Past Catholic Scientists for the Website

("This Date in History" ?)

Useful references:

"Christianity and the Leaders of Modern Science" (CLMS)
https://archive.org/stream/christianitylead00knelrich#page/n7/mode/2up

Dictionary of Scientific Biography

Catholic Encyclopedia http://www.newadvent.org/cathen/

Wikipedia and references cited therein

CALENDAR

January 2 Amagat, 8 Fenyi, 10 Spallanzani, 12 +Fermat & Ricci, 20 Ampere, 22 Gassendi, 27 Senderens, (28 Borelli)

February 2 Binet, 6 H.S.Taylor, 14 Nieuwland, 15 Galileo, 17 Laennec, 18 Volta & (Redi), 19 Copernicus, 24 K. Herzfeld, 25 Morgagni, 28 Brueil & Hauy

March (5 Babinet), 6 Fraunhofer, (7 A.C.Becquerel), 10 Malpighi, 11 Le Verrier, 24 Stefan, 25 Clavius, 31 Descartes

April 2 Grimaldi, (5 Dujarin), 9 Castelli, 10 Cabibbo, 17 Riccioli

May (2 Kircher), (4 Thenard), 5 Garrod, 10 Fresnel & Killing, 16 Agnesi, 18 Boscovic, 21 Coriolis,

June 8 Cassini, 9 Duhem, 13 Lejeune, (14 Coulomb), 18 Le Pichon, 19 Pascal, 24 Hess, 28 Secchi

July 1 Semmelweis, 11 Oresme, (12 Bernard), 14 Dumas, 16 Piazzi, 17 Lemaitre, 20 Mendel, 24 Picard, 25 Scheiner

August (5 Majorana), 9 Avogadro, 11 +Cusa, 21 Cauchy, 26 +Bradwardine, 29 Roothaan

September 5 Saccheri, 8 Mersenne, 9 Galvani, 18 Foucault, 23 Fizeau, 28 Macelwane

October 5 Bolzano, 9 +Grosseteste, 15 Torricelli, 24 Whittaker, 29 -31 Bassi

November 5 Sabatier, 15 +St. Albert, (29 Doppler), 30 +Cavalieri

December 5 Steno, 6 Cowan, (7 Schwann), 22 Fabre, 24 Hermite, 28 von Neumann, 31 Vesalius

SHORT BIOS BY DATE (of birth or death)

Émil Hilaire Amagat (**January 2, 1841** – Feb 15, 1915)

Gyula Fényi, S.J. (**January 8, 1845** - Dec 21, 1927)

Lazzaro Spallanzani (**January 10, 1729** – Feb 12, 1799) Lazzaro Spallanzani is regarded as one of the top biologists of the eighteenth century. In 1754, he became a professor of logic, metaphysics and Greek at the University of Reggio, but for the last 30 years of his life was professor of natural history at the University of Pavia. In 1762, he was ordained to the priesthood (and thenceforth was generally referred to as Abbé Spallanzani or Abate Spallanzani). His scientific investigations spanned an astonishingly wide range, including reproduction in mammals, the dynamics of blood circulation, digestion, regeneration of limbs in lower animals, respiration in plants and animals, and echolocation in bats, as well as volcanology and meteorology. He showed that fertilization in mammals results from the combination of semen and ovum, and he was the first to perform *in vitro* fertilization and artificial insemination (with animals). He showed that the process of digestion involves the chemical solution of food by the action of gastric acid. He disproved the widespread idea of "spontaneous generation" of life from inanimate matter; and when Louis Pasteur had to do the same thing a century later, he based his own famous experiments on those of Spallanzani. Spallanzani was elected a Fellow of the Royal Society in 1768, one of the highest honors in science then as now. See https://www.encyclopedia.com/people/science-and-technology/biology-biographies/lazzaro-spallanzani

Gregorio Ricci (aka as Gregorio Ricci-Corbastro) (**January 12, 1853** – Aug 6, 1925) Ricci was an Italian mathematician whose most notable achievement was developing, in collaboration with Tullio Levi-Civita, the field of tensor calculus, which is a generalization of vector calculus important in many branches of physics and in engineering. Tensor calculus is particularly important for the formulation of the general theory of relativity (Einstein's theory of gravity). The Ricci curvature tensor $R_{\mu\nu}$ and the Ricci scalar curvature R are named after him. These appear in Einstein's Equations for the gravitational field, which are written

$$R_{\mu\nu} - \tfrac{1}{2} R\, g_{\mu\nu} + \Lambda\, g_{\mu\nu} = 8\pi G/c^4\ T_{\mu\nu}$$

where $g_{\mu\nu}$ is the metric tensor, Λ is the cosmological constant, G is Newton's gravitational constant, c is the speed of light in vacuum, and $T_{\mu\nu}$ is the stress–energy tensor.

The depth of Ricci's Catholic faith is reflected in this excerpt from his spiritual testament:

> "Only in the faith of Christ and in the Gospels have I found comfort in the troubles of life and a sure guide to lead me in life itself. Only the faith of Christ can give a satisfactory

> answer to those questions that are imposed even on those who do not want to know: Why are we in this world? What awaits us after this life, which, even when long, ends so soon? And how must we conduct ourselves to achieve the end for which we were created."

Pierre de Fermat (1601 – January 12, 1665) Though a lawyer by profession, Fermat is one of the great figures in the history of mathematics. He did pioneering work in analytic geometry, independently of and earlier than Descartes, and contributed to the early development of calculus. With Blaise Pascal and through their extended correspondence on the subject, he helped lay the foundations of the theory of probability. He also did important work on the theory of numbers and Diophantine equations, where he proposed one of the most famous theorems in the history of mathematics, "Fermat's Last Theorem," which was not proved until 1994. In physics, Fermat proposed the "principle of least time" (also called "Fermat's principle"), which states that light travels between two points on a path which minimizes the travel time. (From this the law of reflection and Snell's Law of refraction can be derived.) This principle was later generalized (by Maupertuis, Euler, Leibniz, Lagrange, and Hamilton) into the "principle of least action" (more correctly called the "principle of extremal action"), which lies at the heart of all of classical physics. According to many reference works, Fermat was a devout Catholic throughout his life. (See, for example, the articles on Fermat in *A to Z of Mathematicians,* Tucker McElroy (New York: Facts on File, Inc., 2005); and *The Complete Dictionary of Scientific Biography* (New York: Charles Scribner's Sons, 2008).)

André-Marie Ampère (January 20, 1775 – June 10, 1836) Ampère is one of the principle architects of the theory of electromagnetism. In 1823, he discovered the law that describes the force between two pieces of wire that are carrying electrical current, which became known as Ampère's Law. In different mathematical guise, this law appears as one of the four "Maxwell's equations," which together with the Lorentz Force Law constitute the classical theory of electromagnetism. In honor of his epoch-making discovery, the most commonly used unit of electrical current is called the ampere (or "amp" for short). Ampère was a sincere Catholic believer. The Catholic Encyclopedia relates the following:

> "On the day of his wife's death he wrote two verses from the Psalms, and the prayer, 'O Lord, God of Mercy, unite me in Heaven with those whom you have permitted me to love on earth.'. Serious doubts harassed him at times and made him very unhappy. Then he would take refuge in the reading of the Bible and the Fathers of the Church. 'Doubt,' he says in a letter to a friend, 'is the greatest torment that a man suffers on earth.'"

Pierre Gassendi (January 22, 1592 – Oct 24, 1655) Pierre Gassendi was a Catholic priest and one of a circle of French scientist-philosophers (that included Mersenne, Descartes, and Pascal) who were important figures in the Scientific Revolution. Gassendi's importance in the early development of science lay chiefly in his philosophical ideas, especially his advocacy of

empiricism and his revival and promotion of "atomism" (the idea that matter is composed of small indivisible constituents of varying properties). Gassendi's ideas were very influential in his time and were known and appreciated by such major scientists as Boyle and Newton. Gassendi made no major discoveries, but had some significant scientific achievements to his credit. He observed the "transit" of Mercury across the face of the Sun in 1631, which had been predicted many years earlier by Kepler. (This was the first transit of a planet ever observed.) He made one of the first measurements of the speed of sound in 1635 (five years after Mersenne), showing it to be independent of pitch. And he explained parhelia ("sun dogs") as due to ice crystals in the atmosphere.

Jean-Baptiste Senderens (**January 27, 1856** – Sept 26, 1937) Jean-Baptiste Senderens was a Catholic priest and chemist who did pioneering work in catalytic chemistry. He collaborated extensively with Paul Sabatier, who won the Nobel Prize in chemistry in 1912 and was himself a devout Catholic. Senderens and Sabatier co-authored almost fifty scientific research papers. They were jointly awarded the Jecker Prize of the French Academy of Sciences for discovering the Sabatier-Senderens Process, which is a method of catalytic hydrogenation, one of the uses of which is making margarine. [add something about his book on evolution?]

(Giovanni Alfonso Borelli) (**January 28, 1608** – Dec 31, 1679) Considered the father of biomechanics. The highest award of the American Society of Biomechanics is the Borelli Award. **Evidence of Catholicism**

Jacques-Philippe-Marie Binet (**February 2, 1786** – May 12, 1856) Binet was a French mathematician, physicist and astronomer. He made significant contributions to number theory and was the first to describe the rule for the multiplication of matrices. Binet's Theorem, the Binet-Cauchy identity, the Cauchy-Binet formula, and the Binet equation are named after him. Elected to the Académie de Sciences in 1843, he was president of it at the time of his death. According to the Catholic Encyclopedia, "Binet was a man of modest manner and a devout Catholic."

Sir Hugh Stott Taylor (**February 6, 1890** - April 17, 1974) Taylor was an English chemist who made important contributions in several fields, including catalytic reactions and the structure of proteins. He joined the faculty of Princeton University in 1915 and was chairman of its chemistry department from 1926 to 1951. He received many notable awards, including the American Chemical Society's Nichols Medal (1928) and Remsen Award (1951), and the Franklin Institute's Franklin Medal (1941). He was elected a Fellow of the Royal Society in 1932 and knighted by Queen Elizabeth in 1953. Taylor was a devout Catholic, who helped to establish the Catholic chaplaincy at Princeton in 1928 and spoke publicly about the harmony between science and faith. He was made a Knight Commander of the Order of St. Gregory the Great by Pope Pius XII in 1953.

