Trivium et Quadrivium

Or

The Seven Liberal Arts & Sciences

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In Plato's The Republic, written some 300 years before the start of the Common Era, Socrates converses with Glaucon (Plato's older brother) over a variety of subjects in which he felt every man should be educated. Three subjects: grammar, logic, and rhetoric are mentioned at various stages before the Allegory of the Cave. Immediately following that parable, Socrates mentions four more subjects as a group that are most important: arithmetic, geometry, astronomy and music. These were considered to be liberal (thinking) arts, as opposed to practical arts such as architecture and medicine.

The first set of subjects, The Trivium (or "place where three roads meet") were not grouped under this title until the early Renaissance. In the Dictionary of Word Origins, John Ayto said that "study of the trivium was requisite preparation for study of the quadrivium. For the medieval student, the trivium was the curricular beginning of the acquisition of the seven liberal arts; as such, it was the principal undergraduate course of study. From that contrast, between the simpler trivium and the more difficult quadrivium, arose the word *trivial*."[1]

Our word for grammar comes to us from the Middle English word '*gramarye*,' from the Old French '*gramaire*,' which means "learning, especially Latin and philosophy," which was an adaptation of the Latin '*grammatica*,' from the Greek '*grammatike tekhne,*' which is the "art of letters." In the 14th century, with their inception, grammar schools were initially institutions where languages were taught grammatically. By the mid-1800s, the term in the United States came to refer to schools that were between the primary and secondary levels, where students were taught English grammar. In the United Kingdom, however, grammar may also to refer any book of grammar rules (i.e. a foreign language textbook,) as in "see, she's carrying her Latin grammar!"

Grammar teaches the mechanics of language, both oral and written, to the student. In her book The Trivium: The Liberal Arts of Logic, Grammar and Rhetoric, Sister Miriam Joseph states "General grammar is concerned with the relation of words to ideas and to realities."[2] By learning the proper arrangement of words, students begin defining objects and information perceived by the five senses. One example of object definition would be the Law of Identity: *a tree is in fact a tree, and not a cat.* Through the proper application of punctuation and capitalization, whether written or through vocal emphasis, students avoid such grammatical errors as "*helping my uncle jack off a horse*," or "*let's eat Grandma*." These simple mistakes mark the difference between being a decent family member and the participant in a felony. Also, by learning correct pronunciation, you can avoid putting the "emPHAsis on the wrong sylLABle [*sic*]." Through the skilful manipulation of correct grammar, we can playfully describe an ocean-going vessel, whose purpose is to transport other nautical freight carriers by saying "there goes a ship shipping ship, shipping shipping ships."

A monitorial section no longer in use during the second section of the Fellow Craft Degree, found in Monitor and Ceremonies, states it thusly: "Logic teaches us to guide our reason discretionally in the general knowledge of things, and directs our inquiries after truth. It consists of a regular train of argument, whence we infer, deduce, or conclude, according to certain premises laid down."[3] But what are those premises and how exactly does logic guide us? Logic is the "mechanics" of thought and of analysis; the process of identifying fallacious arguments and statements, and generally divided into three categories: inductive reasoning, abductive reasoning, and deductive reasoning. By inductive reasoning, we can accept the possibility of true statements with a false conclusion; "because I have only seen brown cows, I believe that all cows must be brown," is a fine example of this. Abductive reasoning is basically a posh term for guessing; as an example, the rational of "my car is wet, ergo it must have rained" would be acceptable; where multiple reasons for a wet car exist (sprinklers, water balloons, etc.) but the observer simply picked one option and ran with it. Deductive reasoning, Dr. Watson, is the stringing together of clear premises and arriving at a definitive, true conclusion such as "all Humans need a mixture of Nitrogen, Oxygen, Argon, Carbon Dioxide and other gasses in a precise ratio called 'air' in order to breathe. Timmy is a Human. Therefore, Timmy breathes air."

Logic was also anciently referred to as dialectic, which is a discourse between two or more people with differing viewpoints on a particular topic, who want to discern the truth by means of reasoned arguments. It is not to be confused with debate, nor is it synonymous with rhetoric. In a debate, the object is to win either by proving one's own point as superior or by demonstrating how the opponent's argument is inferior; whereas the goal of rhetoric is to persuade the listener to one's point of view. While dialectic may employ both debate and rhetoric to a small extent, the main ideal is to find commonality between disparate philosophies and bring groups together through mutual understanding.

