Bournemouth U3A – Great Thinkers

Erasmus Darwin 1731 - 1802

Introduction

In his biography of Erasmus Darwin published in 1999, author Desmond King-Hele comments nobody from his day to ours has rivalled him in his achievements in such a wide range of fields. He was for the author a far-sighted scientific genius, fertile in theory and invention and one of the foremost physicians of his time. The author, a physicist, mathematician and member of the Royal Society studied Erasmus Darwin for more than three decades.

King Hele's book, A Life of Unequalled Achievement, makes a clear statement on the standing in which he is held by fellow luminaries, much impressed by his polymath abilities in an era of innovation and change but as we shall see Erasmus Darwin was not alone. This was an era rich in innovation, discovery, experiment and enlightened thinking that questioned tradition and accepted methods and led to the birth of the Industrial Revolution from about 1760.

The 18th century was a time of change and revolution not only in Britain but Europe and America. Intellectuals and others gathered to discuss anything and everything, from the social order problems of the day, to the latest scientific advances, and the intertwining political and philosophical issues. Clubs were formed in order to allow members the pleasure of enjoying the finest food and wine whilst debating these issues with other like-minded individuals.

With the ascendant British Empire centred firmly on London, a small group of friends met monthly in and around Birmingham to apply their minds to the problems of the age. They were called the Lunar Society as they often returned from their meetings at night and travelled by the light of the moon. An exclusive club it never had a core of more than fourteen members noted for their expertise in a particular field. Invited guests would attend occasionally, including Thomas Jefferson and Benjamin Franklin.

Whilst Erasmus Darwin possessed a penetrating and inquiring intellect he was helped enormously by this group of friends who could experiment, debate and challenge in a mutually supportive way, in congenial and informal surroundings far removed from the stuffy and pompous environment of London and Royal Society in particular.

A Biographical Sketch

Erasmus Darwin, grandfather of Charles Darwin and biologist Francis Galton, was born at Elston Hall, near Nottingham, on 12 December 1731. The son of a lawyer he studied classics and mathematics at St John's College Cambridge and then engaged in medical training for three years at the University of Edinburgh. Erasmus moved to Litchfield in 1756 where he ran a flourishing medical practice and five year later was elected a fellow of the Royal Society.

His was a meteoric rise to fame fired by an extraordinary intellect with ideas spinning from his fertile mind much like a Catherine wheel. The Royal Society was the prime

gathering place for scientists, inventors and natural philosophers but Erasmus felt their formalised debates left little room for his creative and questioning energies. Imagination and ingenuity were required and a challenging ethos to probe causes and explore future ideas. Empirical evidence and hypothesis followed but by that time his attention was likely to be focused elsewhere.

A remarkable polymath, Erasmus became a best selling poet while also working as a country doctor, naturalist, medical botanist, and inventor. His major interests were medicine and inventions but in the late 1770s he became fascinated by botany. He translated textbooks and in 1779 composed the “Loves of the Plants,” a series of elaborate footnoted verses that extolled the taxanomic system of Swedish botanist Carolus Linnaeus. Erasmus followed this up with The Botanic Garden (1791) and The Temple of Nature that appeared posthumously in 1803.

The overriding characteristic of the work of Erasmus was a commitment to progress that he harnessed through an informal, yet highly influential group of scientific and technical entrepreneurs. His florid and corpulent complexion and stammer belied an avuncular manner and high octane energy that magnetized debate. As a wonderful and questioning conversationalist his great gift for friendship enabled him to recruit members of the Lunar Society, regarded by many historians as the prime intellectual powerhouse of Britain’s Industrial Revolution in England. He was especially close to Benjamin Franklin, Josiah Wedgwood, Matthew Boulton and James Watt, all pioneers of their time. He was far less friendly with Dr Johnson who lived very close by in Litchfield and the two often clashed, hardly surprising given Johnson’s forthright and very candid opinions.

Much interested in the development of medicine Erasmus was drawn to psychology as well as physiology and even suggested talking therapies as a remedy rather than reliance on medication. Natural herbal remedies were prescribed although on one occasion following an overdose of digitalis the unfortunate patient died. He believed in the benefits of opium to relieve pain in a time of experimentation to find cures and remedies.

Erasmus was the first person to give a detailed description of how clouds form and of photosynthesis in plants. He was also an obsessive inventor of mechanical devices, among them a speaking machine, a copying machine and the steering technique that we recognise today in cars.

The most striking of Darwin's diverse talents was his extraordinary scientific insight into physics, chemistry, geology, meteorology and virtually all aspects of biology with his deepest observations on the evolutionary theory of life. Two of his books, the Zoonomia, which made him famous as the leading medical mind of the 1790s, and The Temple of Nature, a long poem, show he believed the origins of life developed from microscopic specks in primeval seas with fish and amphibians to 'humankind.” At that time he failed to convince his peers about biological evolution and this was left to his grandson Charles.