Julius A. Nieuwland, CSC (**February 14, 1878** – June 11, 1936) Julius Nieuwland was a priest, chemist, and botanist. Born in Belgium, he was brought at the age of two to the United States. After being ordained a priest of the Holy Cross order, he obtained a doctorate in chemistry from the Catholic University of America. In 1904, he became a professor of botany at the University of Notre Dame, (where he had done his undergraduate work) and in 1918 a professor of organic chemistry there. In 1920, he discovered a method for polymerizing acetylene. This was noticed by chemists at the DuPont Company, who were able to exploit this advance to synthesize neoprene, the first synthetic rubber. Neoprene has properties that make it useful in a wide range of applications. In 1935, Fr. Nieuwland received the Nichols Medal of the American Chemical Society "for basic work on synthesis from unsaturated hydrocarbons" and the Gold Medal from the American Institute of Chemists. He was inducted into the (U.S.) National Inventors Hall of Fame in 1996.

Galileo Galilei (**February 15, 1564** – Jan 8, 1642)

René Laennec (**February 17, 1781** – Aug 13, 1826) Laennec was a French physician most famous for inventing the stethoscope in 1816. Listening to the chest and "percussion" had been a traditional technique in diagnosing patients. The practical difficulty of hearing well, however, led Laennec to develop an improved method he called "indirect listening" ("mediate auscultation"). The idea was suggested to him by seeing children playing a game in which they scratched one end of a stick with a pin and listened at the other end. The great improvement in audibility provided by his invention allowed Laennec to refine this method of diagnosis. In 1819 he published his *magnum opus* "*De l'auscultation médiate ou Traité du Diagnostic des Maladies des Poumon et du Coeur"* ("On Indirect Listening, a Treatise on the Diagnosis of Maladies of the Lungs and Heart"). Laennec was deeply devout. Sir John Forbes, who translated Laennec's treatise into English, wrote of him that "Laennec was a man of the greatest probity, habitually observant of his religious and social duties. He was a sincere Christian, and a good Catholic, adhering to his religion and his church through good report and bad report."

Alessandro Volta (**February 18, 1745** – March 5, 1827) Alessandro Volta is most famous for his invention in 1800 of the first battery, which was called the "voltaic pile." A voltaic pile was a stack of electrochemical cells, each of which consisted of an electrolyte-soaked paper sandwiched between two different metals, such as zinc and copper. Volta's invention of the battery made possible further progress in electromagnetic research as well as in chemistry. Electrical currents produced by voltaic cells were used to split chemical compounds through electrolysis and isolate new chemical elements. (In 1807-8, Sir Humphrey Davy discovered in this way sodium, potassium, boron, barium, calcium, magnesium, and strontium.) In honor of Volta's researches in electricity, the SI unit of electrical potential (the volt) was named after him. Volta also made other scientific contributions, including discovering and isolating the gas methane. Volta gave testimony to his religious beliefs in a letter sent on Jan 6, 1815 to the Canon Giacomo Ciceri, in which he declared, "I have, indeed, and only too often, failed in the

performance of those good works which are the mark of a Catholic Christian, and I have been guilty of many sins: but through the special mercy of God I have never, as far as I know, wavered in my faith. … I constantly give thanks to God, who has infused into me this belief in which I desire to live and die, with the firm hope of eternal life. In this faith I recognize a pure gift of God, a supernatural grace. But I have not neglected those human means which confirm belief."

(Francesco Redi) (**Feb 18, 1626** – March 1, 1697) Father of modern parasitology. **Need info on his Catholicism**

Nicolaus Copernicus (**February 19, 1493** – May 24, 1543)

Karl F. Herzfeld (**February 24, 1892** – June 3, 1978) Karl Herzfeld was an Austrian-American physicist who worked primarily in statistical physics, the theory of gases and liquids, ultrasonics, and molecular physics. Born in Austria, he studied in Vienna, Zurich, and Göttingen, before taking a position at the Ludwig Maximilians University (LMU) in Munich. In 1926, he emigrated to the United States, where he was a faculty member at Johns Hopkins University (JHU) from 1926 to 1936 and Catholic University from 1936 to 1969. He was the author of numerous influential scientific review articles and books, both in German and English. Among his doctoral students were the famous physicists Walter Heitler (at LMU) and John Archibald Wheeler (at JHU). In 1969, he was elected to the (U.S.) National Academy of Sciences. During World War II, Herzberg did weapons research for the U.S. Navy, but he declined to become involved in the effort to make the atomic bomb, as he thought such a weapon would not discriminate between civilians and combatants and was therefore not consistent with traditional Catholic moral teaching.

Giovanni Battista Morgagni (**February 25, 1682** - Dec 6, 1771) Morgagni was an Italian anatomist and pathologist who is considered the founder of anatomical pathology. Before Morgagni, anatomical knowledge had reached a high level as the result of the research of Vesalius and many others, but it was mainly knowledge of healthy human bodies. Morgagni undertook to study diseased organs and parts with the goal of understanding the origin of illnesses. In 1761, he published his monumental treatise *De Sedibus et Causis Morborum per Anatomem Indigatis* ("On the Seats and Causes of Diseases Investigated through Anatomy") based on 646 dissections, many of which it describes with great precision and detail. This work had an enormous impact and was translated from the original Latin into French, English, and German. Morgagni, who was professor of anatomy at the University of Padua for 56 years, was one of the most respected scientists of his time and was elected a fellow of the Royal Society of London in 1724, the Academy of Sciences of Paris in 1731, and other scientific societies throughout Europe. Morgagni had ten children who survived to adulthood, of whom eight became nuns, one became a Jesuit priest, and one entered the medical profession.

Henri Breuil (**February 28, 1877** – Aug 14, 1961) Nicknamed the "Pope of Prehistory," Henri Breuil was a French Catholic priest and archaeologist who became recognized in his

lifetime as the world's foremost authority on prehistoric cave art. At the age of 23 he was ordained a priest of the Sulpician order. One year later he participated in the discovery of two major sites of cave art and for 61 years thereafter studied cave art at sites all over the world, spending (by his own estimate) a total of seven years in subterranean caves. In 1952, Breuil published his masterpiece *Four Hundred Centuries of Cave Art*, which contained his meticulous drawings of paintings from 92 caves. Breuil also made important contributions to understanding the classification and chronology of prehistoric industries. The Abbé Breuil (as he was often referred to) was Professor of Archaeology at the College de France from 1929 to 1947 and was appointed a member of the prestigious Institut de France in 1938. In 1924, he was awarded the Daniel Giraud Elliot Medal by the (U.S.) National Academy of Sciences.

René-Just Haüy (**February 28, 1743** – June 3, 1822) René-Just Haüy was a French priest and mineralogist, sometimes referred to as the "father of modern crystallography." Haüy developed a theory of crystal shapes based on the idea that crystals are made up of fundamental units, which he called "integrant molecules," arranged in a lattice that is periodic in three directions. He showed that by assuming the number of molecules in successive layers changed by constant increments he could explain all the angles that crystal faces made with each other. The rule he derived was essentially equivalent to what is now called the "law of simple rational intercepts," which is the fundamental law of geometric crystallography. He gave a systematic classification of all known minerals by their geometric properties. Haüy's ideas were very influential and their validity and physical basis was eventually established in the early twentieth century by use of X-ray diffraction. During the French Revolution, Haüy refused, as a faithful priest, to take an oath accepting the Civil Constitution of the Clergy, by which the revolutionary government took control of the Catholic Church. For this he was thrown into jail, but managed to survive the September Massacres, in which many Catholic clergy were put to death.

(Jacques Babinet) (**March 5, 1794** – Oct 21, 1872) Most famous for Babinet's Principle, which concerns the diffraction of light. *CE

Joseph von Fraunhofer (**March 6, 1787** – June 7, 1826) Fraunhofer was a Bavarian physicist and manufacturer of optical equipment. He invented the first modern spectroscope as well as the first diffraction spectroscope. In 1814, he discovered the dark absorption lines in the Sun's spectrum, which are now called "Fraunhofer lines" in his honor. He discovered similar lines in the spectra of several stars and from the fact that they are differently located in those spectra inferred correctly that such lines were produced near the source and not by the earth's atmosphere. These discoveries inaugurated the field of stellar spectroscopy and thus modern astrophysics. Like many glassmakers of that time, he was poisoned by heavy metal vapors, which led to his death at the age of 39. One source reports, "Frauhofer was a man of disciplined and benevolent temper, occasionally clouded, it is true, by outbursts of his natural irritability. He was a loyal adherent of his religion, so thorough in his obedience that even those invited to his house were obliged to observe the prescribed fasts and abstinences."

(Antoine César Becquerel) (**March 7, 1788** – Jan 18, 1878) With his son A.E. Becquerel is said by wiki to have discovered the photovoltaic effect. But wiki article on photovoltaic effect says his son discovered it in his laboratory. Father of A.E. Becquerel and grandfather of Henri Becquerel. Fellow of the Royal Society and winner of its Copley Medal. CE Did he do anything really significant?

Marcello Malpighi (**March 10, 1628** – Nov 29, 1694) Marcello Malpighi was a pioneer in the use of the microscope for scientific research and made many important discoveries in anatomy, histology, physiology, and embryology. Although the microscope was invented around the year 1600, it was not until the 1650s that it began to be employed as a tool in scientific research, principally by Malpighi in Italy, Robert Hooke, and Nehemiah Grew in England, and Antonie van Leeuwenhoek in the Netherlands. Malpighi made many discoveries about the microscopic structure of the lungs, liver, kidneys, skin and other parts of the body, as well as about the structure and development of plants and insects, and in embryology. His most famous discovery was the existence of capillaries, which completed Harvey's explanation of the circulation of blood. Many parts of animals and plants are named after him. In 1669, Malpighi was made an honorary member of the Royal Society of London, the first Italian to be so honored. Having spent many years on the faculties of the Universities of Bologna, Pisa and Messina, Malpighi was invited to Rome by Pope Innocent XII to become the papal physician (a high honor) and professor at the Papal Medical School.

