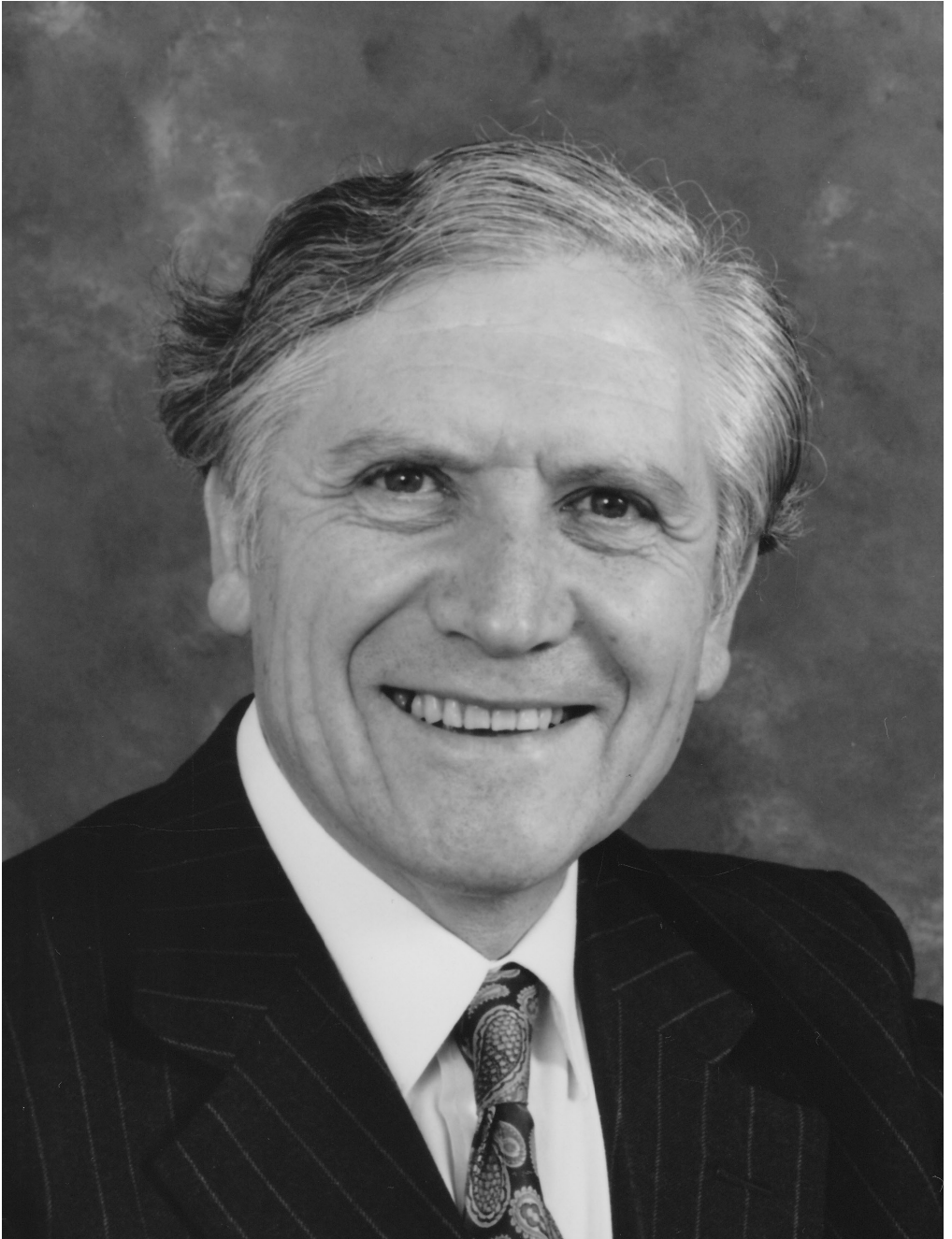


AMOS HENRY CHILVER F<sup>REng</sup>,  
BARON CHILVER OF CRANFIELD

30 October 1926 — 8 July 2012



Henry Chilton

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Henry Chilver was a structural engineer and educationalist. During his early career at Cambridge and University College London, he and his team of researchers made significant contributions, both theoretically and experimentally, to the understanding of imperfection sensitivity in the elastic post-buckling of thin-walled structural components. Awareness of this sensitivity was essential for the safe design of load-carrying shells that were increasingly being used in nuclear reactors and aerospace structures. As Vice-Chancellor of Cranfield Institute of Technology he focused on the application of knowledge rather than merely on its acquisition and led the way in harnessing research relevant to the demands of industry. With his incisive intellect, innovative thinking and farsighted vision he was also in great demand as an adviser to the government, overseeing advisory committees, and holding chairmanships and directorships of numerous companies.

## EARLY YEARS

Henry Chilver was born on 30 October 1926 in Barking, a suburb of east London. Like his father he was christened Amos Henry, but opted to be known as Henry from his postgraduate days. His father was a cabinet maker who worked all his life in Shoreditch. His mother, Annie (*née* Mack), who came from a Dalston family involved in the furniture trade, was a wonderful home maker for their three sons. All were taught to work with wood, but diverged from the family business into scholarly pursuits. Henry outlived his two younger brothers, Peter and Bob. Henry's passion for music was shared by Peter, and both were ardent film viewers; he loved swimming with Bob, and once had to rescue him from the sea. All three went on to teach, either at schools or colleges, and to write academic books.

