ARITHMETIC – MASONIC MATHEMATICIANS
Rt Wor Bro R J Nairn PSGW KL
The names of known Freemasons are shown bold

Introduction

At University, when I had to struggle with the mathematics of **Newton**ian mathematics, Euler functions, **Laplace** transforms, Lagrange multipliers, Euler functions, Fourier series, Lorenz transformations and Bessel functions, it might have been more interesting if we had been told more about the problems that these brilliant men were trying to solve.   I also probably would have been more interested if I knew some of the most prominent ones were Freemasons. .

I learned because I understood applied mathematics was necessary to an end – my studies in engineering and economics.   However advances in pure mathematics were different.   They took place because people kept putting questions to themselves about the world we live in.

Arithmetic can be learned by rote but most mathematics is understood by intuitive or conceptual learning.   In mathematics you don't understand things, you just get used to them!   It is through science that we prove, but through intuition that we discover.

We all understand that addition, subtraction, multiplication and division are necessary to our daily living but who first thought of fractions?   Who introduced the idea of a variable? Who first posed A + B = C?   Who then found out how to solve for A, B and C?   Who first thought of the need to define sines and cosines?

As Freemasons we are familiar with Pythagorus, who, since the fourth century AD, has commonly been given credit for discovering the Pythagorean theorem, that states that in a right-angled triangle the area of the square on the hypotenuse is equal to the sum of the areas of the squares of the other two sides—that is, $a^2 + b^2 = c^2$.   We can surmise that this was useful in order to be able to build one wall square to another or to erect a true vertical. While the theorem that now bears his name was known and previously utilized by the Babylonians and Indians, he, or his students, are often said to have constructed the first proof.

However, it is Archimedes of Syracuse (287–212 BC) who is rated as being the greatest mathematician and one of the leading scientists in classical antiquity.   He used the method of exhaustion to calculate the area under the arc of a parabola with the summation of an infinite series, and gave a remarkably accurate approximation of pi.   We can imagine that it may have been necessary to know the value of a gold coin, without scales to weigh it, or a segment cut from it – a not unusual practice then and until quite recently – in which an accurate measure of pi may be essential.   Archimedes also defined the spiral bearing his name, formulae for the volumes of surfaces of revolution and an ingenious system for expressing very large numbers.

There are often many ways to solve a problem.   Finding the best and surest way is the test. A mathematician, a physicist, and an engineer were all given a red rubber ball and told to find the volume.   The mathematician measured the diameter and evaluated a triple integral. The physicist filled a beaker with water, put the ball into it, and measured the displacement. The engineer looked up the model and serial numbers in his red-rubber-ball catalog.

Appendix A lists those who are regarded as the 30 greatest mathematicians of all time, headed by **Newton.**

## *Branches of Mathematics*

Arithmetic is known to almost everyone. Basic arithmetic usually operates in a decimal system, which allows easy expression of fractions but computer systems operate on binary arithmetic and originally on an octal base. There are 10 kinds of mathematicians in the world..... Those who understand Binary, and those who don't.

Geometry is concerned with shape, size, relative position of figures, and the properties of space. Geometry is one of the oldest mathematical sciences. In the 3rd century BC geometry was put into an axiomatic form by Euclid, and Euclidean geometry set a standard for many centuries to follow.

Algebra is the study of the rules of operations and relationships including polynomials and equations. It introduces the concept of variables representing numbers and provides techniques for equation solving. The Persian mathematician Omar Khayyam is credited with identifying the foundations of algebraic geometry and found the general geometric solution of the cubic equation.

Trigonometry is a study of triangles and polynomials and the relationships between their sides and the angles between these sides. Trigonometry has applicability to cyclical phenomena, such as waves. The field evolved during the third century BC as a branch of geometry used extensively for astronomical studies. It is also the foundation of the practical art of surveying.