Urbain Jean Joseph Le Verrier (**March 11, 1811** – Sept 23, 1877) Urbain Le Verrier was a French astronomer whose theoretical prediction of the existence and position of the planet Neptune led to its discovery. The orbit of the planet Uranus deviate from the predictions based on Newtonian mechanics and gravity. After months of mathematical calculations, Le Verrier was able to show that this could be explained by the gravitational influence of a hitherto unsuspected new planet lying farther from Sun. He was able to compute its position and orbit and sent this information to Johann Galle of the Berlin Observatory, who received it on September 23, 1846. On the same night, Galle and d'Arrest found the planet within 1^{o} of its predicted position. This was one of the most sensational astronomical discoveries of the 19th century and powerful confirmations of the accuracy of Newton's theories. Le Verrier also studied the anomalous precession of the orbit of Mercury and showed that it could not be explained by Newtonian gravity and the perturbing influence of other planets. Many decades later this anomalous precession was explained by Einstein's theory of General Relativity. In the words of the Catholic Encyclopedia,

> "Le Verrier was a zealous adherent and true son of the Catholic Church; even as deputy of the [French] Assembly he openly acknowledged and defended his Catholic faith before all the world. … When dying he said in the words of the aged Simeon: "Nunc dimittis servum tuum, Domine, in pace" [Now let your servant depart in peace, O Lord]. … When, on 5 June, 1876, he presented to the Academy his completed tables for Jupiter, the result of thirty-five years of toil, he emphasized particularly the fact that only the thought of the great Creator of the universe had kept him from flagging, and had maintained his enthusiasm for his task."

In the words of François Arago, Le Verrier was "the man who discovered a planet by the point of his pen."

Josef Stefan (or **Jožef Štefan)** (**March 24, 1835** – Jan 7, 1893) Josef Stefan was an Austrian physicist and mathematician of Slovenian ethnicity. When young he considered entering the Catholic priesthood as a member of the Benedictine order, but his interest in physics led him into scientific research instead. His most famous discovery was the Stefan-Boltzmann Law (also called Stefan's Law), which states that the energy radiated by a "black body" is proportional to the fourth power of its absolute temperature: $j = \sigma T^4$, where the coefficient σ is called the Stefan-Boltzmann constant. (The great physicist Boltzmann was Stefan's student.) Stefan made many other contributions on topics including heat conduction, diffusion, evaporation, and phase transitions. These contributions are reflected in the large number of physics concepts named after him, including Stefan flow, Stefan problem, Stefan equation, Stefan formula, and Stefan number. Also named after him is the famous Institut Jožef Štefan, the largest research center in Slovenia.

Christopher Clavius, S.J. (**March 25, 1538** – Feb 6, 1612) Christopher Clavius was German Jesuit priest, astronomer and mathematician. The Jesuit order was founded in 1540 and quickly became involved in scientific research. Christopher Clavius joined the order in 1555 and in 1579 was commissioned by Pope Gregory XIII to oversee the reform of the calendar. The old Julian Calendar had been established by an edict of Julius Caesar in 45 BC. Because the system of Julian years and leap years did not correspond exactly to the astronomical year, dates of important Christian feasts had gotten out of alignment with the seasons. Clavius and his commission adopted the ideas for calendar reform of Aloysius Lillius with some modifications, and in 1582 Pope Gregory XIII promulgated the new calendar. It was quickly adopted by Catholic countries, but Protestant and Eastern Orthodox countries were very slow in doing so. For example, Britain did not adopt it until 1752 and Greece until 1923. The Gregorian Calendar is now in nearly universal use. Though Clavius made no important discoveries, he wrote widely used textbooks and worked successfully for the adoption of rigorous mathematical curricula in Jesuit colleges, at a time when the importance of mathematics in natural science (then called "natural philosophy") was widely deprecated, especially by Aristotelians. The tradition of Jesuit astronomy and mathematics, which continues to this day, includes such notable figures as Scheiner, Grimaldi, Riccioli, Saccheri, Boščović, Secchi, and Bolzano.

René Descartes (**March 31, 1596** – Feb 11, 1650)

Francesco Maria Grimaldi, S.J. (**April 2, 1618** - Dec 28, 1663) Grimaldi, a Jesuit priest, physicist, and astronomer, made one of the most significant discoveries in the history of physics, namely the phenomenon of diffraction of light, which shows that light does not travel in straight lines. Grimaldi's discovery came about through careful and systematic observation. He studied the shadows cast on a screen by objects of various shapes illuminated by a thin beam of sunlight that he allowed to enter a darkened room through a small aperture in the wall. He discovered that within the shadow region on the screen there were faint fringes of light, and in the illuminated

region there were faint fringes of shadow. Grimaldi not only discovered these "diffraction fringes," he made very careful observations of their number, intensity, and coloration, and how they looked for objects of different shapes. It is also he who coined the term "diffraction." It was not until the work of Thomas Young and Augustin-Jean Fresnel in the early 19th century that diffraction was understood theoretically in terms of the wave nature of light. As quantum mechanics implies that all particles are also wave-like, the phenomenon of diffraction is of key importance in many branches of physics. Working with Riccioli, his fellow Jesuit, Grimaldi was the first to make accurate measurements of the gravitational acceleration at the earth's surface (g), and also to map the surface of the moon.

Benedetto Castelli, O.S.B. **(1578 – April 9, 1643)** Benedetto Castelli was a priest of the Benedictine order. He was a student of Galileo and defended Galileo and Copernicanism throughout Galileo's troubles with Church authorities. When Galileo decided to defend himself publicly against some of his accusers, he chose to do so by means of an open letter addressed to Castelli, which is now famous. At Galileo's recommendation, Castelli was made professor of mathematics at the University of Pisa in 1613. There he began to study water in motion. In 1628, he published his magnum opus, *On the Measurement of Water Currents*, which is considered the beginning of modern hydraulics. By this time, Castelli had been called to Rome by Pope Urban VIII to be a consultant on hydraulics and a professor at the University of Rome. There he taught his famous student Evangelista Torricelli, who carried Castelli's work on fluid motion much further. Torricelli was the first person to create a sustained vacuum and to discover the principle of the barometer. Torricelli also made substantial contributions to mathematics, along with another famous pupil of Castelli, a priest named Buonaventura Cavalieri.

Nicola Cabibbo (April 10, 1935 – August 16, 2010) Nicola Cabibbo made many contributions to theoretical particle physics, the most famous of which is the Cabibbo theory of the weak interactions of "strange" particles, which is now part of the Standard Model of particle physics. In the 1950s, types of particles were discovered having a property that physicists named "strangeness." The way that "strange" particles behaved under the Weak interactions raised a number of theoretical conundrums. The seed of the solution was contained in a 1960 paper by M. Gell-Mann and M. Levy, but it was Cabibbo who developed the idea in a more correct physical and mathematical form in a classic 1963 paper (which is among the top 15 most cited papers in the history of theoretical particle physics). Cabibbo's theory was able to successfully explain many experimental results involving strange particles. It contained a parameter that came to be called the "Cabibbo angle," which (in today's terms) describes how the first and second "families" of quarks "mix" with each other. In 1973, two Japanese theorists, M. Kobayashi and T. Maskawa, hypothesized the existence of a third "family," which turned out to be correct. The mixing of all three families of quarks is described in the Standard Model by a 3x3 matrix now called the Cabibbo-Kobayashi-Maskawa matrix (or "CKM matrix"). To the surprise of many physicists, the 2008 Nobel Prize was awarded to Kobayashi and Maskawa without Cabibbo. Cabibbo was, however, the recipient of many distinguished awards, including the Sakurai Prize

(1989), the Pomeranchuk Prize (2009), the P.A.M. Dirac Medal (2010), and the Benjamin Franklin Medal (2011). Cabibbo was a devout Catholic and served as President of the Pontifical Academy of Science from 1993 to 2010.

Giovanni Battista Riccioli, S.J. (**April 17, 1598** – June 25, 1671) Riccioli was a Jesuit priest, astronomer, and physicist. In 1651, he published a massive treatise on astronomy (the *Almagestum Novum*), which became a standard reference work for astronomers throughout Europe for many decades. With his fellow Jesuit, Grimaldi, he made the first map of the moon's surface, establishing the names still used for its main features. Riccioli developed methods for measuring time more accurately in experiments and used them to make the first accurate measurement of the acceleration of gravity and also to make the first accurate tests of Galileo's Law of Falling Bodies, which was important for establishing its validity. With this improved accuracy, he was able to detect small deviations from Galileo's principle that bodies with different masses fall at the same rate, and he correctly ascribed this to the effects of air resistance. Riccioli discovered and analyzed the important Coriolis effect in physics two hundred years before Coriolis did, though his mathematical treatment was naturally less sophisticated given that he lived before the discoveries of Newton.

(Athanasius Kircher, S.J.) (**May 2, 1602** – Nov 28, 1680)

(Louis-Jacques Thénard) (**May 4, 1777** – June 21, 1857) Discovered hydrogen peroxide CE

Dorothy Garrod (**May 5, 1892** - Dec 18, 1968) was a pioneer of early prehistoric archaeology. She received an Archaeology Diploma from the University of Oxford in 1922, after which she studied for two years with Abbé Breuil at the Institut de Paleontologié Humaine in Paris. From 1939 until 1952, she was the Disney Professor of Archaeology at the University of Cambridge, the first woman to hold a chair at either Cambridge or Oxford. Garrod, like Breuil, advocated a global approach to prehistoric archaeology. Her field work spanned an unusually wide geographic range: in her 40-year career of excavation she worked at 23 sites in seven countries (Britain, France, Gibraltar, (then) Palestine, Iraq, Lebanon, Bulgaria, and Turkey), making significant contributions to the understanding of paleolithic chronology. Her excavations were the first to use aerial photography. Garrod was born in England and raised as an Anglican, but converted to the Catholic faith in 1913, remaining a committed Catholic throughout her adult life.

Augustin-Jean Fresnel (**May 10, 1788** – July 14, 1827) Fresnel was a French physicist and engineer who put the wave theory of light on a firm mathematical foundation, thereby explaining many hitherto puzzling phenomena and successfully predicting others. Before Fresnel's theoretical and experimental work, very few physicists believed in the wave theory of light (accepting instead the "corpuscular theory"), whereas after his work virtually all physicists did. Fresnel developed the correct basic mathematical theory of diffraction that is taught in textbooks today. By boldly and correctly hypothesizing that light waves are purely transverse (which was hard to justify theoretically at that time), he correctly explained many polarization phenomena

(such as optical rotation and chromatic polarization) and derived the "Fresnel equations" for the reflection coefficients of light. He introduced the concepts and terms "linear polarization", "circular polarization", and "elliptical polarization." In optics many things are named in his honor, including Fresnel diffraction, Fresnel integrals, the Fresnel equations for reflection coefficients, Fresnel's equation for the index of refraction in anisotropic medium, and Fresnel lens. Fresnel died at the age of 39 of tuberculosis, receiving on his death bed the Rumford Medal of the Royal Society of London. Fresnel was a profoundly religious man and sincere Catholic, though he held Jansenist views. (Jansenists held extreme, rigorist views on sin and predestination, some of which had been condemned by popes in 1653 and 1713.) According to his friend Alphonse Duleau, Fresnel saw the study of nature as part of the study of the power and goodness of God. On one of his scientific works he wrote the epigraph, "*Natura simplex et fecunda*" ("Nature, simple and fertile").