Towards the end of his life Erasmus Darwin gained recognition as a leading English poet and deeply influenced Samuel Coleridge, William Wordsworth, William Blake and later Mary Shelley who used him as an inspiration for the character of Baron

Frankenstein. Coleridge claimed that Darwin possessed "perhaps, a greater range of knowledge than any other man in Europe, and is the most inventive of philosophical men."

Zoonomia

The most significant work produced by Erasmus Darwin was Zoonomia, otherwise known as *The Laws of Organic Life,* published between 1794 and 1796. This two-volume work aimed to classify facts about animals, to set out laws describing organic life to cataloguing diseases together with their treatments and an analysis of human pathology, anatomy and psychology.

He believed in evolution and that all warm blooded animals originate from a single source, are improved through each generation, and develop without intervention by God as they occur naturally. Is this roughly what Charles said as his postulations appear similar? This debate is so frustrating for scientists as whilst clues and trails exist there is no compelling documented evidence. Yet the views of Erasmus are incredibly close, tantalizingly close.

In Zoonomia, section 39 (4.8) of Generation, we get an insight into how he linked related themes into an all encompassing theory. “From thus meditating on the great similarity of the structure of the warm-blooded animals, and at the same time of the great changes they undergo both before and after their nativity; and by considering in how minute a proportion of time many of the changes of animals above described have been produced; would it be too bold to imagine, that in the great length of time, since the earth began to exist, perhaps millions of years...that all warm-blooded animals have arisen from one living filament, which THE GREAT FIRST CAUSE endued with animality...and thus possessing the faculty of continuing to improve by its own inherent activity, and of delivering down those improvements by generation to its posterity, world without end?...”

Erasmus Darwin further develops and refines this notion. “Shall we then say that the vegetable living filament was originally different from that of each tribe of animals above described? And that the productive living filament of each of those tribes was different originally from the other? Or, as the earth and ocean were probably peopled with vegetable productions long before the existence of animals...shall we conjecture that one and the same kind of living filament is and has been the cause of all organic life?”

He arrived at his ideas through intuition and speculation of what might be in contrast to his grandson Charles who as a modern scientist gathered and assessed facts. For Paul Nurse, President of the Royal Society, both methods are important as whilst a trigger or catalyst may inspire or spark original thought there is a need to accumulate evidence but the paradox is this can lead us back to hypotheses, anathema to Erasmus.

For Paul Nurse he was a great scientist, thinker and personality too. We are left to conjecture how far his thoughts acted as a springboard for grandson Charles not so much to test out this theory but to assemble facts to assess whether any form of evidence exists, and if so in what forms and what may be concluded that may lead

to other lines of inquiry. We may then argue that it is not so much later generations standing on the shoulders of a giant by the name of Charles Darwin but his standing on the shoulders of his own grand-father whose influence was substantial.

Yet there is much more to Charles Darwin's own ideas that had much to do with the development of science in Europe, the ideas of his contempories at Cambridge and opportunities to travel free from the worry of expense that allowed him to return to his first love botany. For that he can thank his grandfather Erasmus in particular and also his cousin Francis Galton.

The Lunar Society

The Society was a select gathering of free and fertile minds. Apart from Erasmus Darwin, leading members included local manufacturer Matthew Boulton, engineer and Scottish friend James Watt, Joseph Priestly a natural philosopher, clergyman, chemist, educator and Liberal political theorist and Burslem ceramic manufacturer Josiah Wedgwood whose daughter married a son of Erasmus. They had a son by the name of Charles Darwin.

It was Wedgwood who summed up the ethos of this group saying they were 'living in an age of miracles in which anything could be achieved'. Their strength and impetus came from links with industrial organisations and the articulation and exchange of thoughts and ideas and perceptive insights into an industrial vision of the future. Historian Jacob Bronowski said of the Lunar Society, "What ran through it was a simple faith: the good life is more than material decency, but the good life must be based on material decency."

Birmingham was a booming and bustling city with a population exceeding 30,000 that encompassed a vast range of trades with local expertise and artisans organised into productive groups. Dominant trades included toy manufacture and work with large quantities of metals to make buckles, belts, buttons and coins that would often involve very detailed and fine precision work for sale in specialist shops.

Mathew Boulton inherited his father's small toy trade business and his extraordinary technical knowledge complemented the ideas of university educated Erasmus Darwin buzzing with scientific theories. The formation of the Society came out of a meeting of these two minds in the late 1750s.

Several years later Matthew Boulton received a letter of introduction from Benjamin Franklin praising the talents of William Small, professor of Natural Philosophy at the College of William and Mary in Williamsburg, Virginia. Thomas Jefferson recalled his great ability to communicate well and noted his courteous and impeccable manners. A decade later they were joined by James Keir, a Scottish chemist and inventor and in 1780 by Joseph Priestly both of whom were members of the Royal Society.

