Biographies of creation scientists

Vance Ferrell

Evolutionists tell the public that creation scientists are not smart enough to do worthwhile research or make useful contributions to science. Yet the foundations of modern science were primarily laid by the research discoveries of brilliant creation scientists. These pages are filled with a few of the many biographies of creation scientists.

In reading these and other histories of scientific research, a common pattern emerges: An Individual with unusual Intelligence and determination spends years studying nature, and finds a few of its extremely technical secrets.

How could the random confusion of "natural selection" or damaging, lethal effects of mutations produce such sophisticated laws, high-level functions, and complicated organs? Only a Person with far higher Intelligence and craftsmanship could have produced what we find in nature.

AGASSIZ-(Ag'uh-see) Jean Louis Rodolphe Agassiz (May 28, 1807 - December 12, 1873). Swiss-American naturalist and glaciologist.

Agassiz was the son of a pastor, and a descendant of a French Huguenot family that fled France during religious persecutions under Louis XIV.

After obtaining a Ph.D. at Munich, he completed a medical degree in 1830. Arriving in Paris in 1832, he worked with Cuvier and then became professor of natural history at Neuchatel in Switzerland.

While there he completed a massive study on fossil fish, which was published in 5 volumes between 1833 and 1844. Europe's leading scientist, Humbolt, paid to have it published. He later received the Wollaston Prize for this achievement. Then Agassiz began studying glaciers, and became the father of glaciology. Immense boulders had been carried into the valleys of Switzerland, and Agassiz decided that glaciers were responsible. If true, this meant that glaciers at some earlier time were much larger than today, and that they moved.

In the summer of 1836 and 1837 he explored glaciers and found evidence of that movement. The sides and ends of glaciers contained piles of rock. In addition, rocks had been scoured by glacial movement. He also found similar grooved rocks where no one remembered ever having seen glaciers. Then, two years later in 1839, Agassiz found a cabin that had moved nearly a mile since being erected in 1827. Next, he drove heavy stakes into the ground in a straight line across a glacier. Two years later, in 1841, he found that the stakes had formed a U shape. This meant that the center of the glacier was moving faster than the edges.

"Charles Lyell, who led out in encouraging "Charles Darwin to write his book Origin of the Species, was not happy with Agassiz' discoveries, for they disproved his concept of uniformitarianism, which theorized that no unusual changes had ever occurred in past time.

Acclaimed as one of Europe's leading scientists, Agassiz spent the last 27 years of his life in the United States, most of it at Harvard University as a professor. He spent his spare time studying glaciation and ancient lakes in North America.

When Charles Darwin published his book, Agassiz resolutely refused to accept it. In fact, he became the most prominent biologist in America to oppose it, just as Sir Richard Owen in England was the leading biologist in Europe to resist Darwin's theory of evolution by natural selection. Evolutionists today declare that creationists never make good scientists. But men such as Louis Agassiz prove them wrong.

BABBAGE-Charles Babbage (December 26, 1792 - October 18, 1871). English mathematician.

Charles Babbage was an earnest Christian who, as a youth, taught himself mathematics. Then he applied for and received permission to study at Cambridge University. While there, he founded the Analytic Society and gathered together young mathematicians who wanted to research more deeply into mathematics than had been done since the time of Newton.

Before long, Babbage became so prominent that he was elected to the Royal Society in 1816. Vigorously, he sought to encourage British scientists to do more advance work in mathematics. Practical as well as mathematical, Babbage devised new methods of mass production in post offices and public work places, using methods strikingly similar to those Henry Ford would later employ in America.

Babbage developed the first reliable actuarial (lifespan) tables, now in use by governments and insurance companies around the world. In 1847 he invented the first ophthalmoscope, for examining the retina of the eye.

A major achievement was his development of a calculating machine. Very much aware of the mathematical errors in astronomical data and logarithm tables, he devised a machine which could automatically calculate numbers. Obtaining the backing of the British government, he worked on the, machine for several years, and then hit on something totally new: a computer.

This entirely new concept, which forms the basis of the latter 20th century computer revolution, was keyed to punched cards directing the calculating machine in its operations, and enabling the calculator to do many functions beyond that of mathematical operations. He thought out many of the basic principles which guide modern computers. However, he only had machines with which to do it, not our present electronic gadgetry.

BOYLE-Robert Boyle (January 25, 1627 - December 31, 1691). English physicist and chemist.

Born into a wealthy home, Boyle early showed great brilliance. At the age of eight he was enrolled at Eton College, and then traveled through Europe with a private tutor. While in Geneva, during a terrible thunderstorm he determined to dedicate his life to God. For the remainder of his life he was an earnest Christian.