Wilhelm Killing (**May 10, 1847** – Feb 11, 1923) Wilhelm Killing was a German mathematician who made fundamental contributions to the study of Lie groups, Lie algebras, and non-Euclidean geometry. Lie groups and Lie algebras are mathematical structures that have important applications in particle physics and relativity theory. For example, they are needed to describe the gauge symmetries of the Electromagnetic, Weak, and Strong interactions, as well as angular momentum, the spins of particles, and the geometry of space-time. Lie groups and Lie algebras are named after Sophus Lie, who discovered them. But Killing discovered Lie algebras independently and did important work on their classification, introducing such basic concepts as the Cartan subalgebra, the Cartan matrix (both discovered by Killing before Cartan), and the "root system" of a Lie algebra. Killing's work is also important in non-Euclidean geometry and the study of curved space-time. Many mathematical terms bear his name, including Killing vector, Killing spinor, Killing tensor, Killing equation, Killing horizon, Killing form, and the Killing-Hopf theorem. Killing taught for many years at the Jesuit seminary college Collegium Hosianum, until becoming a professor at the University of Münster in 1892. He and his wife , who were devout Catholics, became members of the Third Order of St. Francis in 1886.

Maria Gaetana Agnesi (**May 16, 1718** – Jan 9, 1799)

Ruđer Bošcović, S.J. (Roger Boscovich) (**May 18, 1711** – Feb 13, 1787) Bošcović was a Croatian astronomer, physicist, and Jesuit priest, who is most famous for his ideas about atoms, which in certain respects were far ahead of his time. The idea that matter is made up of indivisible units, or "atoms," goes back to the ancient Greeks, who supposed atoms to be bits of matter with finite size and definite shape. "Atomism" in this form was revived in the 17th century. Newton made some advance on this idea, by supposing atoms to be points possessing mass and capable of gravitational attraction. However, he proposed no theory of how atoms interacted other than by gravitation or how they coalesced to form solids and liquids. Bošcović took these ideas further to propose that there were new forces between atoms that were attractive at large distance, repulsive at very short distance, and possibly alternating in between. In the twentieth century, this idea was shown to be correct (e.g. the Lennard-Jones potential between neutral atoms). In the words of the historian I. Bernard Cohen, Bošcović's "writings about science elicited the highest praise from leading men of science including --- among others ---

Faraday, Clerk Maxwell, J.J. Thomson, Laplace, Ampère, Helmholtz, Hertz and Lorentz. In 1870, Mendeléev compared Boscovich to Copernicus and held him to be the 'founder of modern atomism.'" Bošcović also made notable contributions to astronomy, and it is likely at his urging that Pope Benedict XIV lifted the general ban on books espousing Copernicanism in 1758.

Gaspard-Gustave de Coriolis (**May 21, 1792** – Sept 19, 1843) Coriolis was a French mathematician and mechanical engineer who discovered and derived the equations for the pseudo-forces needed to describe motion in a rotating frame of reference. One of these forces is called the "Coriolis force" in his honor, as is the "Coriolis effect" that it produces. One of the most familiar consequences of the Coriolis effect is the rotation of storms clockwise in the Sothern hemisphere and counterclockwise in the Northern hemisphere. Coriolis was also the first person to use the term "work" for force times the distance over which it acts. Coriolis was a devout Catholic and this comes out in much of his correspondence. In his youth he considered a religious vocation and towards the end of his life he wrote in a letter "Ah, if we did not need studies to become a Jesuit or a Benedictine and if my health allowed me I would be happy to enter [the priesthood]."

Giovanni Domenico Cassini (**June 8, 1625** – Sept 14, 1712) Cassini was one of the leading astronomers of the 17th century, with many discoveries to his credit. He was born in Tuscany and studied under the Jesuit scientists Giovanni Battista Riccioli and Francesco Grimaldi. In 1650, he became the principal chair of astronomy at the University of Bologna. In 1669, he was invited to Paris to set up the Paris Observatory, where he remained as Director until his death. Cassini discovered four of Saturn's moons (Huygens had discovered Titan, the largest moon of Saturn, earlier). He discovered the gap in Saturn's rings that is now called the "Cassini Division". He discovered the Great Red Spot on Jupiter (independently of Robert Hooke) and was the first to observe differential rotation within Jupiter's atmosphere. He also determined the rotation rate of Mars and Jupiter and gave the correct explanation of "zodiacal light." One of his more remarkable achievements was to measure the size of the Solar System. He did his by observing Mars simultaneously with a colleague whom he had dispatched to French Guyana. Parallax gave the distance to Mars, which then by angular measurements gave the distances between other objects in the Solar System. The Cassini space probe is named after him. His Catholic piety is reflected in the fact that while living in Italy he sent a manuscript to Riccioli treating of the Immaculate Conception and recommending that it be celebrated as a special feast.

Pierre Duhem (**June 9, 1861** – Sept 14, 1916) Duhem is famous as a physicist, historian of science, and philosopher of science. In physics, his main contributions were in the field of thermodynamics, where he is remembered for the Gibbs-Duhem relation and the Duhem-Margules equation. As a historian of science, he did extensive research on medieval science, the results of which were contained in his ten-volume *La Système du Monde*. His work helped revise previous views of medieval science by showing that it had much greater vitality and originality than had been previously supposed and that it had considerable continuity with the later developments of the Scientific Revolution. As a philosopher of science, Duhem is associated

with the well-known and widely accepted Duhem-Quine thesis, which says that what can be tested empirically are not individual hypotheses in isolation, but only theories as a whole with all their background assumptions. Duhem's own philosophy was a blend of a traditional Thomistic metaphysics and a strongly positivistic conception of science. Duhem wrote, "I believe with all my soul in the truths which God has revealed to us and that He has taught us through his Church." At the same time, he insisted that "physics proceeds by an autonomous method absolutely independent of any metaphysical opinion."

Jérôme Lejeune (**June 13, 1926** – April 3, 1994) Lejeune was a French geneticist and pediatrician most famous for discovering in 1958, in collaboration with Raymond Turpin and Marthe Gautier, that Down Syndrome is caused by an extra copy of chromosome 21 (an example of trisomy). This was the first time that an intellectual disability was shown to be the result of a chromosomal abnormality. Lejeune went on to discover the connection between several other diseases and chromosomal abnormalities. For his discoveries Lejeune was the recipient of many honors including the William Allan Award, the highest award of the American Society of Human Genetics. Lejeune was very outspoken in defense of the unborn and named the first President of the Pontifical Academy for Life, a position he held for only a few weeks before he succumbed to cancer in April of 1994. He has been named a "Servant of God" by the Catholic Church, the first stage in the process of canonization.

Xavier Le Pichon (**June 18, 1937** -) Xavier Le Pichon is a French geophysicist whose who comprehensive model of the motion of the plates of the earth's crust provided decisive confirmation of the theory of plate tectonics and continental drift. Since the 1500's numerous scientists and others had noticed how the land masses on the two sides of the Atlantic seemed to fit together and had speculated that the continents had moved apart. The "continental drift" idea was promoted vigorously in the early twentieth century by Alfred Wegener, who adduced a variety of evidence, including similarity of geological features and fossils at corresponding locations in Africa and South America. The theory was generally rejected by scientists, however, due to a lack of any convincing mechanism for the motion of continents. In the late 1950s and early 1960's strong evidence of the spreading of sea floors was discovered, leading to the theory of "plate tectonics," which says that the crust of the earth is made up of distinct floating plates that are moved by convective flows in the underlying mantle. By 1967, this theory was becoming generally accepted. A decisive development was the demonstration by Le Pichon, with a comprehensive computer model of the earth's plates and large data sets, that the rate at which new crust was being created at divergent boundaries was equal to the rate at which crust was being destroyed at convergent boundaries. Le Pichon received numerous prestigious prizes and awards for his work, including the Maurice Ewing Medal from the American Geophysical Union, The Wollaston Medal of the Geological Society of London, membership in the French Academy of Sciences, and election as a foreign associate of the (U.S.) National Academy of Sciences. Le Pichon is a devout lifelong Catholic. Since 2003, he has lived in an intentional community he and his family helped found to provide retreat for families caring for a loved one

with mental illness. Before that, for nearly three decades, he and his wife raised their six children at the original French L'Arche community, centered around people with mental disabilities.

Blaise Pascal (June 19, 1623 – Aug 19, 1662)

Victor F. Hess (June 24, 1883 – Dec 17, 1964) Victor Hess was awarded the Nobel Prize in Physics in 1936 for discovering cosmic rays. Before Hess did his pioneering work, it was assumed that the ionizing radiation measured in the atmosphere had a terrestrial origin and would thus decrease in intensity at higher altitudes. After improving the devices used to measure such radiation, Hess carried such devices up to altitudes as high as 5.3 km in a series of balloon flights undertaken both at night and daytime in 1911-2. He found that the intensity of radiation did indeed decrease with height up to about 1 km, but then strongly increased with altitude, indicating a cosmic origin. The physicist Carl D. Anderson gave the name "cosmic rays" to this radiation. Anderson discovered positrons (the anti-electrons predicted by Dirac's theory of electrons) in cosmic rays in 1932, for which he shared in the 1936 Nobel Prize. In 1936, Anderson and his student Seth Neddermeyer discovered muons in cosmic rays, the first particle to be discovered that is not a constituent of ordinary matter. In 1938, Hess emigrated from his native Austria to the United States with his Jewish wife to escape Nazi persecution. He was a devout Catholic, and in 1946 wrote an article, "My Faith", in which he discussed the relation of science and religion and explained why he believed in God.