Keir's work originally involved cryallisation and alkalis but soon he was to research alloys and the properties of gases. He was in good company as Joseph Priestley had established a reputation as an authority on gases and his discovery of ten new gases included nitrous oxide, ammonia, nitrogen, oxygen (jointly discovered with Antoine Lavoisier) and later carbon monoxide.

Priestly too had considerable influence on the Group apart from his scientific abilities. He embraced the philosophy of Francis Bacon that social progress is dependent upon the development of science-based commerce. By this time Priestly had modified his Calvinist views, now believing that far from being wrathful, God was benevolent and encouraging. The modification of his views failed to convince the atheist Erasmus.

Core membership fluctuated. Some like Wedgwood, Watt and Boulton focused on commercial applications such as the development of steam through an adaptation of the Newcomen engine patented in 1769. Steam power revolutionised mining and was soon used in paper, flour, cotton and other mills, helping to increase output, productivity and profits. Boulton & Watt became the most important engineering firm in Britain and in 1785 the two inventors were admitted to the Royal Society.

Josiah Wedgwood wanted to 'surprise the world with wonder' and 'conquer France in Burslem' in reference to his trade of pottery. He used his knowledge of chemistry and documented thirty five years of experiments in a series of notebooks, ranging from his early creamware to the highly distinctive blue and white we know today.

Keen to broaden his knowledge Wedgwood soon delved into unfamiliar but curious subjects related to pottery such as the science of heat, minerals and geology. In so doing he realised the earth was millions of years older than the Bible said. This plus the origins of the human and animal species fascinated the Group and Erasmus Darwin in particular.

The discussions, with no officers or minutes, would alarm the formality of the Royal Society in the way they were conducted. Whilst Erasmus Darwin speculated and theorised using intuition, imagination, sketches and notions, Joseph Priestley much preferred facts. Both liked to form opinions from discovery and disliked hypotheses. They were in one accord that prejudice, dogma and pre-conceived notions were obstacles to critical inquiry, as was the notion that facts merely support a premise.

A typical Society monthly meeting meant arrival for a late and wholesome lunch at two and the meeting would continue until at least eight in the evening when they left by the light of the moon. Sometimes members stayed over because of inclement weather or need to continue a captivating debate or experiment. Often impromptu laboratories were attached to their respective homes as they liked to do experiments together. Erasmus Darwin wrote to Matthew Boulton on 5 April 1778, "Lord! What inventions, what wit, what rhetoric, metaphysical, mechanical and pyrotechnical, will be on the wing, bandy'd like a shuttlecock fro, one to another of your troop of philosophers."

Correspondence available is a helpful reminder that these decades were incredibly productive. Close links were forged with Europe across a vast range of topics and the bulk Boulton's production was for export to Europe. As both and inventor and entrepreneur he promoted his scientific interests on the back of his commercial activities.

They were, as a collective Group, prophets of the next generation and catalysts for the burgeoning industrial revolution sweeping the major towns and cities of Britain. Cut off from London, most loathed the metropolis and cited bribery and corruption, clashes between church and state, an emphasis on paying taxes and excise duties

and above all the problem of establishing patents. They were not alone as Samuel Crompton had found to his cost. The wily Richard Arkwright with legal help had devised all embracing patents that stifled competition in the cotton mills.

The Group experimented in safety, far removed from the learned academics and the institutional atmosphere they operated in. The Lunar Society could test things out before they had to show them. The domestic quality of their work, with the kitchen and drawing tables as a form of laboratory, enabled models to be created and gave credence to the efficacy of their experimentation that was always work in progress, such was the desire to improve, modify and create.

These scenes were captured beautifully by eminent artist of his day Joseph Wright of Derby. His 'An Experiment on a Bird in the Air Pump' was painted in 1768 and is on display in the National Gallery. A group of fascinated minds, including children, are huddled around a table, only the glow of a candle showing. A scientist demonstrates how a vacuum is formed by withdrawing air from a flask using a white cockatoo.

Elsewhere in Europe and in London, such as the Royal Society, science was kept in academies as a form of institutional straight-jacket. Outside of this was more of a club atmosphere helping to form the new industrial enlightenment, unfettered by constraints with no political or religious inhibitions and an absence of hierarchies that might otherwise dominate agendas and free-ranging thought. Visitors attending the Lunar Society were impressed and spellbound by how daring these meetings were in challenging anything. They were swept up by the excitement and adrenalin of not only creating ideas but developing society and improving the quality of life of people.

Above all chemistry was the master science and would show the world as it really was with Josiah Wedgwood, James Watt, Joseph Priestly prominent and Scottish chemist James Keir too. They were able to test the viability of what might appear a crackpot scheme and get it witnessed and debated informally. Only then would they bring it to the market and hopefully get it patented with all its attendant difficulties.

