Fifty Years Ago, in the Royal Society of Edinburgh*

By PROF. D'ARCY WENTWORTH THOMPSON, C.B., F.R.S.

THE Royal Society of Edinburgh was a hundred years old just fifty years ago. We are looking back across those fifty years as on a remembered road whereon we all have travelled. Let us step across Princes Street, and pay a visit to the former habitation of the Society.

We pass through a vestibule and enter those beautiful apartments, one opening into another, at which some of us still glance enviously through the tall pillared windows at the foot of the Mound. In the first room, surrounded by books, at a table which we use still, an old man sat reading all day long. It was said of him that few men had absorbed more learning, and exuded less! He was the Society's librarian, Mr. James Gordon. He wore a long, wide-skirted frock-coat, and a black satin stock came close up to his clean-shaven chin. He had a shy but dignified manner, and a hesitation, almost a stammer, in his speech. He wrote the easy, fluent sonorous Latin of the cosmopolitan scholar, and loved to write addresses to be sent abroad to some university or academy. He wrote such a one when Wyville Thomson went to Uppsala for the Linnean Centenary in 1878; and I remember hearing Wyville tell how much it had been admired by the Swedes. So we looked for it the other day and found it in our minutes: *Amplissimis Curatoribus, Rectori Magnifico, Doctissimoque Senatui Universitatis Upsaliensis*:—and so on!

In the next room, a long and beautiful room, our meetings were held. Five large windows looked out on the Castle and the Gardens; but the meetings were at eight o'clock, and the curtains were drawn. Opposite the windows the bookcases were kept low, and there the portraits hung:—our Walter Scott, and Sir James D. Forbes, and Sir David Brewster, and Sir T. Makdougall-Brisbane, and Raeburn's portrait of old John Robison, and later on George Reid's portraits of Christison and of Tait. Half-way up the room, on the window-side, was the president's chair, raised a little, and the table where (as now) the secretaries and other officers sat. On the far side, looking down the room towards the entrance, Tait sat for nearly forty years. I think of Crum Brown, wearing his little velvet cap, sitting beside Tait; of Buchan, at the opposite corner, stroking now and then his long red-brown beard; and Kelvin's eager restless figure in the chair.

Let us recall a certain older meeting, of not fifty but sixty years ago, sixty years almost to a day. David Milne-Home was in the chair, and papers of the usual kind were being read. George Forbes (to-day the oldest of our fellows, save one), son of Tait's illustrious predecessor,

talked of an optical illusion which Tait had noticed one sleepless night. Edward Sang had something to say on the properties of fluid drops within crystal cavities; and then a paper was read by a young author, rather a dull paper, on the "Thermal Influence of Forests". It dealt with the island of Malta, where the chairman had a scheme for the planting of trees. It made a good show of meteorological learning, quoting Réaumur, Humboldt, Becquerel, Boussingault, and Scoresby-Jackson's "Medical Climatology". Its style was technical and scientific, rather than literary:—"In addition to the ordinary hours of observation, special readings of the thermometer should be made as often as possible at a change of wind, in order to admit of the recognition and extension of Herr Rivoli's comparison":—and so on. It was almost the first thing the author ever published, and the only scientific thing he ever wrote. He did better, much better, later on, when he wrote a book called "Treasure Island"!

Two events influenced our Society and the scientific world of Edinburgh fifty and sixty years ago. One was the return of the *Challenger* Expedition; the other was the publication of the famous ninth edition of the "Britannica". Just as Robison and Playfair and Brewster and Dugald Stewart, and other members of our young Society, had been contributors to earlier editions, so fifty and sixty years ago, under Baynes and Robertson Smith, scientific Edinburgh was kept busy writing articles, and who should do this and who should get that was discussed eagerly. I can remember a little outburst of Tait's when "Astronomy" went to a certain popular writer whom Tait held to be outside the pale! But soon afterwards, Clerk Maxwell drew up a scheme for the chief scientific articles, and began by writing the article "Atom", in which Kelvin's vortex-atoms, by the way, had full justice done them; and then he wrote his beautiful article "Capillarity"; and Tait wrote on "Light" and on "Mechanics"; and Chrystal wrote famous articles on "Electricity" and "Magnetism"; and Crum Brown wrote a most original article on "Molecule". Besides these and such as these, there were endless biographical articles: Tait's on Sir Wm. Rowan Hamilton among the chief, and Chrystal's on Pascal, Poisson, Riemann and many more. It was a busy time when all these were being written.