The family moved to Southend in Essex in 1933. Henry attended Southend High School, at times going up to London to help in the family business on Saturdays. With the outbreak of World War II, at night during the blitz he would sometimes join his father, an air-raid warden, watching the German bombers flying up the Thames estuary towards London. Then, in 1940, the family was evacuated to Mansfield in Nottinghamshire, where they all stayed together with a likeable Mrs Woodford. The High School was also evacuated there, so Henry was able to continue his studies of mathematics, chemistry and physics.

#### BRISTOL UNIVERSITY, 1944–54

Henry entered the Department of Mechanical Engineering of Bristol University in 1944, graduating in 1947 with first-class honours and winning the Albert Fry prize. In Bristol he lived first in Wills Hall and then in digs with Peter Morice (later a professor at Southampton), who had matriculated at the same time. Here Henry had the privilege of using the dining room, where he played the piano. Main recreations were attending concerts, going to the Bristol Old Vic and taking long walks in the Somerset Hills. They also managed to travel by train to Switzerland with the National Union of Students.

In 1947 Henry had a short spell as a structural assistant on the railways at a salary of £250 per annum, inspecting bridges for the Great Western Railway. Later that year he returned to Bristol, having secured a Science Research Council (SRC) award to work as a research student in civil engineering with Professor Alfred (later Sir Alfred) Pugsley (FRS 1952). He was appointed assistant lecturer in 1950 and was awarded his PhD in 1951 for his thesis on thin-walled structural members. This described his theoretical and experimental studies of the strength and local buckling of cold-rolled sections used as struts. His experimental work was meticulous and exemplary. When conducting strut tests he was always concerned about the influence of the stiffness and lateral restraint of the large testing machine. He published a paper on the stability of testing machines and another on the effect of end fittings (see the full bibliography, available as electronic supplementary material at <http://dx.doi.org/10.1098/rsbm.2013.0010>). His doctoral research, done in association with the Cold Rolled Sections Association, laid the foundations for much of his later work. Henry acknowledged the valuable outlook that he had gained from his mentor in his 'Appreciation of Pugsley' in a volume marking the 80th birthday of Sir Alfred (17)\*, and in his biographical memoir (18). He admired Pugsley's philosophy of allowing each research student to develop his own intrinsic skills and individual interests, and how as a lecturer he himself was given free rein. This is certainly how Henry treated his own group, including myself, at Cambridge and University College London (UCL). In 1952 Henry became a full lecturer. Phil Bulson, a research student who was later head of a Ministry of Defence Establishment at Christchurch, remembers him as a dedicated and brilliant lecturer, serious minded and completely opposed to what he called affectation of any kind.

He was also a superb sportsman, playing cricket throughout his Bristol years and occasionally at Cambridge. At cricket he played for the Bristol University staff team. John Caldwell (later head of Naval Architecture at Newcastle) remembers Henry saying, as they drove out to Coombe Dingle, that he intended to score a century that afternoon. A century was almost

\* Numbers in this form refer to the bibliography at the end of the text.

unheard of, but Henry did it. John asked himself then, and often later, ‘How does one acquire such self-belief as Henry had?’ While at Bristol he played soccer for the Southern Universities as their goalkeeper. His son, John, enjoys recounting his strategy of standing slightly off centre, so that he would know which way to dive.

### CAMBRIDGE DON, 1954–61

After 10 years at Bristol, Henry moved to the Engineering Department of Cambridge University, first as a demonstrator in 1954, and then as a lecturer in 1956. One of his first friends was Andrew Schofield (later a professor at Cambridge; FRS 1992), and during their long talks Henry explained how Pugsley had advised him against involvement with Baker’s plastic design activity. His refusal to engage in plasticity did not endear him to John Baker (FRS 1956), the head of department (who was, interestingly, a professor at Bristol in 1933 and became a life peer in 1977). John Horlock (FRS 1976; later Vice-Chancellor of the Open University and a knight bachelor) recalls Henry as a tremendous worker, whose office light remained on until late at night.

Henry was elected a Fellow of Corpus Christi College in 1958 and appointed their director of studies for mechanical sciences. His research on thin-walled sections (1, 2), started at Bristol and continued at Cambridge, culminated in a seminal paper to the Institution of Civil Engineers (ICE), for which he was awarded the Telford Gold Medal in 1962. When I congratulated him on this, he modestly brushed the honour aside, saying it was just some sort of political game-playing! The paper (5) on the structural use of cold-formed steel sections prompted a lively discussion, opened by Pugsley.

Henry next addressed some new and original questions in nonlinear post-buckling with his research student, S. J. Britvec, who studied in fine detail the large elastic deformations of frames (6). This work is, as it transpired, of little interest in the design of framed structures because the post-buckling characteristics turned out to be very mild, and induced no appreciable sensitivity to imperfections. But this very mildness allows them to be studied experimentally in repeatable detail, throwing light on the much more violent collapse of thin shells. This study, as an archetypal illustration of post-buckling phenomena, was successfully extended a few years later at UCL in the work of John Roorda.

Henry had a tremendous grasp of ‘strength of materials’ and the elastic theory of structures, and correctly exposed the tricky analysis of shear in thin-walled sections. He co-authored two books during this period: *Problems in engineering structures* with R. J. Ashby (3), and *Strength of materials: an introduction to the analysis of stress and strain* with J. Case (4). The latter was a successful undergraduate text, the fourth edition of which appeared in 1999 with co-authors C. T. F. Ross and J. Case.

