly relative to it, i.e. it has a straight world line relatively to it. Straight lines in Euclidean space have always a maximum or minimum length between two p[oin]ts. Therefore the world line satisfies the conditions given above for one system, therefore it satisfies it for all.

As Alan explained, Einstein had not stated this law of motion in his popular account. Alan might just possibly have guessed it for himself. On the other hand, he could very well have found it in another work which was published in 1928, and which he was reading by 1929 – *The Nature of the Physical World* by Sir Arthur Eddington. Professor of Astronomy at Cambridge, Eddington had worked on the physics of the stars and the development of the mathematical theory of relativity. This influential book, however, was one of his popular works, in which he set out to convey the great change in the scientific world-picture that had taken place since 1900. Its rather impressionistic account of relativity did state the law of motion, although without proof, and might have supplied its form to Alan. Certainly, in one way or another, Alan had done more than study a book, for he had put several ideas together for himself.

This study arose out of his own initiative, and Eperson did not know about it. He was thinking quite independently of his environment, which offered him little but nagging and scolding. He had had to look to his totally

* Usually called 'the law of geodesic motion'.

bewildered mother for a little encouragement. But then something new happened to put him into contact with the world.

There was a boy in another house – Ross's house, in fact – whose name was Morcom. As yet he was nothing but 'Morcom' to Alan, although later[23] he became 'Christopher'. Alan had first noticed Christopher Morcom early in 1927, and had been very struck by him, partly because he was surprisingly small for his form. (He was a year older than Alan and a year ahead in the school, but fair-haired and slight.) It was also, however, because he 'wanted to look again at his face, as he felt so attracted.' Later in 1927 Christopher had been away from school and then had returned looking, Alan noticed, very thin in the face. He shared with Alan a passion for science, but he was a very different person. The institutions that were for Alan such stumbling-blocks had been for Christopher Morcom the instruments of almost effortless advance, the source of scholarships, prizes and praise. He again returned late to school this term, but when he arrived Alan was waiting for him.

His utter loneliness was pierced at last. It was difficult to make friends with an older boy from another house. Nor was Alan good at conversation. But he found an *entrée* in mathematics. 'During the term Chris and I began setting one another our pet problems and discussing our pet methods.' It would be impossible to separate the different aspects of thought and feeling. This was first love, which Alan would himself come to regard as the first of many for others of his own sex. It had that sense of surrender ('worshipped the ground he trod on'), and a heightened awareness, as of brilliant colour bursting upon a black and white world. ('He made everyone else seem so ordinary.') At the same time, it was most important that Christopher Morcom was someone who took scientific ideas seriously. And gradually, though always with considerable reserve, he took Alan seriously. ('My most vivid recollections of Chris are almost entirely of the kind things he said to me sometimes.') So these elements were all present, and had the effect of giving Alan reason to communicate.

Before and after Eperson's classes Alan might talk to Christopher about relativity, or might show him other pieces of work. He had, for example, calculated π to thirty-six decimal places at about this time, perhaps making use of his own series for the inverse tangent function, and being much annoyed to find an error in the last decimal place. After a time, Alan found another opportunity to see Christopher. By accident he discovered that during a certain period on Wednesday afternoons set for private study, Chris went to the library and not to his house. (Ross did not allow boys to work unsupervised, fearing the sexual potential in unregulated associations.) 'I so enjoyed Chris' company there,' wrote Alan, 'that ever since I always used to go to the library instead of my study.'

Yet another chance arose through the gramophone society which the progressive Eperson had started. Christopher, a fine piano player, was a

keen member. Alan had little interest in music, but sometimes on Sunday afternoons he would go to Eperson's lodgings with Blamey (who also had a gramophone and records in their shared study). There he could sit and steal glances at Christopher while the 78's played out their disjointed versions of the great symphonies. This was, incidentally, part of Blamey's noble effort to show Alan that there were other things in life besides mathematics. He also showed Alan how to make a crystal wireless receiver out of basic materials, having noticed that Alan had little pocket money for such things. Alan insisted on winding the coils for the variometer and was delighted to find that his clumsy hands had made something that actually worked, even if he could never aspire to rival Christopher's dexterity.

At Christmas, Eperson reported:

> This term has been spent, and the next two terms will have to be spent, in filling in the many gaps in his knowledge and *organising* it. He thinks very rapidly and is apt to be 'brilliant' but unsound in some of his work. He is seldom defeated by a problem, but his methods are often crude, cumbersome and untidy. But thoroughness and polish will no doubt come in time.

