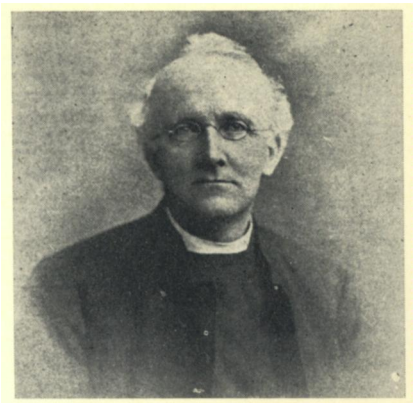
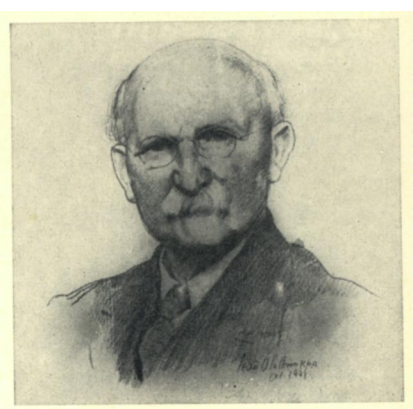
Sir Patrick Dun's Hospital, as it was when Haughton became a governor (*see p.* 5)

The Haughton Medal, Sir Patrick Dun's Hospital, Dublin (*see p.* 5)



The Reverend Samuel Haughton, M.D. (*see p.* 5)

Professor W. S. Haughton (*'Baldy'*), *orthopaedic surgeon* (*see p.* 5)



Samuel Haughton: A Victorian polymath

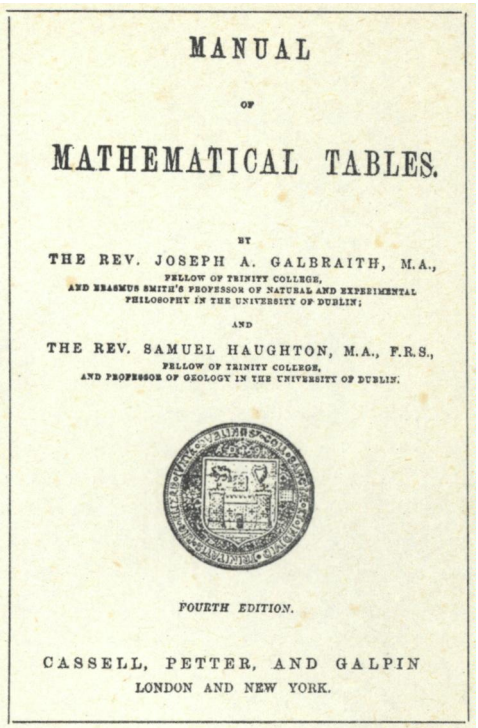
by W. J. E. Jessop[1]

I

Many years ago as a small boy I was a member of an excursion party from a group of country primary schools to the Dublin Zoo. We were impressed by the bison, then in a small enclosure near the gate, by the bears in the pit where the chimpanzees now are and by the lions and tigers. But the journey had been long and we had had an early breakfast so it is not surprising that we also greeted the Haughton House, where we were to have lunch, with considerable enthusiasm. Some six years later, returning to boarding school after a summer vacation I remember the class being issued with copies of mathematical tables bearing the names 'Galbraith and Haughton'. Seven or eight years after that, as a medical student at Sir Patrick Dun's Hospital, I was told about a Haughton prize and medal for which a competition was held each year, alternately in medicine and surgery. About the same time I attended clinical classes in orthopaedic surgery given by a surgeon whose bald dome was surrounded by a fringe of white hair and who had sharp blue eyes which he often closed as he talked, an eagle-like nose and a resonant voice. His name was Haughton and he was commonly known to the students as Baldy Haughton. A few years later, now qualified in medicine and with an interest in physiology, I saw in the museum of the Royal College of Surgeons in Ireland, where I then worked, a skull with the caption 'Skull of the first criminal hanged according to the formula of the Rev. Samuel Haughton, M.D.'

'The Rev. Samuel Haughton, M.D.'—this seemed to me to indicate an unusual combination of professions, but one peculiarly appropriate to a pioneer in the theory of judicial hanging. I made some enquiries and found that the person for whom the restaurant

[1] The Trinity Monday Memorial Discourse, 1973.



MANUAL

OF

MATHEMATICAL TABLES.

BY

THE REV. JOSEPH A. GALBRAITH, M.A.,
FELLOW OF TRINITY COLLEGE,
AND ERASMUS SMITH'S PROFESSOR OF NATURAL AND EXPERIMENTAL PHILOSOPHY IN THE UNIVERSITY OF DUBLIN;

AND

THE REV. SAMUEL HAUGHTON, M.A., F.R.S.,
FELLOW OF TRINITY COLLEGE,
AND PROFESSOR OF GEOLOGY IN THE UNIVERSITY OF DUBLIN.

FOURTH EDITION.

CASSELL, PETTER, AND GALPIN
LONDON AND NEW YORK.

Title page of Galbraith and Haughton's Mathematical tables (*see p.* 5)

building in the Zoo had been named, the co-author of the mathematical tables, the founder of the prize and medal in Sir Patrick Dun's Hospital and the source of the formula relating to the long drop in hanging were indeed all the same person. He was also the father of the Haughton who had taken our clinical classes in orthopaedic surgery and who was, in fact, honorary professor of that subject in Trinity College.