In 1654, supported by a liberal inheritance, he made his home at Oxford, began research with other scientists, and helped found the Royal Society. Boyle was ahead of his age in that he not only had a brilliant mind, but he also believed in experimentation and not just theory.

In 1657 he devised an air pump, and the vacuum produced by it was for a time called a Boylean vacuum. He was one of the first to make use of evacuated, hermetically sealed thermometers. Galileo had earlier said that in a vacuum all objects fall at the same velocity. Using an evacuated cylinder, Boyle was the first to verify Galileo's principle. He also demonstrated that sound could not be heard across a vacuum, while an electrical attraction could still be maintained.

Then he began research on gases. He was the first chemist to collect a gas. He discovered the inverse relationship of air pressure (called Boyle's law). He concluded from this that, since air was compressible, it must be composed of discrete particles separated by a void. Compression merely squeezed the particles closer together.

Boyle was the first scientist to carefully and thoroughly write down the process and results of each experiment, so it could be repeated by others. This was a major step forward in science.

By the publication of a book, which explained that basic elements could not be changed into one another, but could be combined into compounds, Boyle changed alchemy into the science of chemistry. He appealed to scientists to determine elements experimentally, not theoretically. He is today considered to be the father of modern chemistry.

Boyle was the first to distinguish between acids, bases, and neutral substances, and he pioneered the use of acid-base indicators. He was the first to discover that water expanded as (and just before) it froze.

Before Boyle's time, discoveries were often kept secret, but Boyle insisted that they be made public as soon as possible to aid scientific research.

Robert Boyle was deeply religious, and later in life learned Hebrew and Aramaic to aid him in his Biblical studies. He wrote essays on religion and financed missionary work in the Orient. In his will, he founded the Boyle Lectures to defend Christianity against atheism.

BRAUN- Warnher Magnus Maxmillian von Braun (March 23, 1912 - June 16, 1977). German-American rocket engineer.

Von Braun was educated in Zurich, and completed his doctorate at the University of Berlin in 1934. Fascinated with rocketry, he began research into them. One went a mile high. The German government took over the project, and a rocket research center was built in Peenemunde on the Baltic, and by 1940 Von Braun was in charge of it. But Hitler did not like his views and he was briefly imprisoned in 1944, till Hitler was persuaded that the rocket program could not continue without Von Braun's brilliance.

When the war ended, Von Braun and many of his colleagues fled westward to surrender to the Americans. Now he was free to express openly his Christian beliefs. The United States government, recognizing that he was the leading rocket scientist in the world, appointed him to head up the Huntsville Research Center that placed America's first satellite (Explorer I) into orbit on January 31, 1958. In 1962, his team began construction of the Saturn 5 rocket that eventually carried men to the moon.

BREWSTER-Sir David Brewster (December 11, 1781 - February 10, 1868). Scottish physicist.

Son of a schoolteacher, Brewster was educated for the ministry but, although a fervent Christian, went into scientific research instead.

In 1815 he found that a beam of light could be split into a reflected portion and a refracted portion, at right angles to each other, and that both would then be completely polarized. Still known as Brewster's law, it earned him the

Rumford medal in 1819.

In 1816, Brewster invented the kaleidoscope. Later still, he produced the stereoscope, which produces three-dimensional pictures. He helped found the British Association for the Advancement of Science in 1831, and was knighted in 1832.

EULER-(Ol'ler) Leonhard Euler (April 15, 1707 - September 18, 1783). Swiss mathematician.

Euler was deeply religious from his youth, and considered entering the ministry as his father had done, but his mathematical brilliance led him into science instead.

Euler has been considered the most prolific mathematician of all time. He wrote extensively on every branch of the subject and was always careful to explain what he had done, and every false path he had entered in the course of his investigations. In 1766, he became blind, but this hardly slowed his work. In addition to all he had previously learned, he could remember several pages of newly-researched formulas. During his lifetime he published 800 scientific papers, many quite lengthy. At his death, he left behind so many additional papers that it took 35 years for mathematicians to process and print them.

He applied mathematics to astronomy, replaced the geometric proof methods used by GaliIeo and Newton with algebraic proofs, did advance research into lunar motions, was the first to announce that light was a wave form and that color depended on wavelength. We could fill all three of these books, plus many more with all the discoveries of this earnest creation scientist.

FARADAY-Michael Faraday (September 22, 1791 - August 25, 1867). English physicist and chemist.

Faraday was an earnest creation scientist, as well as one of the greatest scientists of all time. Without his research and discoveries, the 20th century would be far different.

He came from a poor family, and was apprenticed to a book binder. But his keen mind soon took him into scientific research.