He would have found the Higher Certificate dull stuff, compared with the job of organising Einstein. But he cared more about his own failure to fit in with what was expected, now that Christopher had done 'hopelessly better' in the test at the end of term. In the new year of 1929 there was another shuffle, and Alan joined the sixth form proper, so that he did all his classes with Christopher. He made a point of sitting next to him in every class right from the start. Christopher, Alan wrote,

> made some of the remarks I was afraid of (I know better now) about the coincidence but seemed to welcome me in a passive way. It was not long before we began doing experiments together in Chemistry and we were continually changing our ideas on all sorts of subjects.

Unfortunately Christopher was away from classes with a cold for most of January and February, and Alan could work with him only for five weeks of the spring term.

> Chris' work was always better than mine because I think he was very thorough. He was certainly very clever but he never neglected details, and for instance very seldom made arithmetical slips. He had a great power in practical work of finding out just what was the best way of doing anything. To give an example of his skill, he could estimate when a minute had passed to within half a second. He could sometimes see Venus in the day-time. Of course he was born with very good eyes, but still I think it is typical of him. His skill extended to all sorts of more everyday things, such as driving, fives and billiards.
>
> One cannot help admiring such powers and I certainly wanted to be able to do that kind of thing myself. Chris always had a delightful pride in his performances and I think it was this that excited one's competitive instinct to do something

which might fascinate him and which he might admire. This pride extended to a pride in his possessions. He used to demonstrate the virtues of his 'Research' fountain pen in a way which made my mouth water and then admitted he was trying to make me jealous.

Slightly inconsistently, Alan also wrote:

Chris always seemed to me very modest. He would never for instance tell Mr Andrews that his ideas weren't sound although the opportunity occurred again and again. More particularly he very much disliked to offend anyone in any way and often used to apologise (e.g. to masters) in cases where the average boy would not dream of doing so.

The average boy, as all school stories and magazines admitted, held the masters in contempt – especially in 'Stinks'. It was the most obvious contradiction of the system. But Christopher rose above it all:

A thing about Chris which I think is very unusual, is that he had a very definite code of morals. One day he was talking about an essay in an exam and how it had led to the subject of 'right and wrong'. 'I have some very definite ideas of "right and wrong",' he said. Somehow I never seemed to doubt that anything that Chris would do would be right, and I think there was a lot more in that than blind admiration.

Take dirty talk for instance. The idea of Chris having to do with such a thing seemed simply ludicrous, and of course I do not know anything at all about Chris at the house, but I should think in this respect he would prevent dirty talk by making people not want to do it rather than making them avoid shocking him. This of course tells you nothing but the way his personality impressed me. I remember an occasion when I made a remark to him on purpose, that would decidedly not pass in a drawing room, but which would not be thought anything of at school, just to see how he would take it. He made me feel sorry for saying it, without him in any way seeming silly or priggish.

Despite all these amazing virtues, Christopher Morcom was human. He had nearly got into trouble when he was dropping stones down train funnels from the railway bridge and struck a railwayman instead. Another exploit involved sending gas-filled balloons over the field to the Sherborne Girls' School. Nor was their time in the laboratories too solemn. Another boy, a tough athlete called Mermagen, joined them for physics, and the three of them had to work through the practical experiments in a little annex while Gervis taught his class. These classes were enlivened by Gervis's sausage-lamps, painted bulbs which he used as electrical resistances. 'Take another sausage-lamp, boy!' was his catchphrase, and the three of them worked out a comic sketch around the things, which Christopher was thinking of setting to music.

In the summer term of 1929 they were doing only the dull revision work for the Higher School Certificate, but even this was coloured by romance since 'As always it was my great ambition to do as well as Chris. I was

always as well supplied with ideas as he, but have not the same thoroughness in carrying them out.' Alan had never before taken any notice of naggings to take care over details and style, since he had worked for himself, by himself. But now perhaps he recognised that what was good enough for Christopher Morcom was good enough for him, and that he should train himself to communicate in the way that the system required. He had not yet acquired the necessary skill. Andrews observed that he was 'at last trying to improve his style in written work,' but Eperson, writing that his work for the Higher Certificate showed 'distinct promise', re-emphasised the need to 'put a neat and tidy solution on paper.' The examiner for the mathematics of the Higher Certificate[24] commented that:

> A.M. Turing showed an unusual aptitude for noticing the less obvious points to be discussed or avoided in certain questions and for discovering methods which would at once shorten or illumine the solutions. But he appeared to lack the patience necessary for careful computation of algebraic verification, and his handwriting was so bad that he lost marks frequently – sometimes because his work was definitely illegible, and sometimes because his misreading his own writing led him into mistakes. His mathematical ability was not of a standard to compensate entirely for the cumulative effects of these faults.