Information picked up in a desultory way over the following years aroused my interest in the Rev. Samuel Haughton and his remarkable range of activities, particularly as in time I found myself involved in some of the fields in which he had worked with such success: the Council of the Dublin Zoo, the Board of Sir Patrick Dun's Hospital, the School of Physic Committee of Trinity College and the General Medical Council. Consequently I am very grateful to the Board of the College for having appointed me to give this Discourse. The appointment was at the same time an honour,

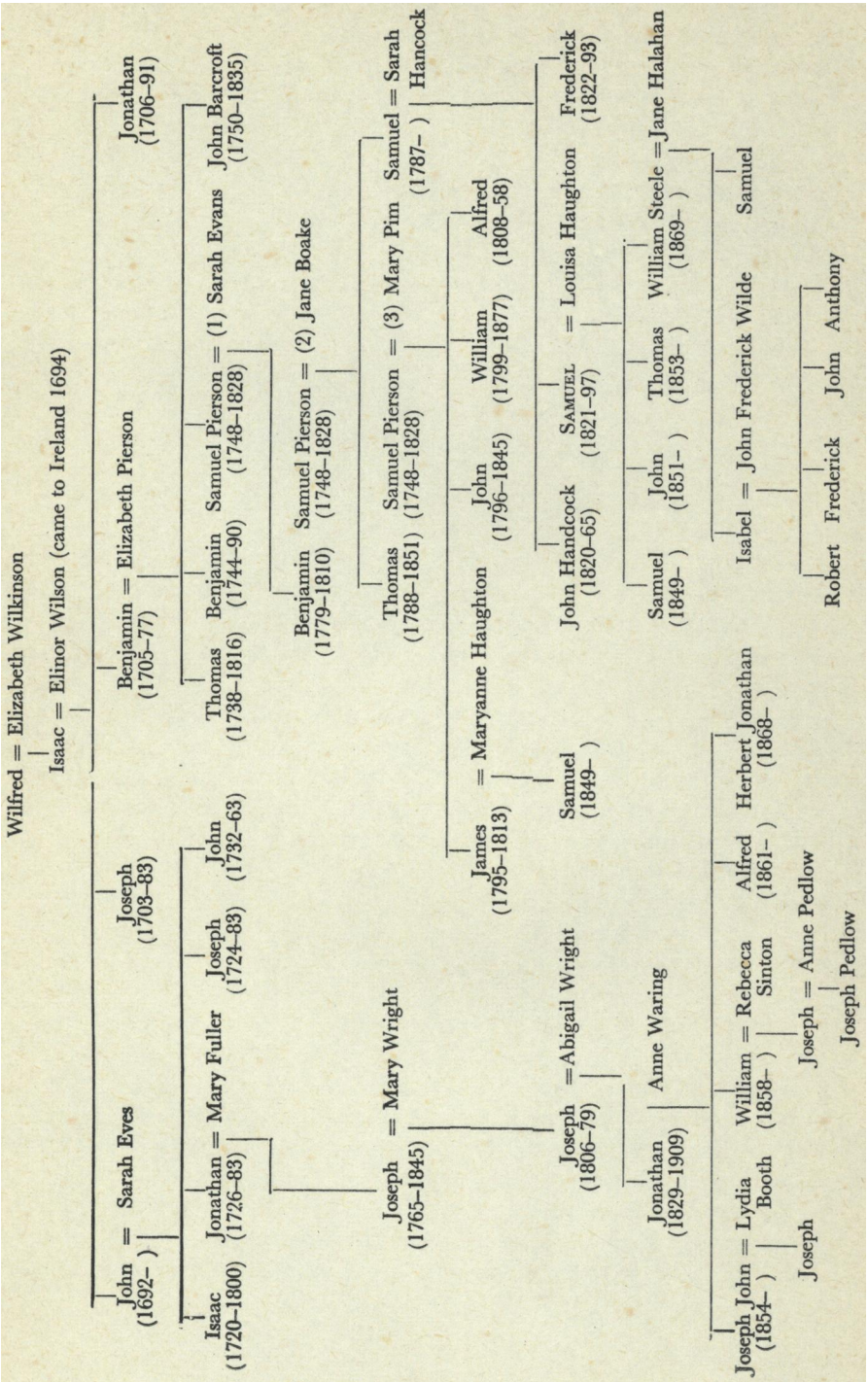
and a stimulus to make a more systematic enquiry into the achievements of the Rev. Samuel Haughton. I am also grateful to the many people who have helped me by making material available—Dr Haughton's grand-daughter, Mrs Isabel Wilde, whom we were privileged to have with us today, Professor Joseph Haughton, a kinsman who supplied me with material about the Haughton family, Mr O'Sullivan, Keeper of Manuscripts in the Library, who placed much manuscript material at my disposal, Dr Crane and Professor Holland for their opinions of Haughton's work in mathematics and geology respectively and Miss Burns, Curator of the Geology Museum, for showing me specimens which Haughton had described.

II

Samuel Haughton belonged to a Quaker family, the first member of which to reside in Ireland having come from Westmoreland in Cromwell's time. The family tree which I have constructed shows that two main branches of this family still exist, that of which Samuel was a member being descended from Benjamin Haughton who married Elizabeth Pearson of Kildare at Edenderry on 19 July 1733. The Haughtons had large numbers of children, families of eight to ten being quite common. Sarah Cambridge, who married John Barcroft Haughton on 8 August 1775, at the age of seventeen, bore him fourteen children, six of whom died under the age of five. Samuel Pearson Haughton's three wives bore him a total of eighteen children, of whom eight died under the age of four. This multiplicity of offspring makes the structure of a complete family tree very cumbersome, and in my version I have omitted children who died young, and all women and all men who did not marry. This is not because I regard women and bachelors as unimportant. It is entirely in the interests of simplicity.

In constructing this family tree I believe I have come upon an error in Samuel Haughton's entry in the *Dictionary of national biography* and in the catalogue of our Library. In both it is assumed that the Samuel Haughton who wrote a memoir of James Haughton was the Reverend Samuel Haughton of Trinity College, and that therefore the latter was the son of James Haughton. This I believe to be wrong. The dates of the Samuel who wrote the memoir are different from those of the Samuel who is the subject of this discourse, and neither in the text of the memoir nor in any of the

HAUGHTON FAMILY TREE



The Tree, as is evident, cannot claim to be chronologically complete.

letters or documents quoted in it is the author referred to except as 'Mr Haughton'. It seems, therefore, that as I have shown on the family tree, the Samuel Haughton who became a fellow of Trinity College was the son of Samuel Haughton and Sarah Handcock, whose father, John Handcock, was a linen merchant of Lisburn and a step-cousin of the author of the memoir.