As the Encyclopaedia brought the learning of Great Britain to an Edinburgh printing house, so did the *Challenger* Expedition make Edinburgh a centre for the naturalists of the world. Wyville Thomson was a weary man and out of health when he came home from the sea, and he died before his work was done. John Murray, the strong, able man who took his place and filled it bravely,

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has overshadowed Wyville's name and memory ; but we few who knew him hold him in honour and affection. He had begun as a boy-naturalist by the East Lothian shore, as did old Sir John Graham Dalyell and Francis Maitland Balfour and many and many another. He came under the potent influence of Edward Forbes, who, with Goodsir, was the first to borrow the oysterman's dredge and begin the endless task of the exploration of the sea. With Carpenter, Wyville explored our western waters in the *Porcupine*, and made the cardinal discovery of the warm and cold waters of the Faeroe Channel, on either side of the submarine ridge which bears his name. We owe to him the grandiose conception, the splendid programme and the immense achievement of the *Challenger* Expedition ; and the planning on a noble scale of the publication of its results. He saw before he died a few parts of the great publication.

Wyville Thomson was a kindly man and faithful to his friends. He would search all Europe and America too to find the best man to deal with this group of animals or that ; but if he found no such specialist he would pick out some friendly naturalist at home or some young pupil of his own. So he gave a certain large group to a very young student, my school-fellow Willie (afterwards Sir William) Herdman ; and Herdman brought his first reports before this Society, and became in time the chief authority on the Tunicates in the world.

Herdman was a schoolboy at the Edinburgh Academy sixty years ago, and three other boys, sitting in the same small class, all became fellows of this Society ; to one of these four, Dr. J. S. Haldane, we are to-day paying the highest compliment in our power ! Some five and twenty years before, other four boys were at the Academy together, all fellows of our Society in after years—Tait and Fleeming Jenkin and Lewis Campbell, and Clerk Maxwell, who towers over all. Maxwell paid our Society his first visit when he was twelve years old. At fifteen he wrote his first paper for us, on "The Properties of certain Oval Curves" ; and when he was sixteen, a student under J. D. Forbes, he wrote another, on "Rolling Curves or Roulettes". But Forbes had to read both of these papers, for it was not thought proper for a boy in a round jacket to address the Society ! We have just had the rare luck to discover the MS. of the former paper, in Maxwell's schoolboy hand, together with Forbes's report or epitome ; which latter, and not the paper itself, was published, in 1846, in our *Proceedings*.

Let us think of a few more who were men of mark here fifty years ago. As to Lord Kelvin, I can add nothing to what has been so often said, of one who is so well remembered. He was a fellow of the Society for sixty years. His papers on the theory of heat, on hydrodynamical questions, on vortex atoms, on gyrostats, on close-packing of atoms and what not more, adorned our *Transactions* for a long generation. He was the

unquestioned leader of the Society, the master of all. He was president until his death, except for the few years when that office was incompatible with his presidency of the Royal Society of London.

Alexander Buchan sat at the table for years as treasurer, a tall and striking figure. He was a humorous man, and showed it by the twinkle in his eye. He said once : "Everybody thinks me taller than I am, and wiser than I am, and better than I am"—this last having something to do with the fact that he was an elder under Dr. Whyte in Free St. George's ! The 'spells' which have made his name a household word have little to do with his real fame. Seventy years ago he had mapped the isobars and isotherms of the world, and laid the foundations of all we know of atmospheric circulation. He was probably the very first to show that weather 'travels' : on which cardinal fact all our weather-forecasting depends.