### *Marriage to Claudia Grigson*

While a Fellow of Corpus Christi, Henry married Claudia Grigson (the only daughter of Sir Wilfrid Grigson), the sister of his electrical engineering colleague, Christopher Grigson. Henry’s daughter, Helen Prentice, recalls how Henry described meeting his future wife: ‘Christopher was a dashing young man with a fast sports car who seemed to know everyone. We both lived at Madingley Hall, and one day Christopher introduced Claudia to me.’

They were married in March 1959, at a very private wedding in St Bene’t’s Church, with just Christopher and Andrew Schofield as their witnesses. They went on an exotic honeymoon

for that era, to Morocco and back in Claudia's iconic convertible Morris Minor. Helen was born in Cambridge in 1960, and a year later the family moved to London.

*My work with Henry at Cambridge*

I first encountered Henry Chilver, as a lecturer and tutor, in my final undergraduate year at Cambridge in 1957–58. He lectured on structural stability to Part II of the Mechanical Sciences Tripos, and I was immediately impressed by his enthusiasm and the precision with which he covered blackboards and sheets of pure white paper in his elegant hand. Naturally, I chose to do research under his supervision.

Very noticeable in the long corridor of the Baker Building was Henry's doorplate, which in a line of doctors stood out as 'Mr Chilver'. In those far-off days, Cambridge did not 'recognize' doctorates from 'lesser' universities. This little 'slight' was delightfully expunged when Henry became, first, Sir Henry Chilver (1978) and finally Lord Chilver (1987).

One of Henry's strengths was his ability to foresee emerging problems, and he identified the need for research into the buckling of thin shells, which were to have a vital role in the aerospace and nuclear industries. So when I knocked on his door to discuss PhD topics, the subject of shell buckling naturally arose. I chose to work on the intriguing collapse of a thin spherical shell under uniform external pressure.

It was known that experimental shells failed long before the linear 'classical' theory predicted, due, presumably, to slight imperfections in their shape. So we set out to make the world's most perfect spherical shell. We deposited copper electrolytically onto a machined wax sphere, and melted the wax out through a tiny hole. This method had emerged after hours of blue-sky brainstorming with Henry. Our meetings were constantly punctuated by outbursts of hearty laughter, and it often seemed like a Monty Python show. To avoid support stresses, Henry was convinced that we should suspend the spheres magnetically. This did raise problems, however, because he was simultaneously suggesting that I make them as blown glass spheres, or even soap bubbles! We would have launched them into orbit, if we could.

It was during a supervision with Henry that one aspect of his personality emerged. Excited, I went dashing in to say that I was planning to get married. Henry enthused that this was an excellent idea. I eventually learnt that Henry was himself getting married that very afternoon, to Claudia Grigson. He never mentioned this to me, either then or later, but Claudia and I often chuckle about it. As Helen said at her father's funeral: 'Henry was a very private and complicated person, who kept all of us at bay to differing extents. I think it is true to say that he put all the different strands of his life into totally different and often separate compartments, with one significant strand weaving through virtually all the sections, that of Claudia our mother.'

UNIVERSITY COLLEGE LONDON, 1961–69

In his early years, Henry had the concept that every decade one should be seeking a new challenge, so it was no surprise when, at the age of 34 years, he moved to London as Chadwick Professor and Head of Civil Engineering at UCL. Helen writes:

Dad enjoyed telling of the occasion when he turned up in our Morris Traveller at UCL, drove through the gates and parked. The porter hurried over to tell him that students were not allowed to park at college, what was his name, and mentioned that he would report him. Dad just gave his

name as Chilver, said he was terribly sorry, and drove out again. He never heard any more, but was permitted to park afterwards, and the Porter was very helpful.

Henry's diverse talents were now brought into full play, and he quickly built up an impressive team working on nonlinear buckling phenomena, which attracted a stream of international visitors. I joined Henry in 1964 as a lecturer, and Baker's last words to me, as I left Cambridge, were 'Remarkable man, Chilver.' Also arriving as a lecturer in 1964 was Alastair Walker, who had been offered the post when Henry examined his PhD thesis in Glasgow. Alastair and I were followed by Jim Croll from New Zealand.

Alastair remembers this as a formative period, which opened his eyes to higher levels of research; he eventually moved to Surrey, as Head of Mechanical Engineering. Jim Croll, having written to a number of top UK universities, was attracted by Henry's warm and welcoming response; arriving in London, Jim was confirmed in his decision when Henry enthused about all the exciting things that he might choose to pursue.

After the collapse of cooling towers in 1965, Henry joined the Ferrybridge enquiry, and with Jim he made detailed studies of their strength under loading by wind and gravity (9). They made laboratory tests on model towers and collaborated with engineers at the Central Electricity Generating Board to formulate new codes of practice (Croll 1969). Jim followed in Henry's footsteps by himself winning a Telford Gold Medal, and later becoming head of the department (1992–2003).

Henry always took his full share of lecturing, which was of the highest quality. David Arnold, writing in *The Times*, says that nobody who read civil engineering at UCL could be unimpressed by the quality of his teaching. Without making stress analysis 'easy', he was a master at getting it across. Gentle in speech, he accompanied his words with precise diagrams and legible script on the blackboard, written as he spoke, using many coloured chalks which never seemed to spread dust on to his impeccable tweed suit. This view is confirmed by Giles Hunt, who was persuaded by Henry to stay on as a research student and later became a professor at Bath University. After a Chilver lecture he was usually a bit short of notes because everything seemed so logical and straightforward when delivered. Only when visiting it later did he realize that it was not necessarily as simple as it had seemed.