It is worth noting, however, if only incidentally, that James Haughton, the subject of the memoir by his son Samuel, was in some ways as remarkable as his step-nephew, though his interests lay in social rather than academic directions. He was a strong advocate of the abolition of slavery, of Catholic emancipation, the reform of land tenure, temperance, the abolition of capital punishment and many other liberal causes, in which he was closely associated with such prominent men of his time as Daniel O'Connell, Father Mathew, Sir Philip Crampton, John Bright and Richard Cobden. Amongst activities, too numerous to mention in detail, two examples may be noted. He was honorary secretary of a committee, of which the Duke of Leinster was chairman, set up to help to relieve the pecuniary difficulties into which Father Mathew had got himself in his campaign for temperance, and he was prominent in the movement to have a statue of Burke erected outside Trinity College, matching that of Goldsmith which had already been placed in position. In due course similar tributes to the memory of Daniel O'Connell and Thomas Moore occupied his attention.

III

But to return to the Reverend Samuel. He was born at Carlow on 21 December 1821. Good accounts of his life have been published in the *Dictionary of national biography* by A. C. O'Sullivan, then lecturer in pathology and later professor, and in the *Proceedings of the Royal Society* by D. J. Cunningham, professor of anatomy. Both were Haughton's contemporaries and probably knew him well. Although O'Sullivan was appointed lecturer in pathology only two years before Haughton's death he had already been a fellow of the college for nine years and must have worked closely with Haughton concerning general college affairs during that period. O'Sullivan was also a mathematician and had entered the medical school three years after obtaining fellowship. Cunningham, an Edinburgh graduate, came to Trinity only in 1883 but his position as head of what was then probably the most important department of the medical school would have brought him into intimate

contact with Haughton, then chairman of the School of Physic Committee, over the remaining fourteen years of the latter's life. Cunningham was also deeply interested in the Dublin Zoo, he was from 1886 onwards a member of its Council, and would there have met Haughton on more informal terms. While O'Sullivan's account gives a good resumé of Haughton's scientific work and administrative achievements, that of Cunningham reflects in a much warmer manner his character and personality.

We see the young Haughton as an exceptionally bright boy with a lively, enquiring mind, taking full advantage of the good fortune whereby he had in the school to which he was sent in his native town, a master who was deeply interested in the things of nature and who recognised the special qualities of his pupil. Together they explored the basin of the River Barrow in expeditions which, as in many another instance, laid the foundations of later scholarly achievements in the biological and earth sciences.

Haughton entered College at the age of seventeen. Professor Cunningham notes that he 'possessed in a remarkable degree the qualities which lead to success in College life, quickness of apprehension, a clear head, and a tenacious and ready memory'. He obtained the Lloyd Exhibition in mathematics in 1842 and won first place in this subject among the senior moderators in the following year. It is perhaps surprising that we do not find his name in the lists of foundation scholars during this period. In 1884, not yet twenty-three years old and only seven months after moderatorship, he was successful at the fellowship examination. He seems to have been the youngest candidate. Two other candidates were elected to fellowship on this occasion and three candidates were awarded fellowship prizes. All were from two to four years senior to Haughton in respect of the dates on which they had obtained moderatorship. The fellowship to which he was elected was one of ten which had been founded by letters patent in 1840, one to be awarded each year for ten years. In those days the examination for fellowship was formidable, being held on twelve days preceding Trinity Sunday from nine to twelve in the forenoon and two to five in the afternoon of each day. The subjects of the examination were pure and applied mathematics, experimental physics, mental and moral philosophy, Greek language and literature, Latin language and literature and Hebrew and cognate languages. Many candidates were successful only after two or more attempts and the severity of the ordeal was said to be responsible for the

low output of original work by some of the fellows. Haughton, through his early success, experienced very little of this exhausting grind—a circumstance that may have had some bearing on the number and variety of his scientific writings during the subsequent twenty years.

All who have written about Haughton refer to his striking personality. He united 'unbounded courage and great pugnacity' with 'great kindliness of heart', so that extensive reforms were carried through without making lasting enemies. 'He had the power of influencing men of the most various dispositions to work together in concert, while the charm of his manner and bright wit, no less than his honesty and directness of purpose procured him hosts of friends.' 'His brightness and warmth of nature made him very popular with his colleagues.' 'He was one of the most charming of companions, overflowing with wit and humour, ready to take a lively part in any discussion, and able from a well-stored memory to relate many results of a much varied experience.' 'One of his leading characteristics was his extreme unselfishness'—'but he was stern and almost unforgiving with those who, by idleness or otherwise, did damage to the good name of the College he so sincerely loved'.

Endowed with exceptional intellectual powers and with such personal qualities we find him, at the end of a successful undergraduate career and having been elected a fellow of the college at an unusually early age, pursuing with distinction his interests in two separate lines of research—mathematics and geology. In 1851, at the age of thirty, he is appointed to the chair of geology which had been established eight years previously. Eight years later, without relinquishing either his fellowship or his chair, he becomes a medical student, impelled, it has been suggested, by a desire to understand better certain anatomical details in fossils. Inevitably this move leads him to become involved in the administration of the medical school and of its principal teaching hospital. It also supplies him with yet another series of problems related to the human subject in health and disease and these he explores in a series of papers and a striking book. As if the duties of a fellow and a professor, together with the commitments of the medical course and the responsibilities which came his way on its completion were not enough he becomes a member of the Council of the Royal Zoological Society of Ireland, having joined the society as

a life-member two years earlier. In 1864 he becomes honorary secretary, an office which he is to hold for over twenty years, exercising the principal responsibility for the affairs of the society.

IV

We must now look at Haughton's career in more detail. Although much of his work was specifically and purposively directed towards certain objectives these were pursued more or less concurrently throughout the greater part of his scientific and professional life. This makes it difficult to deal with his various interests separately, but for the sake of clarity some degree of separation must be attempted. Perhaps the following scheme will serve from this point of view.

1. His scientific work: (*a*) mathematics; (*b*) geology; (*c*) medicine.
2. His administrative work:
   (*a*) Trinity College: (i) general; (ii) the medical school;
   (*b*) Sir Patrick Dun's Hospital; (*c*) The Dublin Zoo.
3. General interests.