Fifty years ago Prof. Turner (not yet Sir William) was one of the secretaries to our ordinary meetings, and in 1908, when Kelvin died, he became by acclamation president of the Society. There is scarcely anyone of whom I have so old a memory ; for I remember one day, in the year 1867, an uncle of mine rushing into our house, waving his arms, and crying "Turner's got it" ! I told Turner so fifty years after, in the Athenæum. He was extraordinarily delighted ; he laughed and chuckled ; he made me say it all over again. For that had been the great day of his life, when he was elected to Goodsir's chair, after a hard fight with Struthers—to the boundless delight of all the younger men.

Turner lived so long that we can all remember him : his sturdy figure, his rapid walk, his little shake of the head ; the twinkle of his eye, his dominant personality. He was a trifle pompous sometimes, and fond of the verbiage of the anatomists. He came along when I was doing my first day's work in the old dissecting-room : "Well, what have you got ?" said he. "An arm, sir," said I, very timidly. "Call it a superior extremity ; it's so much more precise !" As a demonstrator he was superb. One did not forget one's lesson in a hurry, when Turner had held up nerve or artery in his forceps, and told their names with such a look and voice as though the world depended on them. Of the papers which he read before our Society, many were about whales ; for he inherited a lifelong interest in these great beasts from Knox and Goodsir. Turner had none of the poetry, imagination or insight of Goodsir. But there was nothing Turner touched that he did not do with all his might ; his love of his subject, his faith and enthusiasm, never flagged for a moment. He was a teacher and a master of men. He fairly won and manifestly deserved the honours that were heaped upon him.

Fifty years and one more year ago, Benjamin Peach was put in charge of the geological survey of the North-West Highlands. Then began a

famous chapter in the history of geology, and the unravelling of one of the most difficult regions in the world. It was Peach who first showed the unconformity between the Cambrian rocks and the still older strata; he studied the stupendous thrusts of the great rock-masses of the north-west; and he delighted in the old Cambrian fossils of Durness, which his father, coastguardsman at Wick, had been the first to discover. I do not know that Charles Peach, the father, was ever a member of this Society; but I will not let his name, nor his son's name, pass, without paying something of the debt he laid me under. He was a famous naturalist of the old simple school. I and two or three others came under his spell when he was very old and we were boys; and what he taught us, and the love of living things he shared with us, has been worth much to me. What he taught his son was a great deal more. It made him one of the keenest observers, one of the greatest palaeontologists and geologists of his time. Both father and son were men of unusual strength and immense vitality; their voices and their laughter come ringing down the years!

Dr. Edward Sang, teacher of mathematics, died some forty years ago; he had been a candidate for the natural philosophy chair when Tait won it over Clerk Maxwell. Fifty years ago, an old man, Sang was busy constructing his wonderful tables of logarithms, which have never been printed but are among the Society's most prized possessions. They were among the first tables to be independently calculated since Briggs and Vlacq made theirs, immediately after the "Canon Mirificus". All but a hundred years ago, Sang had read a paper to our Society on Nicol's polarising prism—Nicol being an Edinburgh optician who had just invented this indispensable instrument. Sang's paper was never published, no one knows why; and when he was dying he spoke of it to Tait, and said he thought he had never written a better thing. Tait made instant search for the paper, had it read and printed, but poor Sang was dead. Had it been published when it was written it would have been one of the important scientific papers of the time; it contained things which were not said again for nearly fifty years.