Pietro Angelo Secchi, S.J. (June 28, 1818 – Feb 28, 1878) Angelo Secchi continued the great tradition of Jesuit science into the nineteenth century and was one of the founders of modern astrophysics. Since antiquity, astronomy concerned itself with the positions and motions of celestial bodies. Astro*physics* goes beyond that to questions of what these bodies are made of and how they form and evolve. The first information about such questions came through studying the spectra of light emitted by the Sun and stars. Secchi was a pioneer in the study and classification of stars using spectroscopy. He made the first spectroscopic classification of stars, which remained the standard one until an improved version was developed at Harvard University in the early twentieth century. He made many other contributions to astronomy, as well as to meteorology and oceanography. Perhaps nothing so dramatizes the positive relation of faith and science as the fact that Secchi did much of his groundbreaking research using a telescope that he had built on the roof of the Church of Sant'Ignazio (Saint Ignatius), one of the most beautiful churches in the city of Rome, right above the sacred space where he and his fellow Jesuits daily celebrated Mass.

Ignaz Philipp Semmelweis (July 1, 1818 – August 13, 1865) Semmelweis , the "savior of mothers," was a physician who discovered that antiseptic procedures in maternity wards could greatly reduce incidence of mortality among mothers. In the nineteenth century, puerperal fever (or "childbed fever") led to very high rates of maternal mortality and there was no understanding of the causes or any effective treatment. While working in the obstetrical clinic of the Venna General Hospital, Semmelweis noticed that the maternal mortality rate in the doctor's ward was several times higher than in the midwife's ward. Having eliminated various other explanations,

he concluded that the disease was spread by doctors who had had contact with corpses (thus contaminating patients with what he called "cadaverous particles"). He introduced the practice of doctors washing their hands with calcium hypochlorite before examining the mothers. The rate of deaths from puerperal fever declined drastically as a result. Despite evidence that his antiseptic method worked, his attempt to promote his ideas among doctors throughout Europe met with fierce opposition and often ridicule. This was largely due to the fact that Semmelweis had no viable theory of how the disease spread or why his antiseptic methods worked (this was before the discoveries of Pasteur). Other factors were Semmelwies's relative lack of status in the medical field, resentment by doctors of the idea that their methods were at fault, and the fact that many doctors already washed their hands with soap (which was inadequate). Paradoxically, Semmelweis was accused of being unscientific by those who refused to test his methods on the grounds that his theory of the disease's transmission was poorly grounded and sounded superstitious. Some even blamed his "superstition" on his Catholicism. His failure to convince the medical community, and the avoidable suffering and death this caused, frustrated Semmelweis to the point of desperation. He grew increasingly bitter and strident, and in 1865 showed signs of mental breakdown. He was committed to a mental asylum, where he was badly beaten by guards and subjected to harsh conditions, leading to his death (ironically, from infection) two weeks after his admission.

Nicole Oresme (ca. 1320 – **July 11, 1382**) Nicole Oresme was bishop of the City of Lisieux in France and a scientist of remarkable brilliance and originality. He was also remarkably broad in his interests and accomplishments. He made contributions to musicology, psychology, physics, and mathematics, and is considered the greatest economist of the Middle Ages. In mathematics, Oresme discovered the rules for combining exponents, even discussing fractional and irrational exponents. He gave the first proof that the harmonic series (1 + 1/2 + 1/3 + …) diverges. He developed the use of simple graphs to plot physical quantities, thus anticipating by three centuries some of the ideas of Cartesian analytic geometry. He used such graphical methods to prove the "Merton theorem," which gives the distance traversed by a uniformly accelerating body. Oresme speculated that falling bodies accelerate uniformly, so that the speed of a falling body is proportional to the time it has fallen, which is correct and equivalent to the famous "law of falling bodies," which Galileo discovered experimentally almost three hundred years later. Oresme argued that the apparent motion of the stars could be explained by the earth's rotation on its axis, and the analysis by which he refuted common physical objections to this was superior in some ways to those later given by Copernicus and Galileo, because he understood how to decompose motion into horizontal and vertical components. Oresme fought vigorously against astrology. He also argued for a naturalistic approach within science, writing that in explaining strange phenomena, "there is no reason to take recourse to the heavens …, or to demons, or to our glorious God, as if he would produce these effects directly, any more than [he directly produces] those effects whose [natural] causes we believe are well known to us."

Jean-Baptiste Dumas (**July 14, 1800** – April 10, 1884) *CE

Giuseppe Piazzi (**July 16, 1746** – July 22, 1826) Giuseppe Piazzi was an astronomer and a priest of the Theatine order. He is most famous for discovering the first asteroid, which he named Ceres, on January 1, 1801. Ceres is by far the largest object in the asteroid belt. Because it is large enough that its self-gravitation squeezes it into a spherical shape, it was reclassified in 2006 as a "dwarf planet," as was Pluto. Among other contributions Piazzi made to astronomy was supervising the compilation of an extensive and very accurate star catalogue containing 7,646 stars, which was published in 1803. Piazzi also looked for stars with large proper motion, which would be relatively close to the solar system and thus good candidates for measuring stellar parallax. He identified 61 Cygni as having especially large proper motion in 1804, and in 1838 Friedrich Bessel was able to measure its distance to earth (which is 11.4 light years) using parallax. This is the first star whose distance to earth was measured (other than the Sun).

Georges Lemaître (**July 17, 1894** – June 20, 1966) Georges Lemaître was a Belgian priest, theoretical physicist and mathematician who proposed the Big Bang theory, which is the central pillar of modern cosmology. Einstein published his theory of gravity (called General Relativity) in 1916. In 1922, a Russian mathematician Alexander Friedmann and a few years later Georges Lemaître, independently, found solutions to Einstein's gravitational equations that described a universe in which space itself is expanding. (The "metric tensor" that describes this is now called the "Friedmann-Lemaître-Robertson-Walker metric" or "FLRW metric.") Meanwhile, the astronomer Slipher found evidence that galaxies were flying apart from each other at tremendous speeds. It was Lemaître who combined these observations with the mathematics of General Relativity to propose, in 1927, that the universe is indeed expanding. He also predicted from this hypothesis that the rate at which remote galaxies are receding from the earth should be proportional to their distance away. Few knew of Lemaître's prediction at the time, so that when the astronomer Edwin Hubble discovered this relationship it from observation in 1929 it came to be called the "Hubble Law." Recently an overwhelming vote by the membership of the International Astronomical Union recommended that it be renamed the "Hubble-Lemaître Law." In 1930, Lemaître suggested that the expansion of the universe began from a state of enormous density, which he called "the Primeval Atom" and which is now called "the Big Bang." Lemaître's thinking about cosmology was remarkably prescient in several ways. He proposed that there should be observable radiation left over from the Big Bang explosion, which is correct, though he incorrectly identified it with cosmic rays. This "cosmic background radiation," which is now redshifted by the cosmic expansion to the microwave part of the electromagnetic spectrum, was discovered by Arno Penzias and Robert W. Wilson in 1964. Lemaître also suggested that quantum effects should be of great importance at the time of the Big Bang, which is also believed to be correct. (His particular idea is that the Big Bang was a radioactive decay of the primeval atom.) And in order to accommodate a realistic age of the universe, he proposed models in which the "cosmological constant," a possible term in Einstein's equations, leads to an accelerating phase of the universe's expansion. As it happens, in 1998 it was discovered that the universe's expansion is indeed accelerating, due to "dark energy," which is thought most likely to be the cosmological constant (though Lemaître's particular model is not right in detail). Lemaître was opposed to linking particular scientific theories, including the Big Bang theory, to theological ideas, as each field much respect its own methods and competences.

Gregor Mendel (July 20, 1822 – Jan 6, 1884)

Émile Picard (July 24, 1856 – Dec 11, 1941) Picard was a French mathematician who made important contributions to several areas of mathematics, including complex analysis, differential equations, function theory, and the theory of algebraic surfaces. He is best known to students of mathematics for the Picard theorems in complex analysis, but his name is associated with many other ideas as well, the Picard group, Picard-Vessiot theory, the Picard-Lefschetz formula, and the Picard-Lindelöf theorem. Among his many doctoral students were the famous mathematicians Jacques Hadamard and Andre Weil. Picard was elected a Fellow of the Royal Society.

Christoph Scheiner, S.J. (July 25, 1573 – June 18, 1650) Christoph Scheiner was a German Jesuit priest and astronomer most famous for his studies of sunspots Scheiner was one of five astronomers who discovered sunspots using independently of each other and practically at the same time. (The others were Thomas Herriot, Johannes and David Fabricius, and Galileo.) To be more precise, these men were the first to discover them *with telescopes*. Sunspots were actually seen with the naked eye as early as 800 BC by Chinese astronomers and around 300 BC by the Greeks. One was observed by the Benedictine monk Adelmus on March 17, 807, and the first drawing of a sunspot was by the English monk, John of Worcester, in 1128. However, the scientific investigation of sunspots only began when they were rediscovered with telescopes in the 17th century. Scheiner made the most sustained and systematic observations of them, published in his massive treatise, *Rosa Ursina*, in 1640. Scheiner tracked sunspots as they moved across the face of the sun and showed from this data that the sun was rotating on an axis that is tilted with respect to the earth's orbit. Scheiner's extensive sunspot data is still of use to scientists today. Scheiner was the first person to build a telescope with two convex lenses (a great improvement over existing telescopes that had been proposed but not actually built by Kepler) and used them for his observations.

(Ettore Majorana) (August 5, 1906 - ??) Predicted fermions that are their own antiparticles, now called Majorana Fermions. He disappeared mysteriously in 1938 and may have committed suicide, as he suffered depression and other psychological ills.

Amedeo Avogadro (August 9, 1776 – July 9, 1856) Avogadro is famous for Avogadro's Law, which states that two gases of equal volume at the same temperature and pressure contain an equal number of molecules. In honor of him, the number of molecules in a mole of a substance is called Avogadro's number. Avogadro, who was of noble birth, obtained a degree in ecclesiastical law and started practice in that field, before deciding to pursue a scientific career. At that time, the existence of atoms and molecules was still hypothetical and very controversial. Experiments of Joseph Gay-Lussac had shown that gases reacted in simple integer ratios of volumes. For example, when two liters of hydrogen gas reacted with one liter of oxygen gas two

liters of water vapor were produced. Avogadro correctly interpreted these results in terms of his hypothesis that equal volumes of gas contain equal numbers of molecules. For example, the reaction of hydrogen and oxygen can be understood, if hydrogen and oxygen molecules are diatomic, as resulting from this molecular reaction $2H_2 + O_2 \rightarrow 2\ H_2O$. Avogadro's work was largely ignored during his life but became known shortly after his death and eventually his ideas were shown to be correct. Little is known about Avogadro's private life, but his obituary in the Gazzetta Piemontese nine days after his death says that he was "religioso senza intolleranza, dutto senza pedanteria" ("religious without intolerance, learned without pedantry").