1 (*a*) MATHEMATICS

Between 1847 and 1851 Haughton published eight substantial mathematical papers, dealing with the motion of solids and viscous fluids, the propagation of waves in elastic solids and the equilibrium of planets formed by dislocation from a central gaseous star. In relation to the last topic he dealt with the effects of centrifrugal and gravitational forces in determining the shapes of planets and referred particularly to the earth, the crust of which he calculated to be 768 miles. Dr Crane has kindly looked at this material and he suggests that the work represents a filling out of details rather than the production of basic theory, the latter having already been developed by Hamilton and others. He is also of the opinion that Haughton was a good mathematician, well to the forefront in applied mathematics at one stage of his work. Apparently he was a pioneer in his work on models of the earth and its inner structure. His paper 'On the equilibrium and motion of solid and fluid bodies', published in 1847, when he was twenty-six, earned him the Cunningham Medal of the Royal Irish Academy.

While there are few entirely mathematical papers in his later work he seemed constantly to evoke the aid of mathematics even when dealing with problems not directly mathematical in themselves. As an example of this might be mentioned his paper read

TABLE L.—*Work done, expressed in Urea Grains, and divided into its component parts.*

No.	Total Urea.	Opus vitale.	Opus mechanicum.	Opus mentale, &c. &c.
	grs.	grs.	grs.	grs.
Table B, No, 1, . . .	367·5	343·3	24·2	–
" Nos. 2, 3, 4, 5,	400·6	279·8	120·8	–
Table A, No. 1, . . .	465·0	250·1	28·7	186·2
" No. 2, . . .	677·2	250·1	57·4	369·7
" No. 3, . . .	644·6	250·1	57·4	337·1
" No. 4, . . .	554·0	345·3	15·8	192·9
" No. 5, . . .	630·0	375·1	34·5	220·4
" No. 6, . . .	484·3	287·8	33·0	163·5

In this Table I have calculated the grains of urea corresponding to the vital work from the expression—

$$Opus\ vitale = \frac{297{\cdot}7 \times w}{150} \qquad (9)$$

where w denotes the weight in pounds.

I have calculated the mechanical work done by the following equation deduced from (5),

$$Opus\ mechanicum = \frac{5280 \times w \times n \times 38{\cdot}69 \text{ grs.}}{20 \times 2240 \times 100}, \qquad (10)$$

n denoting the number of miles walked:

On making this calculation, I have assumed the partridge-shooting of No. 2, and athletic games of No. 3, as each equivalent to 10 miles' walking. The column headed *Opus mentale, &c.*, is found by difference, and has now to be discussed.

In the first place, I take Nos. 1, 5, 6, whose mental occupation was almost identical, consisting of high class teaching, and severe study preparatory to it (correcting the statement appended to No. 6, in Table A, as I find on inquiry, that the two hours there mentioned only include the time of preparation, and not the time of teaching, which was also two hours).

If we suppose that mental work, like other work, causes a waste of tissue proportional to the weight of the body, then the coefficient of mental work, or the number of grains of urea that represent one hour's mental work of a man 150 lbs. weight, will be—

$$Opus\ mentale = \frac{150 \text{ lbs.} \times x \text{ grs.}}{n \times w} \qquad (11)$$

where x is the number of grains of urea taken from Table K, n the number of hours' work, and w the weight of the subject in pounds.

Page from 'On the natural constants of the health urine of man'

before the Association of the King's and Queen's College of Physicians in 1860, entitled 'On the natural constants of the healthy urine of man'. Phrased somewhat differently this is a question any first or second year medical student might now be expected to answer, but not according to the treatment used by Dr Haughton in this paper. One wonders what the fellows and members of the College of Physicians made of it.

1 (*b*) GEOLOGY

In Haughton's collected papers there are about fifty on geological subjects. The most substantial again occur in the earlier period but one, 'Report on the chemical, mineralogical and microscopical characters of the lavas of Vesuvius from 1631 to 1868', published with Hull in the *Proceedings of the Royal Irish Academy* and 116 pages

long, appeared in 1876. Again I have to rely on other opinions for an assessment of the quality of Haughton's original work in geology and I am grateful to Professor Holland for the following statement. 'Haughton's contributions in the geological sciences seem to be a reflection of his whole career in that they deal with so many branches. Regional geology, stratigraphy, palaeontology, mineralogy, petrology, structural geology and economic geology are all included. His publication of rock analyses was an innovation in those days and in effect it was part of the beginnings of geochemistry. His use of the distortion of fossils to measure development in rocks is something which remains significant in modern times.'

Haughton's ability to exploit the mathematical approach is apparent throughout his geological papers. His descriptive writing is clear and readable but he is obviously happiest with the crisp precision of the mathematical solution. For him this is final. He does not tell us how he had his rocks analysed chemically. In those days there were very few technicians or Ph.D. students to whom such tasks could be assigned. Professional chemists in their laboratories did their own analyses, using techniques they had perfected perhaps over years. In the department of chemistry of Trinity College the interests of the professor, Dr Emerson Reynolds, were largely in the organic section of chemistry. One also notices occasional uses of chemical terms by Haughton not closely in accordance with those of the trained chemist. Clearly, he was interested in chemistry, mainly as a means to an end—that of an objective precision.

Another geological topic that engaged Haughton's attention was the tides, possibly as has been suggested because of the difficulties encountered by sailors navigating the waters around the coast of Ireland. In 1855 and again in 1866 he published two substantial papers in the *Proceedings* of the Royal Irish Academy, the first dealing with diurnal and the second with semi-diurnal tides on the coasts of Ireland—providing the first comprehensive tables to become available. He discussed in other papers the relationship of tides to cases of shipwreck, to the sequence of events at the Battle of Clontarf in 1014 and to the evidence in a murder trial nearly ten years prior to his relevant article.