#### *Stability research group*

The stability research group, supported by the Atomic Energy Authority and the SRC, was seeking to develop a coherent and balanced research effort in the mechanics and stability of thin-walled structures. The work was a continuation of that done at Cambridge on the bifurcational properties of frames (6) and the foundations that had been laid for a general theory of elastic stability (Thompson 1963). The fusion of these set a valuable tradition of phenomenological studies. Work was aimed at the delineation and classification of structural response and was characterized by carefully controlled small-scale experiments, the study of analytical models and the development of a general theory of behaviour. Henry published extensively on these activities (7–16).

John Roorda first reinterpreted the work of Britvec as an archetype of post-buckling. He chose the simplest frames and arches, focusing on lateral deflections and varying a controlled imperfection. In this way John and Henry (Roorda 1965) delineated experimentally the forms of imperfection sensitivity predicted by the distinguished Delft theoretician W. T. Koiter (Koiter 1945). A general perturbation theory was next developed, and a comprehensive review embracing the four well-known distinct critical points was published (Thompson 1969). These

two papers brought our understanding of the distinct branching points of elastic stability to a new level of maturity.

Henry's interest then turned to the approach and coalescence of distinct branching points, and in a seminal contribution he showed that, in the presence of nearly coincident critical loads, post-buckling equilibrium paths can exhibit violent contortions; however, these vanish when complete coincidence is achieved (7). Branching analyses associated with nearly coincident critical loads will thus experience severe difficulties that can perhaps be overcome, by an analytical 'fudge', to secure complete simultaneity. This was followed with his research student, Bill Supple, when Henry examined near-coincidence in symmetric systems and demonstrated secondary branching from a primary post-buckling path. This phenomenon can explain changes in the buckling modes of structures, and in particular the dynamic changes in waveform of compressed plates. The mathematical basis of this type of modal interaction was strengthened some years later by catastrophe theory (Thompson & Hunt 1984). Chilver and Ken Johns enumerated the many post-buckling paths that can be generated at a compound branching point, and a corresponding perturbation theory employing a systematic elimination of passive coordinates was developed both with and without a scheme of diagonalization (Thompson & Hunt 1973). The great complexity of behaviour implied by these many paths could have a profound influence on the development of the subject, necessitating a more experimental approach to stability problems. The philosophy of structural optimization that looks for coincidence of local and overall buckling loads was re-examined in the light of these studies.

This stream of activity followed the classical assumptions that loading can be described by a single parameter, that all deflections are admissible and that the structures remain integral under load. Such assumptions can break down, and Henry initiated a complementary stream of non-classical studies. Huseyin (1975) studied problems of multiple loading, Ian Burgess looked at one-way buckling, and Brian Hayman studied degenerating structures, such as heavily cracked cooling towers. The last two papers by Henry (15, 16) contain his analysis of the statistical variation of the buckling strengths of columns, winning the Cooper's Hill War Memorial Prize of the ICE.

Once the underlying mechanics was well understood, progress could be made in its application. A step in the development of the general theory was the demonstration that the perturbation studies could be developed without resort to a scheme of diagonalization, and this served to give the theory greater elegance and invariance. Of more practical importance was the fact that the new theory could be used advantageously with the kinematically admissible finite-element procedure as a method of post-buckling analysis. This was pursued by Walker (1969) and others, the applications including structures with irregular geometry and loading that could not be treated by closed-form analytical methods.

Jim Croll's background in the finite-difference technique brought the relative merits of the numerical approaches under scrutiny, and a useful unification of outlook was achieved (Croll 1970). This showed the finite-element and finite-difference methods to be only two examples of more general numerical procedures, allowing a comparison of their accuracy and convergence properties. A significant continuum perturbation analysis of a frame was made by Roorda and Chilver (12).

Motivated by Henry's leadership and passion, these were exhilarating times for us young researchers in structural stability, as we all well remember.



*Transport and aeronautical research*

One of Henry's scoops, in response to an invitation from a funding consortium (which included Shell Mex and the Greater London Council), was to create a chair in Traffic Studies for the renowned scientist Reuben Smeed in 1966. In this way, and by attracting other senior figures, Henry and, later, Richard Allsop laid the foundations for what continues to thrive, 46 years on, as a global centre of excellence in transport research. Chilver was also influential in the establishment under his directorship (1967–69) of the Centre for Environmental Studies, located near Regent's Park. This had a profound impact on urban research and led to the creation of the Mathematical Advisory Unit in the then Ministry of Transport.

Starting with a short period in 1951, when he worked (at Pugsley's suggestion) at the Royal Aircraft Establishment, Farnborough, on cumulative fatigue damage in aircraft structures, Henry had a sustained involvement with aeronautical problems of structural stability and safety. Associated with the Aeronautical Research Council since 1957, he became a member of the Council, and chairman of its Loading Actions Committee. Henry organized a one-day meeting of the Aeronautical Research Council at UCL, at which we presented our novel frame-buckling experiments.