Nicolas of Cusa (1401 – **August 11, 1464**) Nicholas of Cusa (often called Cusa or Cusanus) was a German Cardinal who died nine years before Copernicus was born. He was an important figure in the history of medieval philosophy. In fact, he was really more of a theologian and philosopher than a scientist. For theological and philosophical reasons, Cusa suggested that the universe is infinitely large and has no center and that all bodies in the universe, including both the earth and the sun, are in motion in infinite space. He also speculated about the existence of intelligent life on other planets and celestial bodies and thought it was probable due to God's creativity. Historians of science rightly admire the boldness of Copernicus and Galileo in suggesting that the earth was in motion and that the sun rather than the earth was at the center of the universe, and rightly disapprove of those who attempted to quiet them. Yet it is not often realized that even before them Cardinal Nicholas of Cusa had proposed even bolder ideas.

Augustin-Louis Cauchy (**August 21, 1789** – May 23, 1857) Cauchy is regarded as one of the greatest and most influential mathematicians in history. He was also one of the most prolific, having written about 800 research papers. He almost single-handedly founded the theory of functions of a complex variable. He also helped put mathematical analysis (basically, the study of continuous quantities) on a rigorous foundation. In the words of the mathematician Hans Freudenthal, "More concepts and theorems have been named for Cauchy than for any other mathematician…" A very long, but partial list is given here:
https://en.wikipedia.org/wiki/List_of_things_named_after_Augustin-Louis_Cauchy
In addition to his work in pure mathematics, he worked extensively in mathematical physics, including the theory of light waves, elasticity, and mechanics. Cauchy was a very devout Catholic and a member of the Society of St. Vincent de Paul. It was partly through his influence that the famous mathematician Charles Hermite returned to the Catholic faith.

Thomas Bradwardine (ca 1300 – **August 26, 1349**) Thomas Bradwarding, who briefly was Archbishop of Canterbury before his death, was part of a group of thinkers called the "Oxford Calculators" or "Merton Calculators," who made significant advances in the mathematical analysis of motion. One of them, William Heytesbury, was the first person to prove the "mean speed theorem" (or "Merton Theorem") which gives the distance traveled by a uniformly accelerating body. (And this required, of course, first understanding the concept of uniform acceleration, which is itself a substantial achievement, especially before the development of

calculus.) Bradwardine's most interesting work was on the relation of force to motion. Aristotle had believed that the speed of an object was proportional to the force on it and inversely proportional to the body's "resistance" to motion. That is *v* is proportional to *F/R*. This leads to the strange conclusion that if the force is less than the resistance, the object will still move in the direction of the force. Bradwardine tried to find a mathematical relation between force, resistance and velocity that avoided this paradox. His proposed relation was that *v* is proportional to the logarithm of *F/R* (though he did not state it in that way). This implies (more sensibly) that a body will move in the direction of whichever force s larger. While Bradwardine's relation is completely wrong (in fact, force is directly related to *acceleration*, rather than velocity, as Newton showed centuries later), it was one of the first attempts ever made to formulate a mathematical law of motion. And it illustrates both the cleverness and originality of medieval scientists and their willingness to challenge the scientific ideas of Aristotle, despite his overwhelming prestige.

Clemens C.J. Roothaan (**August 29, 1918** --) Clemens Roothaan is a American physicist who is most famous for developing a method for calculating atomic and molecular wave functions that leads to the so-called Hartree-Fock-Roothaan equations. He also played an important part in the development of supercomputers. He was born in Holland and studied electrical engineering at Delft University of Technology. His studies were interrupted by the outbreak of World War II. He and his brother were sent by the Nazis to the Vught concentration camp for involvement with the Dutch Resistance. Later they were transferred to the Sachsenhausen concentration camp in Germany. Near the end of the war, the inmates of that camp, including the Roothaan brothers, were sent on a "death march", which his brother did not survive. After the war, Clemens emigrated to the United States. He received his PhD from the University of Chicago, where he remained as a professor until 1988. Roothaan returned to the practice of the Catholic faith in 2014, after being away from it for many decades. A year after his return to the Church, his wife of more than six decades, Judith, who was Jewish but not a believer, came to faith and was received into the Catholic Church. Clemens Roothaan's great-great-great uncle, Jan Philipp Roothaan, was the Superior General of the Jesuit order from 1829 to 1853.

Giovanni Girolamo Saccheri, S.J. (**Sept 5, 1667** – Oct 25, 1733) Saccheri was a Jesuit priest and mathematician. He is famous for discovering many theorems of non-Euclidean geometry. As many before and after him, he tried to prove Euclid's famous "fifth postulate", which said that through any point not on a given line there is one and only one line parallel to the given line. Saccheri attempted to prove this "by contradiction," that is by showing that the assumption that Euclid's fifth postulate is false leads to a logical contradiction. In trying to find such a contradiction he ended up deriving many remarkable theorems that follow from denying the postulate, which are now understood to be theorems of non-Euclidean geometry (specifically, hyperbolic geometry). Though Saccheri could not find a logical contradiction (there isn't one), he did not believe that the non-Euclidean geometry he was exploring was in fact self-consistent.

(Or at least, he was not willing to claim that.) As a result, he narrowly missed the honor of being the discoverer of elliptical non-Euclidean geometry. That honor belongs to Gauss, Taurinus, Lobachevsky, and Bolyai about 100 years later. Saccheri's work went unnoticed until the mid-nineteenth century, when his writings on the subject were rediscovered by the famous Italian mathematician Eugenio Beltrami.

Marin Mersenne (**Sept 8, 1588** – Sept 1, 1648) Marin Mersenne**,** a French priest of the Minimite order, has been called "the center of the world of science and mathematics during the first half of the 1600s" and one of the "architects of the European scientific community." In those days one of the main channels by which scientists learned of their colleagues' work was correspondence, and the main hub of that correspondence was Marin Mersenne. His religious house in Paris became a meeting place of famous scientists, including Descartes, Pascal, Fermat, Gassendi, and Roberval. In 1653, Mersenne organized the *Academia Parisiensis*, one of the first scientific organizations in Europe. Mersenne also did important research himself, especially about sound and vibrations. He discovered the mathematical relation between the frequency of a vibrating string and its length, mass, and tension. He was the first to measure the speed of sound and he showed that it was independent of frequency and loudness. He also showed that sounds of the same pitch had the same frequency, no matter what musical instruments produced them. One of Galileo's most famous discoveries was that the frequency of a pendulum is inversely proportional to the square root of its length, but Mersenne discovered it independently and published it a year before Galileo did. Mersenne also contributed to the theory and design of reflecting telescopes. According to a modern treatise on the subject, which devotes several pages to discussing his contributions, "Mersenne's work is often referred to, [but] its full significance is rarely appreciated. … Mersenne must be accorded the credit for inventing, on paper, the definitive basic geometrical form of the modern telescope."

Luigi Galvani (**Sept 9, 1737**- Dec 4, 1798) Luigi Galvani was a pioneer in bioelectricity and famous for discovering what he termed "animal electricity. He obtained degrees in medicine and philosophy from the University of Bologna in 1759 and was appointed a permanent anatomist and honorary lecturer there in 1762. He married Lucia Galleazzi, the daughter of one his professors, and thereafter assisted in Prof. Galleazzi's laboratory until succeeding him as professor and lecturer in 1775. Galvani's wife Lucia worked with him in his researches throughout their life together. Galvani discovered that electrical stimulation of a frog's nerves could cause muscular contractions. This led him to propose that what stimulated muscular movements in live animals was not a hydraulic effect mediated by air or fluid, as in some earlier theories, but electrical activity conducted through nerves. His treatise *De viribus electricitatis in motu musculari* ("On the power of electricity in muscular movement"), published in 1791 and 1794, was the beginning of the fields of bioelectricity and electrophysiology. Galvani interpreted the electricity that caused the frog's legs to jerk in his experiments as arising from within the animal tissue and termed the effect "animal electricity." Alessandro Volta disputed this, arguing that the electricity was caused in some cases by the application of dissimilar metals to the frog.

In investigating this, Volta was led to the discovery of the electric cell (which had pieces of different metals, such as copper and zinc, separated by an electrolyte), which in turn led him to the invention of the first battery. Galvani was devoutly religious and at the age of 15 desired to take vows and enter a religious order, but was dissuaded by his parents. Later he became a member of the Third Order of St. Francis.

Jean Bernard Léon Foucault (**Sept 18, 1819** – Feb 11, 1868) *CE says that he was a practicing Catholic "in later years". Wikipedia says "near the time of his death"

Armand Hyppolite Louis Fizeau (**Sept 23, 1819** – Sept 18, 1896) *CE

James B. Macelwane (**Sept 28, 1883** – Feb 15, 1956) member of NAS, AGU has Macelwane Medal named after him.

Bernard Bolzano (**Oct 5, 1781** – Dec 18, 1848)

Robert Grosseteste (ca 1175 – **Oct 9, 1253**)

Evangelista Torricelli (**Oct 15, 1608** – Oct 25, 1647) CE

Laura Bassi (**Oct 19-31, 1711** – Feb 20, 1778)

Edmund T. Whittaker (**Oct 24, 1873** – March 24, 1956)

Paul Sabatier (**Nov 5, 1854** – Aug 14, 1941) Nobel laureate in chemistry See https://www.chemistryworld.com/features/a-provincial-scientist/3004472.article which says he was a "pious Catholic".

St. Albert the Great (ca. 1193 – Nov 15, 1280) St. Albert the Great, also known Albertus Magnus, was a German Dominican bishop, theologian, philosopher, and scientist. He is famous for being the teacher of St. Thomas Aquinas. St. Albert played an important role in introducing the science of the ancient Greeks and the Arabs into the curriculum of medieval universities. Like his contemporaries Bishop Robert Grosseteste and Roger Bacon, he emphasized in his writings the importance of an experimental approach to science. And he practiced what he preached by doing a great amount of original observational work in botany and zoology, especially in the classification of plants, flowers, and fruits; in animal reproduction and embryology; and in the study of insects. For example, he was the first to distinguish between thorns and prickles on the basis of their formation and structure, to note the influence of light and heat on the growth of trees, to establish that sap is tasteless at the root of a plant but becomes flavored as it ascends, and to discover that ants lose their sense of direction when their antennae are removed. The *Dictionary of Scientific Biography* calls his work *On Vegetables and Plants* "a masterpiece for its independence of treatment, its accuracy and range of detailed description, its freedom from myth, and its innovation in systematic classification."