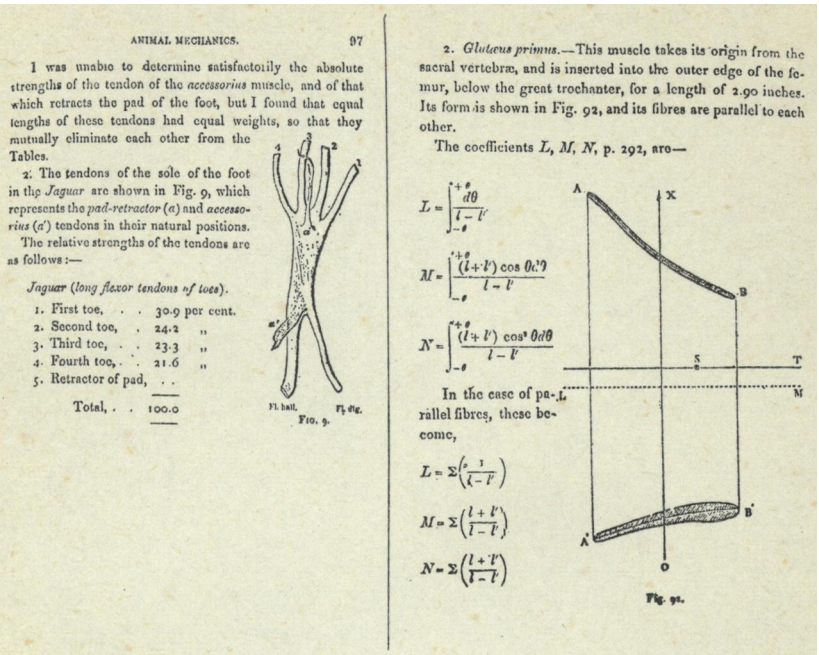
1. (*c*) MEDICINE

Haughton's collected works include seventeen papers on medical

topics. The first of these was contributed to the Royal Irish Academy in 1856, three years before he became a medical student. It was entitled 'Physiological experiments on strychnine and nicotine'; in it he suggests that the respective actions of these two drugs are such that nicotine might be effective as an antidote in cases of strychnine poisoning. Two years later he read another paper to the Academy relating how, apparently, his previous communication had been the means of saving a man's life in St Louis, Missouri. The man had taken six grains of strychnine and appeared to be dying in terrible suffering. A Dr O'Reilly who happened to be there and who knew of Haughton's experiments infused half a cigar in half a pint of water and administered the infusion. After the treatment had been repeated several times the patient recovered.

In those days the examination of the urine was one of the few procedures yielding objective information and it was therefore an important part of the assessment of clinical cases. During his first two years as a student Haughton published three papers on the subject. The first 'On the natural constants of the healthy urine of man', has already been mentioned. The second dealt with the urine in health and disease and the third with diabetes—a subject which occupied many minds then, for insulin was not discovered until sixty years later. Haughton's speculations on diabetes in 1861 were wide of the mark; but this is not very surprising, for Langerhans, who discovered the islets of cells that were subsequently shown to produce insulin, was then only fourteen years old, and the concept of hormones had not yet been formulated.

The aspects of physiological function then most amenable to mathematical analysis were the movements of limbs and the actions of muscles. Haughton made an extensive series of dissections of the limb musculature of several animals, including ostrich, emu, cassowary, pheasant, alligator, crocodile, hedgehog, monkey, llama, sloth, leopard, jaguar, tiger, lion, making careful measurements of their dimensions and those of their tendons. The calculations based on these led to a series of papers and to his book, *The principles of animal mechanics*, published in 1873. Several chapters in this book are devoted to muscular action but the author also discusses in detail the mechanical work of the heart and the muscular forces employed in parturition. He believes that certain general principles emerge from his observations and calculations and he states these in a series of propositions.



ANIMAL MECHANICS. 97

I was unable to determine satisfactorily the absolute strengths of the tendon of the *accessorius* muscle, and of that which retracts the pad of the foot, but I found that equal lengths of these tendons had equal weights, so that they mutually eliminate each other from the Tables.

2. The tendons of the sole of the foot in the *Jaguar* are shown in Fig. 9, which represents the *pad-retractor* (*a*) and *accessorius* (*a'*) tendons in their natural positions.

The relative strengths of the tendons are as follows:—

Jaguar (*long flexor tendons of toes*).

1. First toe,	30.9	per cent.
2. Second toe,	24.2	,,
3. Third toe,	23.3	,,
4. Fourth toe,	21.6	,,
5. Retractor of pad,		
Total,	100.0	

Fl. hall. Fl. dig.

FIG. 9.

2. *Gluteus primus.*—This muscle takes its origin from the sacral vertebræ, and is inserted into the outer edge of the femur, below the great trochanter, for a length of 2.90 inches. Its form is shown in Fig. 92, and its fibres are parallel to each other.

The coefficients *L*, *M*, *N*, p. 292, are—

$$L = \int_{-\theta}^{+\theta} \frac{d\theta}{l - l'}$$

$$M = \int_{-\theta}^{+\theta} \frac{(l + l') \cos \theta d\theta}{l - l'}$$

$$N = \int_{-\theta}^{+\theta} \frac{(l + l') \cos^2 \theta d\theta}{l - l'}$$

In the case of parallel fibres, these become,

$$L = \Sigma\left(\frac{1}{l - l'}\right)$$

$$M = \Sigma\left(\frac{l + l'}{l - l'}\right)$$

$$N = \Sigma\left(\frac{l + l'}{l - l'}\right)$$

Fig. 92.

1. Each muscle is constructed in relation to its joint, in such a manner as to perform one kind of work, only; and it performs that work to maximum advantage.
2. The number of muscles employed is determined by the number of distinct actions required from the limb.
3. The shape and form of the bones employed are the necessary consequence of the shape and power of the muscles in action.
4. The smallest muscle in the combination is as carefully adapted to its conditions of maximum work as the largest.

From these propositions he reaches certain conclusions which demonstrate clearly his whole attitude to his investigative work, at least in the field of biology.

1. That a foreseeing mind planned the type of the limb, and of its actions.
2. The idea of a limb and of its necessary actions being given; the number, shape and arrangement of the necessary muscles can be calculated and predicted with as much certainty as an astronomer can predict an eclipse.
3. That the shape and arrangement of the bones follow of necessity, from the necessary arrangement of the muscles.