Rhetoric is the application of language in order to instruct, and to persuade the listener or reader. It is the art of conversation and discourse; through it, skilled orators and authors can sway the opinions of masses and influence the course of nations. Sister Miriam claims it to be the master art of the three subjects in the trivium, "for it presupposes and makes use of grammar and logic; it is the art of communicating through symbols, ideas about reality."[4] Again referring to Monitor and Ceremonies, we are told that "rhetoric teaches us to speak copiously and fluently on any subject, not merely with propriety alone, but with all the advantages of force and elegance; wisely contriving to captivate the hearer by strength of argument and beauty of expression, whether it be to entreat and exhort, to admonish or applaud."[5]

The truly great orators and rhetoricians, men and women who are able to change the course of human events for good or evil, through the power of speech alone will be forever remembered, so rare a gift is this. Men like: Cicero, whose letters influenced not only the course of the Roman Empire, but also credited for initiating the 14th Century Renaissance, Marcus Antonius's impassioned eulogy of Julius Caesar which incited a riot and nearly began a civil war, Harriet Beecher Stowe, of whom President Lincoln famously remarked "so you are the little woman who wrote the book that started this great war;" Sir Winston Leonard Spencer-Churchill's enheartening speeches which held together a war-torn and devastated nation, or his polar opposite Adolf Hitler, whose equally inflamed and fervid speeches enticed men to commit the most heinous of atrocities.

Now we'll take a look at the second set of subjects, The Quadrivium (oddly enough, "place where four roads meet".) At medieval universities, the quadrivium would be the basis for the Master of Arts degree, which in turn would qualify the student for the Bachelor's degree in higher fields. Some institutions, such as Oxford, still use this medieval degree system to classify their graduates, which can be confusing to those used to the grading system used in the United States.

In his foreword to Quadrivium: The Four Classical Liberal Arts of Number, Geometry, Music & Cosmology, Keith Critchlow states that "The Quadrivium arises out of the most revered of all subjects available to the human mind – Number. The first of these disciplines we call *Arithmetic*. The second is *Geometry* or the order of space as Number in Space. The third is *Harmony* which for Plato meant Number in Time. The fourth is *Astronomy* or Number in Space and Time."[6]

Arithmetic is the elementary foundation block for what we collectively call mathematics. The basics of addition, subtraction, multiplication and division form the basis for the higher mathematics in the same way that grammar governs the way we use language. Again referring to the Monitor, "Arithmetic teaches the powers and properties of numbers, which is variously effected, by letters, tables, figures and instruments. By this art, reasons and demonstrations are given for finding out any certain number, whose relation or affinity to another's is already known or discovered."[7] Order of operation, fractions and percentages, squares and square roots...everything from the double-entry accounting method that determines your pay check to the satellites orbiting the Earth that provide your GPS and mobile phone coverage depend greatly upon someone's grasp of arithmetic.

Once a solid grasp of arithmetic is achieved, students may progress to learning the new rule sets and symbolic notation now available to them through higher mathematics. As confusing as complex formulae may seem, it is still based off of simple arithmetic in the same way that shorthand may baffle the casual viewer, but is based off the writer's native language. However, more care must be followed as the equations become more intricate. A fantastic example of simple errors causing catastrophic results would be the Mars Climate Orbiter, where the scientists in Europe made the calculations in SI, or standard form (a.k.a. new metric) and the American scientists made their calculations in Imperial or US Customary Units as its now called (feet, inches, etc.) That doesn't sound too bad until you take into account that no one wrote down what units they used. So the folks at NASA thought the ESA chaps had used miles, feet and inches, and the Europeans thought we'd used kilometres, meters and so on. Oops, the satellite skipped off the thin Martian atmosphere like a rock on a pond. So they tried again with Mars Polar Lander, this time quadruple checking that units were labelled correctly. Precise X and Y coordinates were diligently plotted and programmed into the landing cycle, but apparently no one remembered that the universe we live in is three dimensional. Guess what happened without that Z coordinate? That's right, the probe ploughed into the Martian surface like a 200 million dollar lawn dart.