Buonaventura Cavalieri (1598 – **Nov 30, 1647**) Bonaventura Cavalieri was a priest of the Jesuate order (not to be confused with the Jesuits). He is a significant figure in the history of mathematics. His great contribution was his so-called "method of indivisibles." This was a technique for computing the volumes and areas of geometric figures by dividing them into infinitesimal parts, and it was an important step on the road to the discovery of calculus later by Newton and Leibniz. Leibniz himself later wrote, "In the sublimest of geometry, the initiators and promoters, who performed a yeoman's task, were Cavalieri and Torricelli. Later others progressed even further, using their work." Galileo wrote, "few, if any, have delved as far and as deep into the science of geometry as Cavalieri."

Bl. Nicolas Steno (Jan 11, 1638 – **Dec 5, 1686** Gregorian Calendar) Blessed Nicolas Steno made fundamental contributions to four branches of science: anatomy, paleontology, geology, and crystallography. He was Danish by birth (Steno is a Latinized version of Stenson). While still in his twenties he was already recognized as one of the leading anatomists in Europe. His anatomical studies greatly increased knowledge of the glandular-lymphatic system. Various parts of the body are named after him, including Stensen's duct, Stensen's gland, Stensen's vein, and Stensen's foramina. He also did important work on heart and muscle structure, brain anatomy, and embryology. He traveled to Florence, where he worked in a research institute that included some of Galileo's pupils. In 1666, while dissecting the head of a Great White shark that had been caught near Livorno, he noticed that the shark's teeth strongly resembled the so-called tongue-stones common on Malta. This led him to develop, after much further investigation, a detailed theory of the origin of fossils and of sedimentary rock that was controversial but correct. He is thus regarded as the founder of the study of fossils and a one of the main founders of geology. Steno's theory of how geological strata were laid down opened the way to understanding the history of the earth. The study of geology led Steno to the study of crystals, where he discovered the basic fact, known as Steno's Law, that in all crystals of the same mineral the angles are the same. Steno was raised as a Lutheran, but a deep study of theology and the writings of the early Church Fathers, led him to embrace Catholicism. He become a priest and soon afterward a bishop. In his last public lecture as a scientist, he offered to history one of the greatest descriptions of the relationship between nature, our grasp of truth, and the absolute mystery of God: "*Beautiful is what we see. More beautiful is what we comprehend. Most beautiful is what we do not comprehend."* As bishop, he was known as an ardent advocate for the poor, for whom he sold all of his belongings, even his bishop's ring. He practiced rigorous asceticism, constantly praying and fasting. On October 23, 1988, he was beatified by Pope John Paul II. His feast day is Dec 5.

Clyde Cowan (**Dec 6, 1919** – May 24, 1974) Cowan was co-discoverer of the neutrino with Reines, who received the Nobel Prize 1995 in both their names.

Jean-Henri Fabre (**Dec 22, 1823** – Oct 11, 1915)

Charles Hermite (**Dec 24, 1822** – Jan 14, 1901)

John von Neumann (Dec 28, 1903 – Feb 8, 1957)

Andreas Vesalius (Andries van Wesel) (**Dec 31, 1514** – Oct 15, 1564) The Flemish anatomist Vesalius is often called the founder of modern human anatomy. Since antiquity, the scientific prestige of Galen, the 2nd century Greek anatomist and physician, had been so great that many of his statements were accepted without question. Vesalius demonstrated that there were numerous errors in Galen's descriptions of human anatomy. (This was due, as Vesalius learned, to the fact that Galen had based his conclusions on studying Barbary macaque apes, because human dissection was banned in ancient Rome.) Human dissection was practiced by medical researchers in Europe, especially Italy, since 1300 (contrary to an anti-Catholic myth that it was forbidden by the Church). However, these dissections were often carried out by barber-surgeons who acted as assistants to medical teachers. Vesalius, by contrast, carried out his own dissections of human cadavers and encouraged his students to do the same. His hands-on approach and careful observation enabled him to make many anatomical discoveries. In 1543, he published his epoch-making multi-volume work, "*De humani corporis fabrica*" ("On the fabric of the human body"), which was filled with richly detailed illustrations of every part of the human body that were far superior to those of earlier books. This work is regarded as a major advance in the history of anatomy. In 1564, as he was returning from a pilgrimage to the Holy Land, Vesalius was shipwrecked in the Aegean island of Zakynthos, where he died soon after.

ALPHABETICAL LIST

***Maria Gaetana Agnesi** (May 16, 1718 – Jan 9, 1799)

***St. Albert the Great (ca. 1193 – Nov 15, 1280)**

***Émil Hilaire Amagat** (Jan 2, 1841 – Feb 15, 1915) Studied the thermodynamics of gases. Published the Law of Partial Volumes in 1880. Devout Catholic according to memoirs of Carl Barus and a member of Societe Scientifiques de Bruxelles, according to Jaki.

***André-Marie Ampère** (Jan 20, 1775 – June 10, 1836) *CE

Leopold Auenbrugger

***Amedeo Avogadro** (August 9, 1776 – July 9, 1856) Re Catholicism see https://www.famousscientists.org/amedeo-avogadro/ wiki says he appeared to be sober and religious. See footnote on page 179 of CLMS

**Jacques Babinet (March 5, 1794 – Oct 21, 1872) Most famous for Babinet's Principle, which concerns the diffraction of light. *CE

Roger Bacon () no dates

***Laura Bassi** (Oct 19-31, 1711 – Feb 20, 1778) First woman to be appointed to a chair in a scientific field at a university.

***(Antoine César Becquerel)** (March 7, 1788 – Jan 18, 1878) With his son A.E. Becquerel discovered the photovoltaic effect. Father of A.E. Becquerel and grandfather of Henri Becquerel. Fellow of the Royal Society and winner of its Copley Medal. CE Enough accompishments??

(Claude Bernard) (July 12, 1813 – Feb 10, 1878) A "founding father" of autonomic physiology, he discovered the vasodilator nerves. He made many other contributions including discovering the glycogenic function of the liver. Re his Catholicism see https://www.ncbi.nlm.nih.gov/pubmed/11625277 Need stronger evidence.

****Jacques-Philippe-Marie Binet** (Feb 2, 1786 – May 12, 1856) A French mathematician, physicist and astronomer. He made significant contributions to number theory, was the first to describe the rule for the multiplication of matrices. Binet's Theorem, the Binet-Cauchy identity, the Cauchy-Binet formula, and the Binet equation are named after him. Elected to the Academie de Sciences in 1843. *CE

*****Bernard Bolzano** (Oct 5, 1781 – Dec 18, 1848)

Giovanni Alfonso Borelli (Jan 28, 1608 – Dec 31, 1679) Considered the father of biomechanics. The highest award of the American Society of Biomechanics is the Borelli Award.

*****Ruđer Bošcović, S.J.** (May 18, 1711 – Feb 13, 1787)

*****Thomas Bradwardine** (ca 1300 – Aug 26, 1349)

*****Henri Breuil** (Feb 28, 1877 – Aug 14, 1961)

(Georges-Louis Leclerc, Comte de Buffon) (Sept 7, 1707 – April 16, 1788) [check on Catholicism]

*****Nicola Cabibbo** (April 10, 1935 – August 16, 2010) Cabibbo angle named after him.

*****Giovanni Domenico Cassini** (June 8, 1665 – Sept 14, 1712) Cassini discovered four of Saturn's moons, the gap in Saturn's rings now called the "Cassini Division", the differential rotation within Jupiter's atmosphere, and (independently of Hooke) the great red spot on Jupiter. He also determined the rotation rate of Mars and Jupiter and gave the correct explanation of "zodiacal light." The Cassini space probe is named after him. ****CE**

*****Benedetto Castelli, OSB** **(1578 – April 9, 1643)**

*****Augustin-Louis Cauchy** (August 21, 1789 – May 23, 1857)

*****Buonaventura Cavalieri** (1598 – Nov 30, 1647)

*****Christopher Clavius, S.J.** (March 25, 1538 – Feb 6, 1612)

Mateo Realdo Colombo no date of birth

*****Nicolaus Copernicus** (Feb 19, 1493 – May 24, 1543)

***Gaspard-Gustave de Coriolis (May 21, 1792 – Sept 19, 1843) See https://tel.archives-ouvertes.fr/tel-00645154/document See Andrew Kassebaum e-mail of 1/15/19 2:46 PM

*Charles-Augustin de Coulomb (June 14, 1736 – August 23, 1806) CE

***Clyde Cowan (Dec 6, 1919 – May 24, 1974) Cowan was co-discoverer of the neutrino with Reines, who received the Nobel Prize 1995 in both their names. Video interview with his widow and son: https://www.youtube.com/watch?v=45RMxpdEp6U
https://www.youtube.com/watch?v=au3SCXknthM
https://www.youtube.com/watch?v=EPvq4S7fPhc Talk by Cowan:
https://www.youtube.com/watch?v=AYqEtm0X2Sc

June 14, 1956 telegram sent by Reines and Cowan teling Wolfgang Pauli that they had detected neutrinos. July 20, 1956 Publication of paper in Science announcing discovery.

***René Descartes (Mar 31, 1596 – Feb 11, 1650)

Christian Doppler (Nov 29, 1803 - March 17, 1853) [check his Catholicism]

***Pierre Duhem (June 9, 1861 – Sept 14, 1916) Catholicism well-known and attested in his article "Physics of a Believer"

Félix Dujardin (April 5, 1801 – April 8, 1860) [check his Catholicism]

**Jean-Baptiste Dumas (July 14, 1800 – April 10, 1884) *CE

**Jean-Henri Fabre (Dec 22, 1823 – Oct 11, 1915) Considered by some the father of modern entomology. Wiki says he was a Christian. According to Stanley Jaki's biography of Duhem (Uneasy Genius), Fabre belonged to a society of Catholic scientists (Societe Scientifiques de Bruxelles).

***Gyula Fényi, S.J. (Jan 8, 1845 - Dec 21, 1927) Demonstrated a correlation between the number of solar prominences and the number of sunspots.