Alan obtained 1033 marks in the mathematics papers, compared with Christopher's 1436.

The Morcoms were a wealthy, vigorous scientific and artistic family, with a base in a Midlands engineering firm. They had developed a Jacobean dwelling near Bromsgrove in Worcestershire into a large country house, the Clock House, where they lived in some style. Christopher's grandfather had been an entrepreneur in stationary steam engines, and the Birmingham company of Belliss and Morcom, of which his father, Colonel Reginald Morcom, had recently become chairman, now also built steam turbines and air compressors. Christopher's mother was the daughter of Sir Joseph Swan, who starting from a very ordinary background had become in 1879 the inventor, independently of Edison, of the electric light. Colonel Morcom retained an active interest in scientific research, while Mrs Morcom matched his energy in her own pursuits. At the Clock House she ran a goat farm; she bought and renovated cottages in the neighbouring village of Catshill; she was out every day on some project or county duty. She had studied in London at the Slade School of Art, and in 1928 returned there, taking a flat and a studio near Victoria, and producing sculpture of force and style. It was typical of her flair and zest that when back at the Slade she still pretended to be 'Miss Swan', but then invited other art students back to the Clock House, involving herself in absurd disguises when she doubled as Mrs Morcom.

Rupert Morcom, the elder son, had entered Sherborne in 1920, and had won a scholarship in science to Trinity College, Cambridge; he was now

engaged in research at the Technische Hochshule in Zurich. Like Alan he was an avid experimenter, but one with the advantage that his parents had been able to construct a laboratory for him at home. His younger brother, who also had the use of the laboratory, now told Alan of all this, exciting great envy.

In particular, Christopher told Alan about an experiment that Rupert had taken up before going to Cambridge in 1925. It concerned a chemical effect which Andrews often used to draw the interest of the younger boys. By chance it involved Alan's old favourite, iodine. Solutions of iodates and sulphites, when mixed, would result in the precipitation of free iodine, but in a rather striking way. Alan later explained: 'It is a beautiful experiment. Two solutions are mixed in a beaker and after waiting for some very definite period of time, the whole suddenly becomes a deep blue. I have known it take a time, 30 secs., and then turn blue in 1/10 of a sec. or less.' Rupert had been investigating not the easy problem of working out the recombination of ions, but that of explaining this time delay. It required a knowledge of physical chemistry, and an understanding of differential equations, both beyond the school syllabus. Alan wrote:

> Chris and I wanted to find a relation between the time and the concentrations of the solutions and thereby verify Rupert's theories. Chris had already done some experiments upon it. We were looking forward very much to the experiment. The results unfortunately did not agree with theory and I made more experiments during the following holidays and invented a new theory. I sent the results to him and so we started to write to one another in the holidays.

He did more than write to Christopher – he invited him to Guildford. Ross, as housemaster, would have been horrified by this audacious step.[25] Christopher replied[26] (after some delay) on 19 August:

> ... Before getting on to experiments I must thank you very much for your invitation to come and stay with you, but I am afraid I shall not be able to come as we are going away somewhere, probably abroad for about three weeks, just at that time ... I am sorry not to be able to come; it is very kind of you to ask me.

As for the iodates, new ventures at the Clock House had rendered them definitely *passé*. There were experiments to measure air resistance, liquid friction, another problem in physical chemistry with Rupert ('I enclose the integral which you might like to try'), plans for a twenty foot long reflecting telescope, and

> ... So far all I have done is to make an adding machine for pounds and ounces. It works surprisingly well. I think I have given up Maths for these holidays, having just read a very good book on Physics in general including relativity.

Alan laboriously copied the ingenious experiment on air resistance that Christopher had devised and wrote back with more ideas about chemistry

and a mechanics problem, only for Christopher to pour cold water on both in a letter of 3 September:

> I haven't studied your conical pendulum carefully but I can't so far understand you're [*sic*] method. Incidentally I believe you're equations of motion have a mistake in them. . . .
> I am now helping my brother analyse American plasticine for an artist. . . . The procedure is to boil with organic solvents. . . . I made a quite good plasticine and very nearly like the stuff we want, by mixing this iron soap with flowers of sulphur . . . and adding a little mutton fat. Hope you are having good holidays; see you on 21st, Yrs, C.C. Morcom.