*Home life in London*

In London, Henry lived with his growing family in Hampstead Square. During the first six years there, a daughter, Sarah, and then sons John, Mark and Paul were born. Helen says that she realized quite early in life that her father was a serious workaholic. He spent long days at UCL, occasionally taking her to his office on a Saturday to 'collect something'. She very quickly learnt that he just wanted to get back to work and she needed to take something 'to do'. Sunday teatimes were special when they all ate together, and Henry would often perform magic tricks. He took great pleasure in teaching Helen a levitation trick using brooms and a sheet. He showed the sporty, risky side of his character when he taught the children how to toboggan down from Whitestone Pond to the Vale of Health, showing no fear with two or three children on board together, flying down the hill. In 1964 Claudia decided to look for a house in Cornwall near to Polperro which had parental associations. She realized that a bolthole outside London for school holidays would help with family harmony. The children loved the freedom at their 'Lanlawren' farm house, and Henry used to appear at weekends.

Michael Stewart, son of close family friends (and now a senior lecturer in anthropology at UCL), tells what a thrill it was to be a guest in the family:

The Stewart and Chilver children grew up in and out of each other's kitchens—especially in that den of childhood pleasure that was the kitchen of Lanlawren. The wonderfully welcoming kitchens of the various Chilver homes were free from fusty convention and were held open long into the night. A lot was down to Claudia and her genius for raising a family and making a home for all who came through. Then every so often this exotic leonine man would appear. A man who had the unique and truly magical quality of suddenly being there in your space, with you, at your level, shrunk to your size and, in a funny way raising you to his. As a contrast to the requisite gravitas of a man in his position, Henry was capable of joining the cheerful anarchy of our children's world, and taking us to unexpected places with him. He was what Lucy Pearce memorably described as 'a bit of a rare commodity.'

*The UCL legacy*

When Henry left UCL for Cranfield in 1970 he left behind an enlarged and strengthened Civil Engineering Department with an international reputation for research, and one that

was far less dependent on government funding. He had embraced the concept of entrepreneurship in universities, linking academics with the world of business. This concept, emulated by future heads of UCL and Imperial College, was to mature fully at Cranfield. It is pertinent to note that a Chilver chair, to be held by the Head of Department, has just been established at UCL in what is now the Department of Civil, Environmental and Geomatic Engineering.

At a personal level, Henry left behind many friends and maintained lifelong friendships with many of his research students. In 2000 he instigated a memorial workshop for John Roorda, to which John's widow was welcomed from Canada, where John had held a chair at Waterloo University.

### CHALLENGES AT CRANFIELD INSTITUTE OF TECHNOLOGY, 1970–89 (LATER CRANFIELD UNIVERSITY)

On New Year's Day 1970 Henry Chilver became Vice-Chancellor of the Cranfield Institute of Technology (CIT), which had the previous day gained its Royal Charter, achieving university status and thus the ability to award its own degrees. Never daunted by a challenge, Henry had made a careful appraisal of the unique situation at Cranfield and its tremendous potential, and now set about his vigorous transformations. Pat McKeown (later CBE), who had joined Cranfield in 1968, vividly remembers the arrival of Henry, who immediately set about visiting departments to meet as many staff as possible. A forceful personality of great energy, drive, intellect, perspicacity and personal charm—but also modesty—had arrived.

For nearly 20 years Henry led an ambitious programme of expansion that made CIT into one of the largest centres in Europe for applied research, development and design. He forged strong ties between his departments and industry, and soon about 1000 companies were working in partnership with CIT (more than with all other UK universities put together).

After a strategic merger with the National College of Agricultural Engineering (Silsoe) in 1975, Henry's sights turned to the Royal Military College of Science (RMCS) at Shrivenham, which was to become a third campus. Both of these establishments had technologies complementary to those at CIT.

The RMCS had become unduly expensive, and the Ministry of Defence proposed to terminate all research and focus on teaching. The Commandant, Major-General Vincent (later Field Marshal the Lord Vincent of Coleshill), thought this would be disastrous, and went to see Henry at Cranfield to discuss possibilities. A competitive contract was devised, and in 1983, by a huge effort of diligence and careful planning, Henry won it for Cranfield against other universities.

The requirement was to train about 250 graduate and 50 postgraduate engineers for the Ministry of Defence over a five-year period. One of the biggest contracts ever placed in UK higher education, it amounted to £10 million a year, with courses to be run at Shrivenham. Frank Hartley, later to succeed Henry as head of CIT, remembers when (as Acting Dean at the RMCS) he was summoned to lunch at Cranfield. Henry announced, 'we've won this contract ... would you agree to run it for CIT?'

So Frank began seven successful years with Henry as his direct boss. He explains that Henry was a great devolver of responsibility, and he was told to run it in his own way. Being 68 miles away, Frank met him once or twice a month, when Henry would throw out new ideas