Calculus focuses on limits, functions, derivatives, integrals, and infinite series. Calculus is the study of change, in the same way that geometry is the study of shape and algebra is the study of operations and their application to solving equations. Calculus has widespread applications in science, economics, and engineering and can solve many problems for which algebra alone is insufficient. These ideas were systematized by **Gottfried Wilhelm Leibniz**, who was accused of plagiarism by **Newton,** who simultaneously provided similar material. They are both now regarded as independent inventors of and contributors to calculus.
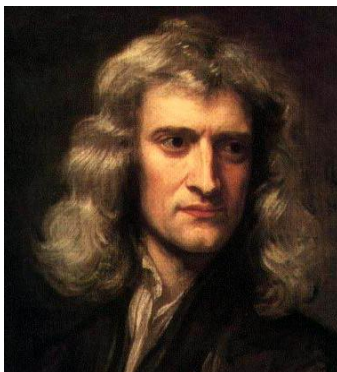
Newton was the first to apply calculus to general physics and **Leibniz** developed much of the notation used in calculus today. The basic insights that both **Newton** and **Leibniz** provided were the laws of differentiation and integration, second and higher derivatives, and the notion of an approximating polynomial series. By **Newton**'s time, the fundamental theorem of calculus was known. It is **Leibniz** who gave the new discipline its name. **Newton** called his calculus "the science of fluxions".

Leibniz was believed to be a Swedish Freemason.

Statistics is the study of the collection, organization, analysis, and interpretation of data. It deals with all aspects of this, including the planning of data collection in terms of the design of surveys and experiments. Statistics deals also with the theory of probability and provides measures for uncertainty and risk.

Mathematics today includes many more esoteric areas such as **imaginary numbers** (square root of minus one called i), **Number Theory, Set Theory** and **Complex Systems**.

<div align="center">

i to π: Be rational.

π to i: Get real.

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It embraces **Chaos theory**, which is about finding the underlying order in apparently random data. (It is easier to understand why it is called chaos theory when we find that Edward Lorenz, who pioneered this theory, was a weather forecaster, who was trying to predict the weather using mathematical equations).

Mathematical research is normally seen as establishing truth by rigorous deduction from appropriately chosen axioms and definitions. When suitably applied to real phenomena, then mathematical reasoning often provides insight or predictions. Mathematics is fundamental to the study and practice of surveying, engineering and science and it is often the case that with problems in these applications that mathematics makes its conceptual advances.

Many mathematicians, however, feel that to call their area a science is to downplay the importance of its aesthetic side, and its history in the traditional seven liberal arts, which was to make men pose questions. Others feel that to ignore its connection to the sciences is to turn a blind eye to the fact that the interface between mathematics and its applications in science and engineering has driven much development in mathematics. One way this difference of viewpoint plays out is in the philosophical debate as to whether mathematics is created (as in art) or discovered (as in science).

Famous Masonic Mathematicians

Marie Jean Antoine Nicolas Caritat, Marquis de Condorcet, (1743-94), was a French philosopher and mathematician. He first made his reputation as a mathematician with his essay on the theory of probability. Later, he engaged in political activity and became a prominent member of the Legislative Assembly during the French Revolution. **Condorcet's** opposition to the excesses of the Jacobins, however, caused him to be arrested for conspiracy. He died in his cell, presumably a victim of suicide. While in hiding, he wrote *"Sketch for a Historical Picture of the Progress of the Human Mind"*.

Condorcet has been called a prophet of progress. He stressed the importance of education, the free exchange of ideas, a republican form of government, a guided economy, the emancipation of women, and a language with one clear meaning for each word. He was said to have been a member of Lodge Les Neuf Soeurs at Paris.

The Frenchman **Pierre de Laplace** (1749-1827) is best known for his nebular hypothesis of the origin of the solar system called the *"Big Bang Theory"*.

He also provided a stronger mathematical basis for Newtonian thinking and his 5-volume '*Treatise on Celestial Mechanics*' was the culmination of over a century of work devoted to the mathematical explanation, on the basis of gravitational theory, of the motions of the bodies of the solar system. He held Grand rank in the Grand Orient of France

James Gregory FRS (1638–1675) was a Scottish mathematician and astronomer. He described an early practical design for the reflecting telescope – the Gregorian telescope – and made advances in trigonometry, discovering infinite series representations for several trigonometric functions. He was a Scottish Freemason in Edinburgh.

Jules Henri Poincaré (1854–1912) was a French mathematician, theoretical physicist, engineer, and a philosopher of science. He is often described as a polymath, and in mathematics as *"The Last Universalist"*, since he excelled in all fields of the discipline as it existed during his lifetime. He made many original contributions to pure and applied mathematics, mathematical physics, and celestial mechanics.