But chemistry had now given way to astronomy, to which Christopher had introduced Alan earlier in the year. Alan had been given Eddington's *Internal Constitution of the Stars* by his mother for his seventeenth birthday, and had also acquired a 1½-inch telescope. Christopher had a four-inch telescope ('He never tired of talking about his wonderful telescope if he thought one was interested') and had been given a star atlas for his eighteenth birthday. Besides astronomy, Alan was also reading deep into *The Nature of the Physical World*, for in his letter[27] of 20 November 1929 there was a paraphrase of part of its account:

> Schrödinger's quantum theory requires 3 dimensions for every electron he considers. Of course he does not believe that there are really about 10^{70} dimensions, but that this theory will explain the behaviour of an electron. He thinks of 6 dimensions, or 9, or whatever it may be without forming any mental picture. If you like you can say that for every new electron you introduce these new variables analogous to the coordinates of space.

This came from Eddington's description of that other change in fundamental physical concepts, one much more mysterious than relativity. The quantum theory had done away with the billiard-ball corpuscles and the ethereal waves of the nineteenth century, and replaced both by entities which had characteristics both of particles and of waves; lumpy but nebulous.

Eddington had a lot to say, for the 1920s had been a decade of rapid advance in theoretical physics, following up the spate of discoveries at the turn of the century. In 1929 Schrödinger's formulation of the quantum theory of matter was only three years old. The two boys also read books by Sir James Jeans, the other Cambridge astronomer, and here too there were entirely new developments. It had only just been established that some nebulae were clouds of gas and stars on the margins of the Milky Way, and that others were completely separate galaxies. The mental picture of the universe had expanded a millionfold. Alan and Christopher discussed these ideas and 'usually didn't agree', wrote Alan, 'which made things much more interesting.' Alan kept 'some pieces of paper with Chris' ideas in pencil and

mine in ink scrawled all over them. We even used to do this during French.'

The date 28/9/29 appeared on them, and so did the official work:

Monsieur . . . recevez monsieur mes salutations empressés*

Cher monsieur . . . Veuillez agréer l'expression des mes sentiments distingués

Cher ami . . . Je vous serre cordialement la main . . . mes affectueux souvenirs . . . votre affectioné

but also there were generalised noughts and crosses, a reaction involving iodine and phosphorus, and a diagram which suggested doubting Euclid's axiom that for every line there would be exactly one parallel line passing through a given point.

Alan kept these pages, as *souvenirs affectueux*, although he could never express his *sentiments distingués*. As for *serrer cordialement la main*, or more – that was probably pretty firmly repressed in his mind, although soon he would write: 'There were times when I felt his personality particularly strongly. At present I am thinking of an evening when he was waiting outside the labs, and when I came too, he grasped me with his big hand and took me out to see the stars.'

Alan's father was delighted, if amazed, when the reports began to change their tone. His interest in mathematics was confined to the calculation of income tax, but he was proud of Alan, and so was John, who admired him for taking on the system and getting away with it. There had been a method in his madness all along. Unlike his wife, Mr Turing never claimed to have the faintest idea of what his son was doing, and this was the theme of a punning couplet that Alan once read out from his father's letter in his study:

I don't know what the *'ell 'e meant*
But that is what *'e said 'e meant*!

Alan seemed quite happy with this bluff and trusting ignorance. Mrs Turing, however, took the more accusing line of 'I told you so,' and made a good deal of the idea that her choice of school had been the right one. She had certainly paid a certain amount of attention to Alan, and it had not all been in the direction of moral improvement, for she liked to feel that she understood his love of science.

Alan was now in a position to think of winning a scholarship to university, a scholarship representing not only merit but a reasonable income, almost enough to live on as an undergraduate. An exhibition, awarded to second-class candidates, would mean significantly less. Christopher, now eighteen, was expected to win a Trinity College scholarship like his brother. It was ambitious of Alan to attempt the same at seventeen. In mathematics and science, Trinity held the highest reputation among the colleges of the university which was itself, after Göttingen in Germany, the scientific centre of the world.

* This piece of work was marked 'Nine wrong genders. 5/25. Very poor.'