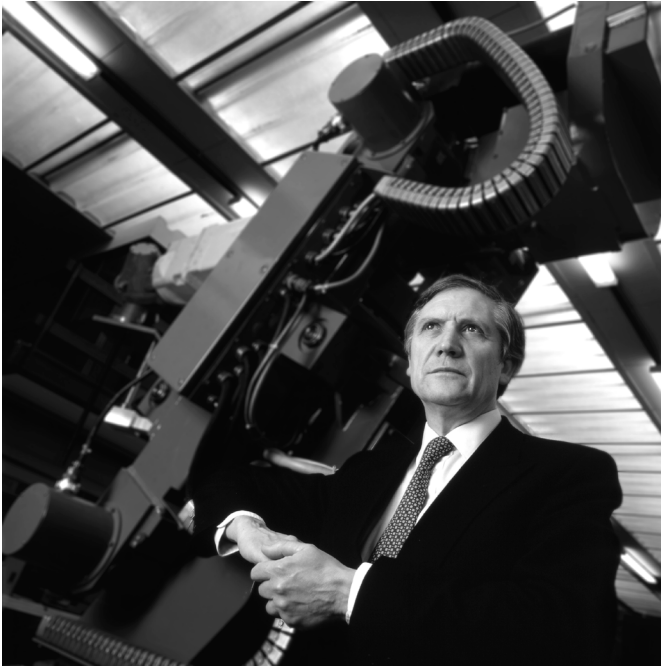


Figure 1. Henry, the Vice-Chancellor of Cranfield Institute of Technology, with an exhibit at the Innovation '85 Exhibition at Cranfield, which focused on information and communication technology. (The photograph (1985) is reproduced under licence from the copyright owner, Michael Harding Photography, London.)

with remarkable fluency. Some of these were admirable, and their implementation paid handsome dividends. Frank correctly concluded that Henry tossed out ideas, leaving his staff to sort through, implement the good ones, and forget the others.

CIT quickly became a showcase of research and development (figure 1), establishing a Biotechnology Centre and expanding its Technology Park. By the mid 1980s double-degree programmes were established, the first with the University of Technology at Compiègne, France. CIT had also set up a holding company providing commercial services. It had customers not only in the UK but also in the USA, France, Japan and Taiwan—and useful collaborations worldwide.

Companies came with problems in such fields as robotics, materials, power and management; and Cranfield used its scientific expertise to solve them. This commercial revenue, coupled with fees for higher degrees and short courses for industry, greatly reduced Cranfield's dependence on state funding. However, the Open University, nearby, was strongly dependent on government funding. Its Vice-Chancellor, John Horlock, told an apposite story: government ministers, driving up the M1, were told to turn left for the Open University or right for Cranfield.

#### *Tributes from staff*

Peter Hancock, who joined CIT in 1970 and became head of Industrial and Manufacturing Science, said that it was hearing Henry project a totally different approach to postgraduate activities that brought him to Cranfield. Henry was always thinking outside the box, looking for ideas and inventions that could lead to profitable products.



Figure 2. Henry in conversation with Vice-Premier Wang in China on 6 March 1979 (the interpreter is in the centre). (Photograph supplied by Lady Chilver; we have been unable to trace the original source.)

John Stollery, head of the College of Aeronautics in 1976, recalls telling Henry that he had just gained a significant SRC grant, and getting the response: ‘But what is your position with Boeing, Lockheed and British Aerospace?’ Henry then set up a meeting for John with the chairman of British Aerospace, which resulted in MSc scholarships for British Aerospace staff. Henry, whose own motivation was immense, always supported those with the enterprise to get things done. John then points to the remarkable fact that Cranfield went on to design and build for Boeing two blended-body-wing research aircraft, perhaps the shape of airliners of the future.

Alvan Davies, as Director of Development, worked closely with Henry on the expansion of CIT. He recounts that when professors went to Henry with a problem, the response was: ‘What are you going to do about it?’ This was followed by questioning and analysis, leading to optimized solutions. Late in the evening Henry sometimes seemed to doze off, but then delivered a sharply expressed opinion. Henry’s offbeat humour popped out when he and Alvan were setting off to Peking, a trip that resulted in a contract for 70 Chinese students to study within engineering alone (figure 2). Henry announced, ‘We’re going to retrain Chinese Red Guards.’

#### *Henry’s Cranfield legacy*

The Chilver years are seen as pivotal in Cranfield’s development. Henry believed that parts of the university system were decaying because they had lost contact with the real world. His vision for Cranfield was to create a Massachusetts Institute of Technology in Europe, focused on engineering, science and management. His philosophy was based on self-sufficiency and attracting staff of the very highest quality.

Accordingly, new staff were recruited and given wide-ranging freedom. A financial system was established that was totally different from that in any other university at the time. Each

department became self-financing, with its income depending on its success in generating commercial contracts and attracting students.

However, in the 1980s the challenges became enormous. Cranfield was receiving 16% of its income from the Department of Education and Science, whereas the other 84% was earned in the open market. Moreover, groups were paid only when they had completed a task. Money was therefore very tight, especially after the global stock market crash of 'Black Monday' on 19 October 1987. The effect of this was that by 1989, when Henry moved on from Cranfield to take over as chairman of the University Funding Council, he was not as popular as he had been when he first laid out his vision. He was succeeded as Vice-Chancellor by Professor Frank Hartley, who held the post for 17 years, to be followed by today's incumbent, Sir John O'Reilly.

In spite of these temporary financial difficulties, Cranfield had become a prototype for a modern technical university and has taken a leading place in the application of knowledge.

#### *Family life at Cranfield*

The family moved to Cayley Lodge at Cranfield (a little 'tied cottage' as Henry called it), which was to be their home. Henry as a city dweller was not happy to leave London, but now he would be able to stroll down to his office, living over the shop, as it were. *The Times* reported that after a particularly busy day of energetic enterprise he had sometimes been found asleep in his office at three in the morning.

And as his work load expanded, the family sadly saw him less and less. Now and again he would work at home and help with school homework. For Helen (aged 12 years) one problem was that Henry would talk as though she were totally familiar with the calculus!