Poincaré became the first person to discover a chaotic deterministic system which laid the foundations of modern chaos theory. **Poincaré** introduced the modern principle of relativity and was the first to present the Lorentz transformations in their modern symmetrical form.

Carl Gustav Jacob Jacobi (1804–1851) was a German mathematician, widely considered to be the most inspiring teacher of his time and is considered one of the greatest mathematicians of his generation. One of Jacobi's greatest accomplishments was his theory of elliptic functions. Theta functions are of great importance in mathematical physics because of their role in the inverse problem for periodic and quasi-periodic flows. He also made fundamental contributions in the study of differential equations and to rational mechanics.

Prof Edward Neville da Costa Andrade, *FRS* (1887-1971) He studied the flow of solid metals under stress and his paper on this published in the Royal Society Proceedings was a landmark in the science of the mechanical properties of solids.

Andrade wrote and published poetry and knew **T S Eliot**. He was a member of Savage Club Lodge No. 2190, London.

Sir James Cockle (1819-1895), Lawyer and Mathematician and Chief Justice, Supreme Court of Queensland from 1863-79 Contributed over 100 papers to English and Australian scientific journals, writing on the theory of equations.

He was a member of Lodge of the Nine Muses No. 235, London.

Sir Edward Victor Appleton *FRS* (1892-1965) was a mathematician and scientist who studied under **Sir John Joseph Thomson**. After WWI he returned to Cambridge and took up research on radio waves, devoting himself to scientific problems in atmospheric physics, using mainly radio techniques. He received the Nobel Prize for Physics, for his contribution towards exploring the ionosphere. His work revealed the existence of a layer of electrically charged particles in the upper atmosphere (the 'Appleton Layer'), which plays an essential part in making radio communication possible between distant stations. He was a member of Isaac Newton University Lodge No. 859, Cambridge.

Johann Reinhold Forster, FRS (1729-1798) was the first official scientist ever appointed and paid by the British government, who, with his son, also a Freemason, accompanied Capt James Cook. He replaced the more famous **Joseph Banks** and it is reported that he wasgiven the task with no job definition or responsibilities, except his own sense of scientific duty.

He was a member of Lodge Zu den dye! Kronen [Three Crowns], at Konigsberg, East Prussia.

 John Machin FRS (1679-1751) was a mathematician and astronomer who contributed three papers to the *"Philosophical Transactions"*. He enjoyed a close professional relationship with **Sir Isaac Newton**, who wrote that **Machin** was the one man who 'understood his *"Principia"* better than anyone.' He was a member of Lodge No. 18 meeting at the Bedford's Head, Southampton Row Covent Garden, London.

Percy Alexander MacMahon, FRS (1854-1929) was a Mathematician, who was forced to leave the Military in India due to illness and returned to Woolwich as Professor of Mathematics. His interest was in number theory and algebraic forms.

He was President of the London Mathematical Society and a member of Ubique Lodge No. 1789, London and a Founder of the **Cavendish** Lodge No. 2620, London.

Brook Taylor, *FRS (1685- 1731)* is said to have been an outstanding Mathematician and was elected to the Royal Society for his distinction in mathematics.   Having studied mathematics under **John Machin,** he obtained a remarkable solution of the problem of the "centre of oscillation".   **Taylor**'s *"Methodus Incrementorum Directa et Inversa"* added a new branch to the higher mathematics, now designated the "calculus of finite differences."   He was a member of an unnamed and unnumhered Lodge meeting at at Bedford's Head, Southampton Street, Covent Garden, London.
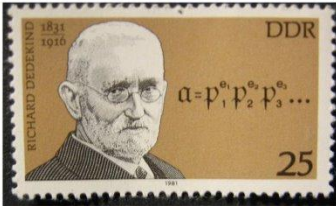
Julius Wilhelm Richard Dedekind (1831– 1916) was a German mathematician who did important work in abstract algebra (particularly ring theory), algebraic number theory and the foundations of the real numbers.

Walter William Rouse Ball (1850–1925) was a British mathematician, lawyer and a fellow at Trinity College, Cambridge from 1878 to 1905. He was also a keen amateur magician, and the founding president of the Cambridge Pentacle Club in 1919, one of the world's oldest such societies.   He is known for his books on the history of Mathematics.