John Aitken of Falkirk also lived to a great age, and was a notable figure of our Society fifty years ago. The greatest of all discoverers are those who discover the simplest things, and John Aitken was one of these. "Why is one's breath visible on a frosty day?" was a question asked, by James Hutton, in one of the first papers ever read before this Society: and Aitken answered it, a hundred years later, in his papers on dust and fog and cloud. How fog and cloud, and all the colours of the sunset, are due to dust-particles in the air, dust far smaller than the motes in a sunbeam; how and why the colours of the sunset were intensified fifty years ago, after the eruption of Krakatoa; how and why and when the 'New Moon holds the Old Moon in her arms'—these are some of the things that John Aitken has explained.

George Chrystal came to Edinburgh five and fifty years ago, welcomed with exuberant delight by Tait and others. He was physicist as well as mathematician. He had been one of the first pupils in the Cavendish Laboratory, where Maxwell set him to work on Ohm's law. When he had done, Maxwell said that seldom or never had so searching a test been applied to an empirical law; and he added the curious remark that the way it had stood the test encouraged one to believe that the very simplicity of a physical law might be taken as some indication of its exactness! In later years Chrystal became interested in the oscillations or solitary waves on certain lakes, to which, in Switzerland, Forel had given the name of seiches. Here he found simple experiment and difficult mathematics after his own heart; and the work which he and a certain younger member of this Society did on seiches is as beautiful and as complete an investigation as was ever brought before our Society.

When Chrystal went to Cambridge he found it (as he afterwards said) "almost decadent as an educational institution"; while in Cayley, Stokes, Adams, Maxwell, it had perhaps the greatest galaxy of talent in all its history! Chrystal became an enthusiast for education, striving to do here what the Cavendish Laboratory was doing and has done in Cambridge: giving mathematics a meaning, direction and purpose, of which the coach and the examiner had not dreamed. I was in our College Library a day or two ago, and two lads were reading diligently near by. I had the curiosity to look at the books they left behind, and both had been reading Chrystal's "Algebra". I opened the book at a random page; the chapter was on certain transformations of circular functions; but the interesting thing was to see how Chrystal guided the student, in a few lines, to Riemann on one hand and Cayley on the other; and then to Maxwell and his lines of force and equipotential, and so to an endless variety of physical problems. Between such algebra, a weapon in the hand of the physicist, and the algebra of the old school-books, there is all the difference in the world.

With a certain peculiar affection we look back upon Crum Brown. He was one of our secretaries for a quarter of a century and a member of Council for more than forty years. I have already spoken of him sitting quietly at the table, with his little velvet cap upon his head, keenly alive to everything but speaking seldom. Once indeed he brought down the house, with a sort of magic bottle, which squeaked out vowel sounds in a voice not unlike his own, and in so doing demolished a theory of Fleeming Jenkin's to which the Society had listened a few nights before. We students behaved none too well during his lectures, from which we came across the quadrangle to sit quiet as mice under Tait. But we learned afterwards how fine, how erudite, how prescient, how suggestive, how educative Crum Brown's lectures had been.

He was a man of very great originality; he was always before his time. When he took his degree, at three-and-twenty, his thesis "On the Theory of Chemical Combination" won no prize, nor was it printed until many years afterwards; but it was a wonderful exposition of structural chemistry, and contained a system of graphic formulæ, undreamed of at the time, but to all intents and purposes that which came ultimately into universal use. He began teaching in a little extra-mural laboratory of his own in High School Yards, to the smallest of classes. He used to come down to our house of an evening and say (in a voice that some of us can still hear): "As I was saying to my man to-day!"—this was his only student. The great John Hunter himself had once no more! But when the University chair became vacant on Lyon Playfair's retirement, Crum Brown was known to and recommended by Bunsen, Hofmann, Wöhler, Baeyer, Kolbe, Beilstein—in short, by the greatest chemists of the day.