As the children grew older they were allowed to stay up talking with Mum and Dad late into the night to discuss academia, politics, literature, art, travel, commerce, money, or indeed any subject that cropped up. The proviso was that they all contribute to the conversation. Debating such issues as 'is revolution the natural state of the world?' his teenage sons Mark and John were engaged at once. Driven by Henry's unending curiosity, this nightly ritual of tea and discussion could easily drift on beyond 2 or 3 a.m.; yet Henry was always ready for work the next morning.

Henry taught Helen and Mark to sail, encouraged Sarah and Paul to pursue their love for music, and John in his passion for art. If he ever had time, he enjoyed going to concerts and listening to opera. He once said that in another life he would have liked to be a musical conductor. He was keen on comedy ranging from Buster Keaton to Fawlty Towers. On two occasions he laughed so much he fell off his seat, once resulting in a broken chair. The children thought this was hilarious; quite different from the correct, upright formal impression of Dad's public image.

Henry's competitiveness and public successes created a difficult act for the family to follow. Helen says they all have a tendency to be workaholics, never giving up until feeling they have done their best. 'We all set ourselves arguably too high standards just as Dad did.' But Henry did have a romantic streak, and had always dreamt of having a house in Provence. So in 1985 he bought a house in Auribeau, near Cannes, which for 20 years became his bolthole, where he could find peace and quiet, and time to think.

Henry's contributions to Cranfield extended well beyond the purely practical. He was a cultured man with a lifelong interest in music and art, and he vigorously supported extracurricular activities in the form of recitals and concerts. Included in these were the late John Dankworth, who lived nearby at Wavendon, and the flautist Richard Adeney.

Claudia gave him huge support while bringing up their five children. With others, she set up the Cranfield Women's Association, which organized lunches, lectures and visits covering a range of topics. Women from all backgrounds were welcomed, especially the wives of foreign students. This gave useful feedback on what could be done to make the lives of students' families more agreeable. As a qualified doctor, Claudia supervised baby clinics on Cranfield campus and in the surrounding villages. She was also a Governor and Trustee of the Harpur Trust for 10 years, working for the Trust schools and concerned with the distribution of Trust funds to give additional educational support and extracurricular activities for children across Bedford. Claudia was, and is, always held in great affection by all who know her. This superb partnership contributed enormously to the Chilver years at Cranfield.

### COMMITTEES AND ADVICE

While Vice-Chancellor, Henry was active in many areas, notably in advising the government. On a visit to Milton Keynes, where Henry was Chairman of the Development Corporation (1983–92), Margaret Thatcher is reported as having said, 'How do you do it, Henry?' She clearly recognized him as a safe and energetic pair of hands. Richard Morgan described in *The Times* how Henry influenced the governing body of Cheltenham College: 'Chilver had an exceptional mind, which he used with rapidity and total clarity. He spoke very quietly, with a ready smile and a compelling authority. At Cheltenham he was known as the cleverest man in England!'

Concerned about a potential decline in standards caused by the rapid expansion of engineering education, the ICE commissioned the Chilver Report (1975). In this Henry raised the standards of training and education demanded by the institution, stipulating challenging new grades to qualify as a professional engineer. 'Fewer chartered civil engineers—but better ones', ran one headline. Later Chilver served as an ICE Vice President (1981–83).

As a dispassionate outsider, Henry was invited in 1978 by the Callaghan government to chair a review of higher education in Northern Ireland. Addressing the failure of the New University of Ulster, he recommended focusing academic studies at the historic Queen's University, while expanding technical education at the new Ulster Polytechnic. Unfortunately he underestimated the opposition of local sectarian, regional and academic interests, and his main proposals were not accepted. Despite this little setback, Henry was knighted on Callaghan's recommendation in the same year.

In 1980 it was proposed to divide the Post Office into two parts—telecommunications and postal—before the scheduled privatization of British Telecom the following year. To oversee this, Henry was appointed by Sir Keith Joseph to be part-time chairman of the Post Office, on which he spent one day a week.

Henry was next appointed by Margaret Thatcher to chair the Advisory Committee for Applied Research and Development, set up to advise the cabinet (1982–85). Here Henry was able to offer his broad views of British industry's declining performance as a sought-after supplier of world markets. The problem was not in the laboratories but among the product designers who had consistently failed to conceive and develop what others wanted to buy.

*Milton Keynes*

Milton Keynes was the most ambitious of Britain's new towns, and in 1983 Henry took charge as chairman of its Development Corporation (MKDC). He had to deal with wide ranges of professions and authorities—from architects and town planners to lawyers and social development officers, and from government departments to parish councils, keeping them all on side; not to mention VIP visits from royalty, presidents, prime ministers and leaders of industry. During his term he encouraged new forms of social housing and the development of cultural and artistic activities to match the rapid growth in population.

Frank Henshaw CBE, General Manager of MKDC (1980–92), remembers meeting an aggrieved delegation from a leading national retailer. The group's chairman made the mistake of saying that MKDC lacked a philosophy. At this cue, Henry gave a brilliant summary of his position that left the other side speechless. Frank also recalls the day that Henry's life peerage was announced when they were both at a cricket match, sponsored by MKDC, between Northamptonshire and the touring Pakistani team captained by Imran Khan. The rapturous congratulations gave Henry a splendid launch into the House of Lords. As Baron of Cranfield in the County of Bedfordshire, he took his seat in 1987 on the Conservative benches, describing himself as a 'radical Tory'.