When searching for Freemasons who made a significant contribution to their profession it is best to look for those who were elected as a Fellow of the Royal College.   Amongst those not listed elsewhere were the following:-

- **Thomas Edward Allibone** (1903-2003), whose work included important research into particle physics, X-rays, high voltage equipment, and electron microscopes. During the 2nd World War, Allibone was involved in a number of research projects including radar equipment and the highly secretive Tube Alloys project.   In 1944 he formed part of a team of British scientists sent to the US, to work on the Manhattan project which developed the world's first atomic bomb. In 1946,   'Bones' as he was known to most, died aged nearly 100, having had over 75 years in industry and academia.   He was a member of University Lodge No. 3911, Sheffield.

- **William Jones** (1675-1749), Mathematician. He published the *"New Compendium of the Whole Art of Navigation"* and his large-scale mathematics text-book,*"A New Introduction to the Mathematics"*   His mathematical works were very highly esteemed and he published **Machin**'s calculation of pi to 100 decimals.   This work attracted the attention and friendship of **Sir Isaac Newton** and Edmund Halley.   He was a member of the Royal Society Committee to determine the originator of the calculus.   He was a member of an unnumbered and unnamed Lodge meeting at the Queen's Head, Hollis Street, Oxford Square, London.

- **John Robertson** (1712-1776) was a mathematician who published *"a Complete Treatise of Mensuration"* He published nine papers in *"Philosophical Transactions"* on mathematical and allied topics.   He was a member of Lodge No. 41 meeting at Vine, High Holborn, London.

- **Thomas Watkins** (1714-1749) was a mathematician and a member of an unnamed and unnumbered Lodge at Rummer, Charing Cross, London.

The only mathematician I knew who was elected as a Fellow of the Royal Society was my great-uncle Alexander Nairn.   Like many others he wanted to be the first to prove Einstein's "*Theory of Relativity*".   The proof depending on the degree of refraction during a solar eclipse, he went to China where there were excellent observatories bur got caught up in the Boxer rebellion and served as a navigator on one of His Majesty's ships.

Conclusion

Einstein is quoted as saying "You do not really understand something unless you can explain it to your grandmother".   Reading Einstein is like reading to your grandmother.   He makes complex physics and mathematical theories seem so simple.   Surely this is the mark of a true genius.   He shows us that conceptual learning is intuitive but contagious in the right company.   In Freemasonry we seek to inspire conceptual learning using ritualistic allegories not normally found in our everyday lives.   It is up to us to provide the right company.

Mathematics is absolute but conceptual and challenges us to think beyond the square like those famous Freemasons listed whose concepts have made such a difference to the emergence of science and engineering.   Arithmetic is logical and linear which teaches us directness and purposefulness, whereas Algebra involves solving for unknowns and variables. This helps us to recognize other's views and to moderate the fluctuations in our moods and lives.

Trigonometry concerns relationships, angles and connections and teaches us to value our fellow creatures and know what directions they are taking.   Calculus concerns the integration of change which teaches us tolerance and cooperation whereas Statistics deals with probabilities and teaches us to expect the unexpected and be prepared to conquer uncertainty and doubts.   All truth is at best a probability, only faith gives us certainty.

Appendix A – The 30 Greatest Mathematicians

- **Isaac Newton**
- Archimedes
- Carl F. Gauss
- Leonhard Euler
- Bernhard Riemann
- Euclid
- **Henri Poincaré**
- Joseph-Louis Lagrange
- David Hilbert
- **Gottfried W. Leibniz**
- Alexandre Grothendieck
- Pierre de Fermat
- Niels Abel
- Évariste Galois
- John von Neumann
- Karl W. T. Weierstrass
- René Déscartes
- **Carl G. J. Jacobi**
- Srinivasa Ramanujan
- Brahmagupta
- Augustin Cauchy
- Peter G. L. Dirichlet
- Hermann K. H. Weyl
- Eudoxus of Cnidus
- Georg Cantor
- Muhammed al-Khowârizmi
- Arthur Cayley
- Emma Noether
- Pythagoras of Samos
- Leonardo `Fibonacci'