**Pierre de Fermat (1601 – Jan 12, 1665) Said to be "devout Catholic,.. held a judicial office in the Church" in http://www.larsoncalculus.com/etf6/content/biographies/fermat-pierre-de/
Said here to be a "staunch Catholic": https://www.encyclopedia.com/people/science-and-technology/mathematics-biographies/pierre-de-fermat Also here:
https://books.google.com/books?id=MiZIWtX9AJUC&pg=PA90&lpg=PA90&dq=fermat+catholic&source=bl&ots=AQcOw3MHf5&sig=HVzQ8wB_rWCHthjmwRYbUy_0qzY&hl=en&sa=X&ved=2ahUKEwjm8v6xnPreAhWkpFkKHRiKB7s4ChDoATACegQICBAB#v=onepage&q=fermat%20catholic&f=false (See evidence in the article I wrote)

**Armand Hyppolite Louis Fizeau (Sept 23, 1819 – Sept 18, 1896) *CE

***Jean Bernard Léon Foucault (Sept 18, 1819 – Feb 11, 1868) *CE says that he was a practicing Catholic "in later years". Wikipedia says "near the time of his death"

***Joseph von Fraunhofer (March 6, 1787 – June 7, 1826) *CE quote from CLMS

***Augustin-Jean Fresnel** (May 10, 1788 – July 14, 1827) **CE Catholicism discussed at length in wiki article. Fresnel was a Jansenist.

***Galileo Galilei** (Feb 15, 1564 – Jan 8, 1642)

***Luigi Galvani** (Sept 9, 1737- Dec 4, 1798) **CE also *wiki and CLMS

***Dorothy Garrod** (May 5, 1892 - Dec 18, 1968) See https://www.academia.edu/469410/One_vision_one_faith_one_woman_Dorothy_Garrod_and_the_Cystallisation_of_Prehistory

***Pierre Gassendi** (Jan 22, 1592 – Oct 24, 1655)

***Francesco Maria Grimaldi, S.J.** (April 2, 1618 - Dec 28, 1663)

***Robert Grosseteste** (ca 1175 – Oct 9, 1253)

***René Just Haüy** (Feb 28, 1743 – June 3, 1822)

Eduard Heis astronomer (achievements seem limited) **CE

***Charles Hermite** (Dec 24, 1822 – Jan 14, 1901) Reverted under the influence of Cauchy.

***Karl Herzfeld** (Feb 24, 1892 – June 3, 1978) Member of NAS. Doctoral advisor of Wheeler and Heitler. On Catholicisn see https://www.aip.org/history-programs/niels-bohr-library/oral-histories/4669 Also see bio at https://www.nap.edu/read/10269/chapter/10

***Victor Hess** (June 24, 1883 – Dec 17, 1964) Won Nobel Prize in Physics in 1936 for his discovery of cosmic rays. Wiki discusses his faith and the article he wrote about it.

***Wilhelm Killing** (May 10, 1847 – Feb 11, 1923) Ground-breaking work on Lie groups. Devout. Third Order Franciscan See http://www-groups.dcs.st-and.ac.uk/history/Biographies/Killing.html

***Athanasius Kircher, S.J.** (May 2, 1602 – Nov 28, 1680)

Włodzimierz Kołos (Sept 6, 1928 – June 3, 1996) One of the founders of quantum chemistry. Check on Catholicism

***René Laennec** (Feb 17, 1781 – Aug 13, 1826) Invented the stethoscope. See wiki and CE on his religiousness.

Johann von Lamont very devout. Achievements seem limited.

Karl Landsteiner Discovered blood groups, among many contributions. Converted from Judaism at age of 22, but was this for social reasons??

Albert Lapparent Achievements seem limited

***Jérôme Lejeune** (June 13, 1926 – April 3, 1994) Discovered the genetic cause of Down's Syndrome and other diseases. Very devout, as discussed in wiki.

***Georges Lemaître (July 17, 1894 – June 20, 1966)

***Xavier Le Pichon (June 18, 1937 -) Helped establish theory of plate tectonics

***Urbain-Jean-Joseph Le Verrier (March 11, 1811 – Sept 23, 1877) Did calculations that led to Neptune's discovery. Faith discussed in **CE

André Lichnerowicz

***James B. Macelwane (Sept 28, 1883 – Feb 15, 1956) member of NAS, AGU has Macelwane Medal named after him.

***Ettore Majorana (Aug 5, 1906 - ??) Predicted fermions that are their own antiparticles, now called Majorana Fermions. He disappeared mysteriously in 1938 and may have committed suicide, as he suffered depression and other psychological ills.

***Marcello Malpighi (Mar 10, 1628 – Nov 29, 1694) Re his Catholicism see Principe in GGTJ.

***Gregor Mendel (July 20, 1822 – Jan 6, 1884)

***Marin Mersenne (Sept 8, 1588 – Sept 1, 1648)

**Giovanni Battista Morgagni (Feb 25, 1682 - Dec 6, 1771) *CE

***Nicolas of Cusa (1401 – Aug 11, 1464)

***Julius A. Nieuwland, CSC (Feb 14, 1878 – June 11, 1936)

***Nicole Oresme (ca. 1320 – July 11, 1382)

***Blaise Pascal (June 19, 1623 – Aug 19, 1662)

***Giuseppe Piazzi (July 16, 1746 – July 22, 1826) Discovered Ceres on Jan 1, 1801.

***Émile Picard (July 24, 1856 – Dec 11, 1941) Mathematician. FRS. Picard's Theorems are named after him. See wiki. On his Catholicism see https://books.google.com/books?id=iDtUCgAAQBAJ&pg=PA227&lpg=PA227&dq=emile+picard+catholic&source=bl&ots=S1ODC9ULgt&sig=vVDBzZ-84BoEoT-K0UelqB74txw&hl=en&sa=X&ved=2ahUKEwjzzfSP4fzeAhUhzlkKHbgTDWkQ6AEwBHoECAcQAQ#v=onepage&q=emile%20picard%20catholic&f=false

*Francesco Redi (Feb 18, 1626 – March 1, 1697) Father of modern parasitology. CE

***Gregorio Ricci-Corbastro (aka as Gregorio Rici) (Jan 12, 1853 – Aug 6, 1925) Developed absolute differential calculus, also called Ricci calculus. The Ricci tensor is named after him. These are key mathematical ideas in Einstein's theory of GR. Andrew Kassebaum gives solid evidence that Ricci was devout

***Giovanni Battista Riccioli, S.J. (April 17, 1598 – June 25, 1671)

***Clemens Roothaan (August 29, 1918 --)

***Paul Sabatier (Nov 5, 1854 – Aug 14, 1941) Nobel laureate in chemistry See https://www.chemistryworld.com/features/a-provincial-scientist/3004472.article which says he was a "pious Catholic".

***Giovanni Girolamo Saccheri, S.J. (Sept 5, 1667 – Oct 25, 1733) Forerunner of non-Euclidean geometry. Proved many theorems of hyperbolic geometry.

***Christoph Scheiner, S.J. (July 25, 1573 – June 18, 1650)

*Theodor Schwann (Dec 7, 1810 – Jan 11, 1882) CE

***Pietro Angelo Secchi, S.J. (June 28, 1818 – Feb 28, 1878)

***Ignaz Philipp Semmelweis (July 1, 1818 – August 13, 1865)
https://en.wikipedia.org/wiki/Contemporary_reaction_to_Ignaz_Semmelweis

***Jean-Baptiste Senderens (Jan 27, 1856 – Sept 26, 1937)

***Lazzaro Spallanzani (Jan 10, 1729 – Feb 12, 1799)

***Josef Stefan (March 24, 1835 – Jan 7, 1893) Stefan's Law, Stefan-Boltzmann Constant, etc. named after him. He considered becoming a Benedictine priest:
https://ostaustria.org/bridges-magazine/volume-12-december-14-2006/item/1667-from-rags-to-research-the-life-of-josef-stefan

***Bl. Nicolas Steno (Jan 11, 1638 – Dec 5, 1686 Gregorian Calendar) Feast day is Dec 5.

***Sir Hugh Stott Taylor (Feb 6, 1890 - April 17, 1974)

*Louis-Jacques Thénard (May 4, 1777 – June 21, 1857) Discovered hydrogen peroxide CE

*Evangelista Torricelli (Oct 15, 1608 – Oct 25, 1647) CE

***Andreas Vesalius (Andries van Wesel) (Dec 31, 1514 – Oct 15, 1564) Flemish anatomist

***Alessandro Volta (Feb 18, 1745 – March 5, 1827) *CE

***John von Neumann (Dec 28, 1903 – Feb 8, 1957)

***Edmund T. Whittaker (Oct 24, 1873 – March 24, 1956)

Robert Grosseteste (1168-1253) was bishop of the City of Lincoln in England in the thirteenth century. His originality lay in the fact that he used both mathematical analysis and experimentation in the study of the behavior of light (the branch of science called "optics"). These were vitally important steps in the development of truly empirical science. Grosseteste formulated a geometric law for the refraction of light that was qualitatively correct, and used it to explain (correctly) how lenses magnify images.

Thomas Bradwardine (1290-1349), who became Archbishop of Canterbury in England, analyzed Aristotle's ideas on motion and showed that they were mathematically inconsistent. He then attempted to develop a mathematical law that related the force acting on a body, the body's resistance to force, and the resulting velocity of the body. Even though Bradwardine's law was not correct, it was the first attempt to formulate a mathematical law of motion. And it illustrates both the creativity of medieval scientists and their willingness to criticize the mistakes of the science that they inherited from the ancient world.

Nicolaus Copernicus (1473-1543), the great Polish astronomer**,** was probably never ordained a priest. However, we include him in this list, because he did hold ecclesiastical office: he was the "canon" of Frauenberg Cathedral. It was his great book *De revolutionibus orbium coelestium* ("On the Revolutions of the Heavenly Spheres") that sparked the Scientific Revolution.

Niccolo Zucchi (1586-1670) made no great discovery. However, he was the first person to build a *reflecting telescope* (i.e. telescopes which use a mirror to gather light, rather than a lens**.**) Zucchi constructed his telescope in 1616, or perhaps even earlier—more than 50 years before Isaac Newton, who is often credited with building the first reflecting telescope. Zucchi used his telescope to make accurate observations of spots on Mars's surface in 1640, and his data contributed to Cassini's discovery in 1666 that Mars rotates on its axis.

Bernhard Bolzano (1781-1858), a Czech priest, is an important figure in nineteenth century mathematics. He helped put calculus, the "theory of real numbers," and the "theory of functions" on a more rigorous foundation. Anyone who studies advanced mathematics will encounter the "Bolzano function" and the "Bolzano-Weierstrass theorem."

Gregor Mendel (1822-1884), an Augustinian priest and monk, is so famous that his contributions do not have to be explained here. He is universally honored as the founder of the science of genetics.