His last act as chairman of MKDC was to pilot sensitive negotiations in the run-up to the Corporation's dissolution in 1992, which was early in comparison with the schedules of previous new towns. Henry insisted that MKDC could only accept the government's timetable if it were given undertakings vital to the completion of their statutory task. These included guaranteeing the primary infrastructure and the landscaping. In achieving this, and in driving through an imaginative scheme for the disposal of MKDC's commercial and community-related assets in a way that would ensure a wide involvement, Henry left a sound platform for the town's future.

*Schools and universities*

Appointed to chair an advisory committee on teachers' pay (1987–91), Henry totally ignored the government's strict limit of £600 million. He argued that teachers' morale was low, more teachers had second jobs, and their commitment was at breaking point. Their status and salaries had been eroded for 20 years, and the limit would make most teachers even worse off (figure 3). He broke the budget by £133 million, and the government conceded. This ensured that an honours graduate would start at a school on a salary equal to the average in other occupations. Schools would be able to reward talented teachers and, if necessary, pay more to recruit and keep staff. So on this occasion Henry embarrassed the Thatcher government, prompting the headline 'The Teachers' Unlikely Champion'.

Henry was the first chairman of the Universities Funding Council (1988–91), working alongside the Education Secretary, Kenneth Baker. Free education had been the accepted creed since the Robbins report, although some governments had hinted that major universities should 'milk the green welly brigade'. So when Chilver stated unequivocally in the *Times Higher Educational Supplement* that he was in favour of charging students the full cost of tuition, it was like a bombshell. This was tempered somewhat when the chief executive-designate of the Universities Funding Council, Sir Peter Swinnerton-Dyer FRS, immediately dismissed the idea out of hand. In all probability Henry was only kite-flying, and in the event fees only went up significantly years later, under Blair and Cameron.



10 DOWNING STREET

LONDON SW1A 2AA

THE PRIME MINISTER

7 September 1988

*Dear Lord Chilver,*

Thank you for your private letter of 2 September about the remit for the Interim Advisory Committee on Teachers' Pay and Conditions. It is most helpful to have your personal thoughts on this. We are at one on the importance of maintaining tight control on basic pay and providing for the necessary restructuring. But we shall obviously have to consider carefully the figures. Kenneth Baker will be in touch with you shortly about our conclusions.

*Yours sincerely*  
*Margaret Thatcher*

The Lord Chilver

Figure 3. A letter from the prime minister, Margaret Thatcher, in response to a private letter sent to her by Henry while Chairman of the Teacher's Pay committee.

### AN ACTIVE RETIREMENT

Between 1972 and 1997, which was well into his retirement, Henry held some 16 company directorships covering industrial, pharmaceutical and financial companies including National Westminster Bank, ICI, Hill Samuel and Britoil. He was chairman of English China Clays (1989–95) and RJB Mining (1993–98). In his later retirement he used his experience in chairing 'start-up' companies, which included Chiroscience (biotech) Group (1995–98), Aurora Computer Services (2000–05) and SG Wealth Management (2001–06). He also chaired Plymouth Development Corporation (1996–98).

Richard Budge of RJB Mining considered Henry a fantastic chairman, one who was very intuitive and always knew which issues were critical. He questioned and pushed people, but always with a good sense of humour. Once, someone spoke in Latin and Henry responded in Latin, to great amusement.

Henry spent many hours promoting his old institutions, including Southend High School, Bristol University and Corpus Christi College, to raise funds from alumni. At Bristol he





Figure 4. Henry with his family on the occasion of his 80th birthday. The gathering includes his wife, Claudia, his surviving brother, Peter, his five children, their spouses and 13 grandchildren. (The photograph (2006) is reproduced courtesy of Henry's son-in-law, Mr F. A. Vaughan.)

recently contributed to a legacy fund that will help support young bright people as students whatever their backgrounds, and actively supported the Wills Hall Association. He also gave annual luncheon parties at Corpus Christi for colleagues and friends.

Sir John Baker was indeed perceptive, in his parting comment to me, that Chilver was a 'remarkable man'. Beneath that elegant demeanour there was a restless steely energy. There is no doubt that Henry's philosophy changed greatly over the years. In the early days I remember him saying, 'this is the sort of problem that one needs to take home to think about on a settee in the evening.' Later it changed to 'academics should get off their bottoms and find out what industry needs.'

He is survived by Claudia; their daughters, Helen and Sarah, and three sons, John, Mark and Paul; and 14 grandchildren (figure 4).

#### HONOURS AND AWARDS

- 1962 Telford Gold Medal, Institution of Civil Engineers
- 1977 Fellow of the Royal Academy of Engineering (FREng)  
Cooper's Hill War Memorial Prize, Institution of Civil Engineers
- 1978 Knight Bachelor
- 1982 Fellow of the Royal Society
- 1987 Life Peer

*Lectures*

STC Communications, O'Sullivan (Imperial), Margaret Beaufort (Bedford), Fawley (Southampton), Lubbock (Oxford)

*Honorary doctorates*

Universities of Leeds, Bristol, Salford, Strathclyde, Bath, Cranfield, Buckingham, Compiègne

*Presidencies*

Institute of Management Services (1982–2000), Institute of Logistics (1993–95), Smeatonian Society of Civil Engineers (1997).

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The frontispiece photograph was supplied by Lady Chilver; we have been unable to trace the original source (date is circa 1989).

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