4. That any alteration, however slight, in any part of the combination of bones, muscles and joints, would entail a loss of work and lead to a less perfect mechanism.
5. Hence the permanence and stability of each species (so far as relates to bones, muscles, and joints) is absolutely secured, on the principles so admirably laid down by Mr Darwin.
6. The profound study of the mechanism of joints lends no support to the postulate, that the similarities found to exist in the bones, muscles and joints of animals may be explained by common descent from a supposed common ancestor.

Haughton found a very practical application for his mathematics in his consideration of the process of hanging. At that time it was, apparently, common for the criminal to drop only three or four feet—sufficient to stun but not to kill him. He then died by strangulation over the next 15 to 45 minutes, usually with much convulsive movements of the limbs and body, accompanied, presumably, by pain. Haughton suggested that a much longer drop would dislocate the joints at the junction of the vertebral column and skull and so damage the medulla oblongata as to cause instantaneous death. He ascertained, but he does not say how, that the shock of a ton dropped through one foot would be adequate for this and therefore the length of the drop required to produce the same result could be obtained by dividing the weight of the criminal in pounds into 2240. His conclusions were supported by details he obtained of two executions in Galway a few years before he published a paper on the subject in 1866.

It is very difficult to evaluate Haughton's medical contributions. He lived through what has been termed 'the golden age of Irish medicine' and men whose names are still universally respected were his contemporaries—Graves, Stokes, Corrigan, Bennet. While he was registrar of the medical school William Stokes was regius professor of physic and during his period as secretary of the Dublin Zoo Corrigan was a member of council as ex-president. He must have known both these men well. But their approach to medicine was very different from his. They were in active clinical practice and they are remembered for their accurate descriptions of disease phenomena. 'Measurement in medicine', for which the Royal Society of Medicine has now a special section, was not then accepted as being of importance. If Haughton had lived a hundred years later we can imagine his fertile mind devising all kinds of new applications for computers in the fields of biology and clinical

medicine. It is perhaps unfortunate that the only contribution with which his name is now associated is the calculation of the long drop in hanging.

Taking Haughton's scientific work as a whole there is no doubt about the reaction to it in his own time. His papers appeared frequently and in the most reputable journals. He was elected a member of the Royal Irish Academy in 1860, became a member of council in 1861 and in the same year was elected a fellow of the Royal Society, at the age of thirty-seven. He was president of the Royal Irish Academy from 1886 to 1891. But is his scientific reputation now commensurate either with his output or his undoubtedly impressive intellectual ability? One of his most noteworthy characteristics was the variety of his interests. Cunningham, in his obituary, gives a list of titles of papers to illustrate this and suggests that if he had limited himself to a few specialised fields he would have made a deeper impression. It has been said that the most important thing in research is to have an idea, but that the next most important thing is not to have another. Perhaps he just had too many ideas.

2. HAUGHTON'S ADMINISTRATIVE WORK

All accounts of Haughton agree on his outstanding ability as an administrator. In this capacity he served his college, and in par-

---

A list of titles of Haughton's publications, from D. J. Cunningham's obituary notice

xxxv

"An Account of Experiments made on a new Friction Sledge for stopping Railway Trains."
"Physiological Experiments on Nicotine and Strychnia."
"On the Sea-Louse of the Baltic."
"On the Reflexion of Polarised Light from Polished Surfaces—transparent and metallic."
"Account of Experiments to Determine the Velocity of Rifle Bullets."
"On the Muscular Anatomy of the Leg of the Crocodile."
"On Hanging, considered from a mechanical and physiological Point of View."
"On Geological Climates."
"On the normal Constants of healthy Urine in Man."
"On the Tides and tidal Currents of the Irish Sea. &c., &c."
"On Slaty Cleavage and the Distortion of Fossils."

ticular the medical school, Sir Patrick Dun's Hospital and the Dublin Zoo.

2 (a) *Trinity College*

(i) *General.* In Haughton's time junior fellows had little direct voice in the government of the College, which was in the hands of the board, composed exclusively of the provost and the seven senior fellows. The Board minutes between his election to fellowship and his co-option as a senior fellow include no references to him except his appointment as registrar of the medical school and his resignation from that post shortly before his co-option. However, there is little doubt that he was at the back of certain actions taken by the board in regard to the medical school. Apart from his work as medical registrar which will be considered in more detail later, his principal college responsibility before his co-option as a senior fellow would have been to the department of geology. When the chair was founded in 1844 the only duty specified was the delivery of a course of at least twelve lectures in each of the three terms of every year. Haughton was appointed to the chair in 1851, six years before the present Museum Building was finished. It seems unlikely that he had much physical space for departmental purposes at his disposal, but after the department was established in the new building, space would not have been a problem. There is no record of what accommodation Haughton actually used, but it seems likely that he had at least the nucleus of a museum. Certainly there are some twenty-four geological specimens in the present museum that had been sent to Haughton and were described by him.

When Haughton was co-opted senior fellow he resigned from the chair of geology and was appointed senior lecturer. Thereafter there is little mention of him in the board minutes except the record of his attendance at meetings.

(ii) *The Medical School.* During the first half of the nineteenth century there were in Dublin, in addition to the medical school of Trinity College, a similar school in the Royal College of Surgeons and several private medical schools. There were no statutory obligations relating to medical education and there was no medical register. Students could attend classes in any of the Dublin schools and have their degrees conferred by Trinity College. About the middle of the century there was much discontent in Trinity College

because of the relatively large number of students taking the degrees of the university but attending classes elsewhere. In 1858 the British Parliament passed the first Medical Act, establishing the General Council of Medical Education and Registration (the G.M.C.) and placing on it the responsibility of keeping a register of duly qualified practitioners and of determining the content of the medical curriculum. All bodies wishing to have their medical qualifications recognised for purposes of registration would now have to consider seriously the requirements of the new statutory body. In 1862 the Board of Trinity College took the unusual step of appointing their professor of geology, who had only recently had the M.B. degree conferred on him, to be registrar of the medical school, presumably in order to adapt the school to the new situation as rapidly as possible.