Erasmus with his fertile mind often played Devil's advocate and liked to pursue grand notions that could not be tested such as changing the wind and producing ingenious, mad and hair-brained ideas that would have little application but which might well resurface decades or even centuries later in a different form such as the aeroplane.

He was interested in physiology and language and invented a speaking machine operated by bellows. This managed only to produce grunts and was much teased by Boulton in particular who offered a wager of £1,000 that this contraption would be unable to recite the Lords Prayer or the Ten Commandments. His bet was safe! In some experiments the Group's enthusiasm was hard edged, notably questions about evolution and tinged with danger in meddling with psychology or education.

Thomas Day, an eccentric and fringe member of the group, was determined to set about applying his views on human development and what shapes this. Children form foundling hospitals were used in controlled experiments such as learning French and how to dance with the aim of developing a perfect child and perfect wife. Force-fed learning and adherence to a highly prescriptive model of child development was a disaster. The experiment disintegrated as Day became bored by science and the Group felt his efforts were useless practically.

There was a darker side to deliberations in the form of a social hierarchy. A large sector of society was excluded or not considered to be part of the social sphere and were consigned to the industrial disciplines of factory work. For Josiah Wedgwood men and women could be turned into machines that cannot err. His prescription was for workers to follow precise and rigid instructions to ensure consistent quality and output. He devised a form of clocking-on and system of factory organisation using division of labour based on industrial processes. He drew the line at slavery as did Erasmus Darwin and Joseph Priestley. A widely held view was that slavery was indispensible for the economic growth of Great Britain and Matthew Boulton concurred. Unlike Josiah Wedgwood he ensured his workers fared reasonably well and even introduced a form of sick pay for industrial accidents mainly.

The French Revolution and age of reform and rebellion were thought to have spelled the demise of the Lunar Society that disbanded in 1813 but the main trigger was the Priestley riots in Birmingham in 1791, sparked by religion and possible notions of a republic. In the late 18th century, while Revolution raged in France, many people in Birmingham feared religious dissent might lead to revolution against the Church of England and British monarchy. In their sights were those who refused to accept the doctrines of an established church, in this case Protestants, who dissented from the Church of England.

Joseph Priestley, a dissenter, was minister of the Old Meeting House. At the radical end of the non-conformity spectrum he had written an inflammatory pamphlet that described 'laying gunpowder' under the 'old building of error.' This had caused alarm among supporters of the established church who believed they were under threat for good reason. Priestley had already gained notoriety for his criticism of an attack on the French Revolution by Edmund Burke, Irish statesman and political thinker.

On 14 July 1791 Priestley and his followers met at a dinner to celebrate the second anniversary of the storming the Bastille. Their opponents took this as an opportunity for full scale riot. They attacked and burned the Meeting House and the homes of a large number of Priestley's friends and supporters including respected Birmingham citizens. The riots made headline news with a detailed account given in Hansard. Three years later Matthew Boulton’s house was invaded by rioters, repelled only through his efforts and those of James Watt.

Liberal toleration was under threat and Joseph Priestley moved to America where he was welcomed by Thomas Jefferson for his innovative ideas and an independence of spirit. The age of enlightened reconstruction widened splits within the Lunar Society with Josiah Wedgwood believing that politics had killed chemistry. Matthew Boulton and Josiah Wedgwood were nervous about the mob heading north to the heartland of manufacturing. New members joined as the original group gradually disbanded in the wake of ridicule and satire and even mistrust by Government, and the death of Erasmus Darwin in 1802. The Lunar Society disbanded fully in about 1813 but the age of discovery was reinvigorated by Michael Faraday and Humphrey Davy amongst others. Innovation was not dead, nor was the excitement this engendered.

Conclusions

Erasmus Darwin, as well as making a contribution to early thinking on evolution, was an important catalyst in the growth of science and technology and its application in Britain through the Lunar Society especially. They were the torch bearers, shining a light for others to follow decades and centuries later. Erasmus Darwin has many fine qualities to be regarded as a great thinker and was a man of his time but so were other brilliant minds, many of whom were members of the Lunar Society.

In looking back at his life, the energetic and inspiring meetings of the Lunar Society and the future discoveries of his grandson Charles and best selling *On the Origin of Species* published in 1859, we may ponder what drove this. Amongst many reasons perhaps two stand out. The opportunity of a good education and supportive environment to nurture and encourage learning made a huge difference to both. Being reasonably wealthy helped too.

The second point concerns inter-dependence. Like many great thinkers both were to some extent autodidacts but in reality required the input of others to act as a check or stimulus and to bounce ideas. For Erasmus it was the Lunar Society that provided the spark whereas for Charles it may well have been Erasmus, the most influential mentor in his scientific life.

Sources

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