He was a man of insatiable curiosity, interested in what he did not know more than in what he knew. He wrote an important paper on the semi-circular canals of the ear and their functions; and illustrated it by curious experiments and exquisite anatomical preparations. He had a passion for making models, geometrical and other. There were times when the glue-pot was always by his fire, and cardboard always ready to his hand; when he was very old indeed he lay quietly knitting, and the little mats he knitted were recondite models of interlaced figures and interwoven surfaces. He had both of these hobbies in common with Maxwell. For Maxwell had made some of the same models when he was a schoolboy, and his are in the Cavendish Laboratory to this day; and he once knitted a kettle-holder gayer than the rainbow, for it depicted a square of unannealed glass placed between crossed Nicol's prisms.

Crum Brown was at heart a mathematician. He said that unless the young chemist learns "the imperial language of science", the higher branches of chemistry (which require reason as well as skill) will pass out of his hands.

I sat in Tait's classroom for the first time well-nigh sixty years ago; and I remember as if it were yesterday the opening lecture which he gave. It was on the rainbow and the aurora—and the moral of it was to show how, of two phenomena, one may have been brought within the knowledge and comprehension of mankind, while the other, no less common nor less beautiful, remains a mysterious pageant beyond our ken. The days went by and every morning Tait gave us of his best; and all he taught us seemed to be just what we had most wanted to know. We also learned the very important lesson (as Prof. Flint long afterwards said) that here was a man whose mind was immeasurably greater than our own.

Tait played with schoolboy zest when it was playtime, and turned easily from work to play. Kelvin said of him that he had made the writing of "T. and T." a perpetual joke; his papers here on "Knots" were one long game—always with the joke behind it that in four dimensions there would be no knots at all! Even in class, once in a way, when he had drawn a freehand circle on the board or skilfully thrown a skipping-rope into waves, his eye would meet ours in momentary triumph and schoolboy comradeship. But in fact Tait's life was one of arduous and almost continuous labour; play there might be, but idleness never; and with duty nothing was ever suffered to interfere. Until the end grew near, when his natural strength abated and sorrow came at the last, he kept the light heart and the happy laughter of a boy; and we who were his pupils, forty, fifty and sixty years ago, still think of him with love, honour and gratitude, and know by a lifetime's experience how rare and exceptional were his qualities of heart and mind.

Muhammad Ibn Umail: an Early Muslim Alchemist

NEARLY twelve years ago, it was mentioned in NATURE of October 28, 1922, p. 574 that a well-known Latin alchemical treatise entitled "Epistola Solis ad Lunam Crescentem" was apparently a translation of the Arabic work "Risālatu'l-shams ilā al-hilāl (Letter of the Sun to the New Moon) by Muhammad ibn Umail al-Tamimi. This suggestion has been confirmed by Messrs. Muhammad Turab Ali, H. E. Stapleton and M. Hidayat Husain, who, in a lengthy and valuable communication to the *Memoirs of the Asiatic Society of Bengal* (vol. 12, No. 1, pp. 1-213; 1933), have published the Arabic text of (a) the Risāla, (b) a prose commentary on the Risāla, by the author himself, entitled "Al-mā' al-waraqī wa'l-ard an-najmīyah" (Book of the Silvery Water and Starry Earth), and (c) a further poem of Ibn Umail's, entitled "Al-qasīdat an-

nūniyah" (Poem rhyming in Nūn). The edition of the texts is the work of Mr. M. Turab Ali; Messrs. Stapleton and Hidayat Husain contribute an excursus on the date, writings and place in alchemical history of Ibn Umail; an edition, with glossary, of an early medieval Latin rendering of the first half of the Mā' al-waraqī; and a descriptive index, chiefly of the alchemical authorities quoted by Ibn Umail.

Ibn Umail was formerly believed to have flourished in the second half of the third century A.H. (that is, A.D. 864-912), but it is now shown that this date is too early. Upon evidence deduced from the period at which his friends, and authors he makes use of, are known to have lived, it appears that his life probably covered the years from 900 to at least 960 A.D., and that his writings are consequently later than those of Razi (Rhazes).