One of Haughton's first actions in this new capacity was to set up a committee of professors, of which the regius professor of physic, Dr William Stokes, was chairman. There is some suggestion that the medical school professors did not like the action that the Board had taken. Certainly several meetings of the committee had been held before there was any reference to the registrar in the minutes and only after several years was his name entered in the record of attendance. Gradually a good working arrangement seems to have been established. Professors were required to keep records of attendances at classes, a definite curriculum, the first on record in this college, was agreed, Haughton having ascertained details from Berlin 'as it is notorious that medical education in Prussia is better organised than it is in any other country in the world'; courses and a qualification in state medicine were instituted—the first in any medical school, and the first series of inspections of examinations by the G.M.C. was negotiated.

The minutes of the meetings of the professors include only one reference of a contentious nature, when the professors objected to the appointment of external examiners by the medical registrar. But correspondence between the medical registrar and the board and entries in the board minutes suggest that this was not the only instance when things did not run entirely smoothly. In June 1868, the professors criticized certain actions and decisions of the medical registrar in a report submitted to the board without his knowledge. When the report was referred to him he quickly countered with a vigorous rejoinder in which he dealt forcefully and effectively with each point. Again there was the noteworthy instance when the

board censured the professor of anatomy and chirurgery and the university anatomist in the following terms: 'That the practice of giving credit to the entire class, whether present at the hour of lecture or not, for attendance at lectures which were not delivered is deserving of great censure as such a practice necessarily renders the returns of attendances untrustworthy and therefore worthless.'

During each of his last ten years as registrar of the medical school Haughton sent an annual report to the board indicating the number of lectures and other teaching sessions actually taken by members of staff compared with the number required by the college. Presumably it was from these reports that the board got the information that led to the motion of censure. Haughton must also have been deeply involved in the prolonged dispute between the board and the professor of anatomy and chirurgery, Dr Benjamin M'Dowel, when the Board decided that his appointment could not be renewed unless he resigned from the post of surgeon to the Whitworth Hospital. When Haughton was about to resign from the post of registrar he submitted at the request of the board a further report giving his suggestions for the duties to be assigned to future registrars. In accepting his resignation the board recorded its sincere thanks to him for the very efficient manner in which he had for a period of fifteen years discharged the important duties of the office.

The board also accepted his suggestion that a special committee of four professors in the medical school be set up, with a chairman appointed by the board, to direct the policy of the school. Haughton was appointed first chairman and W. H. Mackintosh, professor of zoology, succeeded him as registrar of the medical school. Haughton presided over his last meeting in June 1897 only a few months before his death. He was succeeded as chairman by T. K. Abbott, professor of moral philosophy, who had also been co-opted to fill Haughton's place as a senior fellow.

Haughton effected striking improvements in the medical school during his term as registrar. His considerable organising ability was undoubtedly responsible for much of this but I believe that the fact that he was a fellow of the college was also important. This would have enabled him to make his views known to members of the board in a way that a professor who was not a fellow might not have been able to do, for there was then a very distinct gap between the fellows and the professors who were not fellows. He was there-

fore able to make board members more directly aware of the problems of the medical school and so arouse their interest and solicit their help. He seems to have been very adroit in exploiting the advantage this undoubtedly gave him.

2 (*b*) *Sir Patrick Dun's Hospital*

Sir Patrick Dun's Hospital was opened in 1809 as the teaching hospital of the school of physic of Trinity College. During its first fifty years it worked under three serious disadvantages. (i) The fact that it had been founded as a teaching hospital seemed to have had some sinister implications for the poor of the area and many were unwilling to go into it as patients. (ii) The board of the hospital was not formally responsible for the appointment of the senior consultant staff, the Royal College of Physicians and Trinity being the competent appointing authorities. (iii) Admission to the hospital was restricted to medical cases—there were no surgical beds.

Haughton seems to have quickly recognised the importance of clinical teaching in the medical course, and consequently the key position of the teaching hospital. He was elected a governor of Sir Patrick Dun's Hospital in 1862, the same year that he qualified in medicine and became medical registrar, and by 1872 he was the most senior member of the board. The Act establishing the hospital specifically precluded any member of the consultant staff from being a governor. Haughton was therefore one of a very small number of doctors on the board, and indeed for a long period he was the only one. This must have given him considerable influence.

The hospital seems to have suffered in the same way as the medical school from a certain laxity on the part of some members of the staff in the discharge of their duties. As a disciplinarian Haughton can be discerned behind various steps that were taken to eliminate this source of inefficiency. In 1869, the board of Trinity College received a complaint from the hospital that Dr M'Dowel, who was surgeon to the hospital by virtue of being professor of anatomy and chirurgery, was neglecting his hospital duties. The board decided to relieve Dr M'Dowel of his teaching duties at the hospital and to appoint a surgeon to attend in his stead. In spite of protests by Dr M'Dowel, both to the college and the hospital, a lecturer in surgery was appointed to take over his hospital duties. Dr Benjamin M'Dowel's delinquencies did

not escape comment by the students. In a series of verses picturing members of the staff, a resident student wrote of him

> Where is the next chirurgeon? for my pen
> Waits to portray the gay and gallant Ben.
> Alas! he's salmon fishing far away,
> Dr M'Dowel can't attend today.

Haughton's chief contribution was the part he played in having the scope of the hospital's work increased. Because it only admitted medical cases students had to attend other hospitals for their surgical and gynaecological experience. In 1864 agreement was obtained with the Royal College of Physicians and with Trinity College to the equipping of a section of the hospital for surgical cases. A further extension occurred when Haughton was instrumental in having a clause inserted in the School of Physic Amendment Act, 1867, authorising the governors to provide maternity and gynaecological services. In addition to facilitating the medical students Haughton felt that it would considerably help the poor of the area. To the latter end he also encouraged the development of out-patient and accident services. In this way he hoped to overcome the distrust with which the poor tended to regard Sir Patrick Dun's Hospital.

A reform which did nothing to increase Haughton's popularity with hospital consultants was his insistance that the practice of 'pluralism' should cease, i.e. physicians and surgeons should no longer hold posts at more than one hospital. In this campaign he included all the hospitals in Dublin and he was largely successful.