The public schools were good at putting candidates through the daunting procedure for entrance scholarships to the ancient universities, and Sherborne also gave Alan a £30 per annum subsidy. But there was no automatic red carpet laid down. The scholarship examinations were distinguished by questions of an open-ended, imaginative kind, without a published syllabus. They gave a taste of future life. To Alan this was an excitement in itself, but there was more than this to stimulate his ambition. There was Christopher, who would so shortly be leaving Sherborne; there was some muddle over when this would be, but it would probably be at Easter 1930. To fail in the scholarship would be to lose Christopher for more than a year. Perhaps it was this uncertainty that provoked gloomy forebodings in November, when Alan had recurring thoughts that something would happen before Easter to prevent Christopher from going to Cambridge.

The Cambridge examinations opened up the prospect of a whole week in Christopher's company, unconstrained by the house system – 'I was looking forward as much to spending a week with Chris as to seeing Cambridge.' On Friday 6 December, Christopher's study-mate Victor Brookes was to be driving from London to Cambridge, and had offered to take Alan as well as Christopher. They went on the train together to London, where they stopped off to see Mrs Morcom. She took them to her studio, allowed them to play at chipping marble from a bust that she was working on, and then gave them lunch at her flat. Christopher used to tease Alan a good deal, and had a particular running joke about 'deadly stuff', the joke being to pretend that certain harmless substances were really poisonous. He joked about the vanadium in the special Morcom vanadium-steel cutlery being 'absolutely deadly'.

In Cambridge they could live the lives of young gentlemen for a week, with rooms of their own and no lights-out. There was dinner in the Hall of Trinity College, in evening dress, with the portrait of Newton looking down. It was an opportunity to meet and compare themselves with candidates from other schools. Alan made one new acquaintance, Maurice Pryce, with whom he established an easy *rapport* through almost identical interests in mathematics and physics. Pryce was taking the examination for the second time. A year before he had sat under Newton's portrait and had said to himself that now nothing else would suffice. And although Christopher was rather blasé about everything, that was what it was like for them all: nothing could be quite the same again.

It was, wrote Alan, 'a very good meal', and then they

> went to play Bridge with some other Sherburnians in Trinity Hall. We were ... to be back at our Colleges by 10 o'clock but at 4 minutes to 10 Chris wanted to play another hand. I wouldn't let him, and as it was, we were only back just in time. The next day, Saturday, we played cards again 'Rummy' this time. After ten o'clock Chris and I went on playing other games. I remember very clearly

Chris' broad smile when we decided we didn't want to go to bed just yet. We played till 12–15. A few days later we tried to get into the Observatory. We had been invited by an astronomer friend of Chris' to go there if it was fine. Our idea of what was fine did not quite agree with his.

Christopher 'loved all games and was always finding out new ones (of the more trivial kind).' He used to 'try to make people believe things that were credible but just not true,' and at Cambridge persuaded Alan to advance his watch by twenty minutes. 'He was immensely pleased when I found out.' They also went to the cinema together, joined by Norman Heatley, who had been Christopher's friend at a preparatory school, and was now a Cambridge undergraduate. Christopher told him how Alan had a notation of his own for the calculus, and had to translate everything into standard formulae when he did examinations. This aspect of Alan's independence also worried Eperson, who found that 'on paper his solutions were often unorthodox, and required the writer's elucidation.' He doubted whether the Cambridge examiners would perceive the mind that struggled behind the hand.

On the way back from the cinema, Alan hung back and walked with Heatley, to test how much Christopher wanted his company. He was rewarded:

> Evidently I looked rather lonely as Chris beckoned to me (mostly I think with his eyes) to walk beside him. Chris knew I think so well how I liked him, but hated me shewing it.

Alan was conscious that he was a boy in another house, and that everything was open to comment. ('We never went on bicycle rides together. I think perhaps Chris was rather ragged about me at the house.') But this pleased him 'ever so much'.

After what Alan said had been the happiest week of his life, the boys went back to school on 13 December for the last few days of term. At the house supper, they sang about Alan:

> The maths brain lies often awake in his bed
> Doing logs to ten places and trig in his head

The results were published on 18 December in *The Times*, just after term ended. It was a Great Crash. Christopher had won a Trinity scholarship, and Alan had not. Writing in congratulation, Alan had a letter in return with a particularly friendly tone:

> 20/12/29
>
> Dear Turing,
>
> Thank you very much for your letter. I was as sorry you did not get a schol as I was pleased that I did. What Mr Gow says means that you would have certainly got an Exhibition if you had put it down ...
>
> ... Have had two of the clearest nights I have known. I have never seen Jupiter better and I could see 5 or 6 belts and even some detail on one of the large central

belts. Last night I saw no. 1 satellite come out from eclipse. It appeared quite suddenly (during a few seconds) at some distance from Jupiter and looked very attractive. It is the first time I have seen one. I also saw Andromeda Neb. very clearly but did not stay out long. Saw spectrum of Sirius, Pollux and Betelgeux and also bright line spectrum of Orion nebula. Am at moment making a spectrograph. Will write again later. Happy Christmas etc. Yrs ever C.C.M.