Merriam-Webster defines it thusly, "Geometry is a branch of mathematic that deals with the measurement, properties, and relationships of points, lines, angles, surfaces, and solids;[8]" a definition which should sound exceedingly familiar to all. Its roots can be traced back approximately four thousand years, more specifically the 2nd Millennium B.C.E. in both Egypt and Mesopotamia, and by the seventh century before the Common Era, the Grecians were using it to calculate the height of the pyramids, to determine the distance of ships from shore, and to calculate the distance from the Earth to the Sun with an astonishing degree of accuracy. Today, there are several main schools of geometry: Euclidian, Differential, Algebraic, Geometric Topology, Synthetic and Analytic.

It is easy to understand why geometry was sacred to the ancients. One merely had to look about to see mathematical and geometric constructs repeated with precision, from the smallest of delicate flowers and snowflakes, to the movements of the celestial bodies. The earliest mathematicians unlocked the formulae to these repetitions and thus the Golden Ration (1.61803398875) was born. To see it in action, one merely need measure the length of the arm from shoulder to fingertip, divided by the length of the arm from elbow to fingertip. It also proved to their minds that God was a geometrician and an architect, working to a blueprint of mathematical perfection. The medieval masons not only carried these ideas forward, but enhanced them dramatically, where their soaring stone creations were not merely functional buildings, but told a story to the careful observer via mathematics, from trefoil windows to recursive fractal patterns. We, as speculative Masons, are taught that geometry is "the first and noblest of the sciences[9]," for this very reason.

Music is quite possibly Humanity's earliest connection to numbers and mathematics, with instruments like the Divje Babe Flute, carved from the thigh bone of a cave bear, estimated to be around 43,100 years old; and other older instruments in museum displays, with speculation that music was invented 60,000 years ago. Shaver writes that "Music teaches the art of forming concords, so as to compose delightful harmony by a mathematical and proportional arrangement of acute, grave, and mixed sounds...It inquires into the nature [of] concords and discords, and enables us to find out the proportion between them by numbers[10]." 2,500 years ago our ancient brother Pythagoras is said to have discovered harmony in ratio of fifths, which is further proof of Critchlow's assessment about music representing numbers in time.

The word music comes to us from the Greek "mousike," which is "the art of the Muses." It can be vocal, instrumental, or a combination of the two and can be performed by anyone from an individual, up to a full orchestra with choir. Varieties of reasons exist as to why we perform music, whether that is ceremonial to honour the living, religious uses to appease deity, entertainment, to earn a living, or simply for the sheer beauty of it.

“Assisted by Astronomy, we can observe the motions, measure the distances, comprehend the magnitudes and calculate the periods and eclipses of the heavenly bodies.[11]” It is one of our oldest sciences, with virtually every single ancient civilisation documenting the movements of the heavens; Babylonians, Greeks, Persians, Iranians, Indians, Mayans, Chinese, Egyptians, and Nubians all diligently recorded their observations of the night sky. They created navigational charts to aid their traders and established calendars to mark the passing of seasons and religious observations.

It was the Babylonians who first discovered that lunar eclipses occurred in a repeating cycle. Later, the Greeks estimated the size and distance of both the moon and the sun, and were the first to propose a heliocentric model. The Greeks also invented the first analogue computer known as the Antikythera Mechanism that calculated the location of all the known planets, sun and moon for a given date. The Chinese and Egyptians documented the brightest apparent stellar magnitude event, Supernova SN 1006 in the year 1006 of the Common Era. Ironically, despite imprisoning Galileo for suggesting a heliocentric model of the solar system, the Catholic Church was the main financial backer for many a medieval and renaissance astronomer in an attempt to fix the dates of Easter and Christmas.

One could easily spend several lifetimes studying only the seven subjects we covered tonight and still not know all there is to know about them. Though this paper made the briefest and lightest touches upon the subjects of the seven Liberal Arts, it should be easy to understand why we refer to it as “that valuable branch of education, which tends so effectually to polish and adorn the mind...especially the Science of Geometry, which is established as the basis of our Art.[12]”

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10. -- Monitor and Ceremonies, p. 68.
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12. -- Monitor and Ceremonies, p. 77.