Haughton's desire to encourage clinical interest in the students led him to found two prizes, one in medicine and one in surgery for competition each year. He provided the money for these prizes entirely himself and when he died it was found that in his will, dated 11 July 1894, he had bequeathed his residiary estate to the governors of Sir Patrick Dun's Hospital to provide for the 'Haughton clinical prizes' in medicine and surgery. The sum received was £1132 10s 8d the proceeds of which are still used to provide the Haughton prize and medal each year, alternately in medicine and surgery.

When Haughton died in 1897 the board of the hospital recorded their feeling of the loss which the hospital had sustained. 'For many years he was the Senior Member of the Board, but at the same time acting as their Honorary Secretary, devoted his time and energy to the welfare of the Institution. The Board feel that

it is owing to his unremitting and indefatigable energy and diligence that this hospital has been raised to the proud position it now holds, as if not the first then one of the first, clinical hospitals in the City. And by the munificent terms of his will he has now shown that the interests of the Institution engaged almost his latest thoughts. The Board will long remember the intimate and affectionate intercourse which so long existed in all matters concerning the prosperity of the Hospital between themselves and their respected and much loved Secretary.'

2 (*c*) *The Dublin Zoo*

As suggested by the portrait in our Common Room Haughton's dog was his constant companion. He loved animals, so it is not surprising that he became a life member of the Royal Zoological Society of Ireland. From what we have seen of him already it is also not surprising that he quickly found himself in a position of responsibility in the society. Further, it seems to have been his fate that any organisation in which he had such a position would need his help to get it through a difficult period, and the Zoo was no exception. The year after he became secretary of the society the financial position was so precarious that the members of the council had to advance £12 each in order to satisfy the bank.

Haughton's fertile mind soon produced other devices. The carnivora were fed horse flesh instead of beef, thus effecting considerable savings. Various attempts were made to stimulate public interest. A series of scientific meetings were arranged jointly with the Royal Geological Society, of which Haughton was, of course, a prominent member. Topics such as 'The mechanism of flight of the albatross considered in relation to its muscular anatomy' suggest that Haughton himself took a prominent part in these meetings. Fellows and professors in Trinity College were pressed into service for a series of lectures and again we find Haughton contributing on 'The large cats and their poor relations' and on, simply, 'Dogs'. When the public failed to show any appreciation of either scientific meetings or lectures (Haughton said it was like 'flogging a dead horse') other stratagems were tried. 'Promenades', a type of social event popular with Victorians, were arranged at the Zoo. A series of dog shows were held at the premises of the Royal Dublin Society. The former brought in a little money but after an initial success the dog shows became a liability and were abandoned.

All this time attention was being devoted to improving the gardens. After a prolonged period of negotiation the piece of ground on the side of the lake opposite the main buildings was finally acquired and a perimeter fence put up. An aquarium was added and proved a great attraction. Better housing was provided for both the carnivora and the herbivora. A new monkey house was built. Accommodation was provided for two elephants.

Notwithstanding all efforts the position of the society during the second half of last century could never be described as sound financially. Three major factors were probably responsible for its survival. Firstly, the government, after many representations, eventually agreed to give a contribution of £500 per annum to its funds. Secondly, the lions began that notable period of fertility, for which the Dublin Zoo has become famous. Thirdly, there was Haughton himself, tirelessly ensuring that everything possible was done to keep the Zoo going.

Cunningham has mentioned Haughton's enjoyment of the council breakfasts at the Zoo. The council meets on Saturday mornings at 9.30 but members are encouraged to come to breakfast first at 9 o'clock. On these pleasant, informal occasions apparently Haughton was at his best. 'Surrounded by friends of long standing, all of whom had the greatest admiration and affection for him, he was wont to give full scope to his bright and joyous nature.' A feature of these breakfasts is that they begin with porridge which is always taken standing up. The present Director, Mr Murphy, thinks that the custom may have been introduced by a member of Council who was a Scot. He quotes the rhyme:

Eat your porridge standing if you are a Scot.
To be frank, it is rank swank, if you are not.

The great majority of council members, including Haughton have been guilty of 'rank swank' over the years.

When Haughton died, so great was the appreciation of his work for the Zoo that the council had no difficulty in raising by public subscription a sum sufficient to construct the new restaurant premises, known then and now as The Haughton House.

3 *General Interests*

I can only refer briefly to two of Haughton's general interests. Although of a Quaker family his father ceased to be closely connected with the Society of Friends about the time of his marriage.

When Haughton became a fellow it was necessary, according to the obligation still in force, for him to take holy orders and he did so. But this was no mere formality for he clearly had the interests of the Church at heart. He was deeply interested in the views regarding evolution then being actively debated and he used the weight of his knowledge of geology and comparative anatomy sternly to oppose the whole concept. He sent a copy of his book *The principles of animal mechanics* to Darwin who, in thanking him and acknowledging the very high quality of his researches, said 'I grieve that our theoretical views about the organic world differ so widely'.

He was also deeply interested in education, both what we would term post-primary and university. He visited a number of schools in England and made interesting and penetrating observations on the relative merits of the older grammar and cathedral schools and the newer 'manufacturing schools' as he called them. In regard to university education we find that in his time as now its organisation in this country occupied many minds. He saw the problem entirely in terms of Trinity College which he wished to continue as it was then. He advocated the abolition of the Queen's Colleges in Belfast, Cork and Galway and their replacement by a series of high schools distributed over the whole country. If, he said, in the course of time a real and *bona fide* demand should spring up in Ireland for the university education of the Roman Catholics and dissenters it should be met by the founding of a King's College in the University of Dublin as an equal and friendly competitor of Trinity College, unlike the Queen's Colleges—'the impotent, though angry and spiteful rivals of their Dublin sister'.

Mr vice-provost, ladies and gentlemen, in the title of this discourse Dr Haughton is referred to as a 'polymath', that is, according to the *Shorter Oxford dictionary*, 'a man of much or varied learning'. I think I have shown that, according to that definition, he amply satisfied the title but that he was much more besides. If he had been nothing more, then three worthwhile institutions in Dublin would have missed the benefit of his directing hand at a critical stage in their development, certainly to their detriment and possibly even placing in doubt their prospect of survival.