Anything like 'making a spectrograph' was far beyond the resources Alan enjoyed at Guildford, but he got hold of an old spherical glass lampshade, filled it with plaster of Paris, covered it with paper (which made him think about the nature of curved surfaces) and set out to mark in the constellations of fixed stars. Typically, he insisted on doing it from his own observation of the night sky, although it would more easily and accurately have been done from an atlas. He trained himself to wake at four o'clock in the morning so that he could mark in some stars not visible in the December evening sky, thus waking up his mother, who thought she had heard a burglar. This done, he wrote to Christopher about it, also asking him whether he thought it would be advisable to try for a college other than Trinity next year. If this was a test of affection, he was again rewarded, for Christopher replied:

5/1/30

Dear Turing,

... I really can't give you any advice about exams because it is nothing to do with me and I feel it would not be quite write [*sic*]. John's is a very good College, but of course I should prefer personally that you came to Trinity where I should see more of you.

I should be very interested to see your star map when it is done but I suppose it is quite impracticable to bring it to school or anything. I have often wanted to make a star globe, but have never really bothered, especially now I have got the star atlas going down to 6th mag. ...

Recently I have been trying to find Nebulae. We saw some quite good ones the other night, one very good planetary in Draco 7th mag. 10″. Also we have been trying to find a Comet 8th mag. in Delphinus. ... I wonder if you will be able to get hold of a telescope to look for it with your 1½″ will be useless for such a small object. I tried to compute its orbit but failed miserably with 11 unsolved equations and 10 unknowns to be eliminated.

Have been getting on with plasticine. Rupert has been making horrid smelling soaps and fatty acids from ... Rape Oil and Neal's Boot Oil. ...

This letter was written from his mother's flat in London, where he was 'to see the dentist ... and also to avoid a dance at home.' Next day he wrote again from the Clock House:

... I found the Comet at once in its assigned position. It was much more obvious and interesting than I had expected ... I should say it is nearly 7th mag. It ... should be obvious in your telescope. The best way is to learn the 4th & 5th mag. stars by heart, and move slowly to the right place, never losing sight of *all* the known stars. ... In about half an hour I shall look again if it is clear (it has just

clouded) and see if I can notice its motion among the stars and also see what it looks like with the powerful eyepiece (×250). The group of 5 4th mag. stars in Delphinus come into the field of the finder in pairs. Yrs. C.C. Morcom.

But Alan had already seen the comet, though in a more haphazard manner

10/1/30

Dear Morcom,

Thank you very much for the map for finding the comet. On Sunday I think I must have seen it. I was looking at Delphinus and thinking it was Equuleus and saw something like this [*a tiny sketch*] rather hazy and about 3′ long. I am afraid I did not examine it very carefully. I then looked for the comet elsewhere in Vulpecula thinking it was Delphinus. I knew from the *Times* that there was a comet in Delphinus that day.

. . . The weather really is annoying for this comet. Both on Wednesday and today I have had it quite clear until sunset and then a bank of cloud comes over the region of Aquila. On Wednesday it cleared away just after the comet had set. . . .

Yours A.M. Turing

Please don't always thank me for my letters so religeously. I'll let you thank me for writing them legibly (if I ever do) if you like.

Alan plotted the course of the comet, as it sped from Equuleus into Delphinus in the frosty heavens. He took the primitive star globe back to school to show to Christopher. Blamey had left at Christmas, and Alan now had to share another study, in which the inky sphere was poised. There were but few constellations marked in, but they amazed the younger boys with Alan's erudition.

Three weeks into the term, on 6 February, some visiting singers gave a concert of sentimental part-songs. Alan and Christopher were both present, and Alan was watching his friend, trying to tell himself, 'Well, this isn't the last time you'll see Morcom.' That night he woke up in the darkness. The abbey clock struck; it was a quarter to three. He got out of bed and looked out of the dormitory window to look at the stars. He often used to take his telescope to bed with him, to gaze at other worlds. The moon was setting behind Ross's house, and Alan thought it could be taken as a sign of 'goodbye to Morcom'.

Christopher was taken ill in the night, at just that time. He was taken by ambulance to London, where he underwent two operations. After six days of pain, at noon on Thursday 13 February 1930, he died.