This brilliant, self-taught scientist first devised methods for liquefying gases such as carbon dioxide, hydrogen sulfide, hydrogen bromide, and chlorine under pressure. He was the first to produce lab temperatures below O°F. In 1825 he discovered benzene, improved Davy's initial studies on electrolysis, and developed what are now called Faraday's laws of electrolysis which established the connection between chemistry and electricity, putting electrochemistry on a solid basis.

In 1821, Faraday showed that a current of electrified wire around a magnet could convert electrical and magnetic forces into continual mechanical movement. This provided the basis of modern electric motors. Later research that he did, produced open and closed circuits, electric induction, and the first transformer. Faraday was the first to discover magnetic lines of force and the magnetic field.

Interestingly enough, Faraday was the greatest scientist in history who knew no mathematics- He was entirely self-taught. Maxwell, another creation scientist, was later to devise the mathematics of electromagnetism-and in doing so arrived at the same conclusions that Faraday had. In 1831 Faraday produced the first electric generator. It is considered to be the greatest single electrical discovery in history. Later expansion of this discovery made it possible to produce large amounts of inexpensive electricity, whether it be coal-fired, hydroelectric, or nuclear-generated. Because of it we now have electrified cities, offices, factories, and homes.

FLEMING-Sir John Ambrose Fleming (November 29, 1849 - April 18, 1945). English electrical engineer.

Fleming was the brilliant son of a Congregational minister. After completing university work at Cambridge, he worked with Edison Electric for a time, and then with Marconi. After this, he set out on his own to advance the research of both scientists.

He found that the Edison effect (the passage of electricity from a hot filament to a cold plate within an evacuated bulb) to be caused by electrons boiling off the hot filament. This helped clarify certain important facts about alternating current. In 1904 he developed the rectifier. (De Forest, in America, added a grid to it, and this made electronic instruments practical.)

Fleming was knighted in 1929, and lived to be nearly 100.

GESNER-(Guess'ner) Konrad von Gesner (March 26, 1516 - December 13, 1565). Swiss naturalist and natural historian.

Gesner was the son of a furrier killed in the religious wars, and the protégé of the Protestant reformer, Ulrich Zwingli. In 1541, Gesner obtained a medical degree at the University of Basel and became a physician.

In his time, he was known as a master of erudition, for he spent his time researching and collecting a wide variety of natural materials: plants, animals, rocks, fossils, etc. He wrote extensively, and discovered over 500 species hitherto unknown.

GUTENBERG-(Goo'ten-berg) Johannes Gutenberg (c. 1398 - c 1468). German Inventor. Gutenberg ranks as one of the most influential men of all history. His invention of the basics of the printing press laid the basis for all modern research, transmission of knowledge, invention, and modern life.

Gutenberg is often called the inventor of printing. What he actually did was to develop the first method of utilizing moveable type and the printing press in such a way that a large variety of written material could be printed with speed and accuracy.

For thousands of years men had used seals and signet rings, which work on the same principle of block printing. Block printing could print a book, but required a completely new set of carved blocks for each new book. Gutenberg made movable type-each letter of the alphabet was a separate block. But he also did far more. Modern printing required movable type, along with some procedure for setting it and fixing it in position. The printing press itself was needed. Special inks were required. And, last, paper was needed.

Gutenberg already had the paper available to him, and some work had earlier been done on the other aspects. But he made brilliant improvements on each of the first three-and succeeded where others before him had failed.

Gutenberg developed a metal alloy suitable for type. He made a mold for casting blocks of type precisely and accurately. He made an oil-based printing ink. He made a press suitable for printing. But Gutenberg did far more: he combined them all into a complete manufacturing process. Mass-production of books, pamphlets, and tracts was needed, and Gutenberg supplied it.

When Gutenberg lived, China and Europe were about equally advanced. But within 50 years after Gutenberg introduced high-speed printing to the West, Europe shot ahead. Gutenberg's invention was not the only reason for this, but it was a major one.

HENRY- Joseph Henry (December 17,1797 - May 13, 1878). American physicist.

Like Faraday, Henry came from a poor family, had little schooling, and had to go to work while young. Also, like Faraday, he became interested in electrical experiments. Trying to wrap additional wires about a magnet to induce a greater magnetic field, he found he could not do so because the wires touched and short-circuited. So he began producing home-made insulated wires. He was now able to make powerful electromagnets. In 1831 he developed one that could lift 750 pounds (Sturgeon had earlier lifted 9 pounds). At Yale, later that year, using an ordinary battery he lifted more than 2,000 pounds of iron. In 1832, he was accepted as a professor at Princeton.

By 1831, he was sending signals over a mile by small, insulated wires. One problem was that, according to Ohm's law, the longer the wire, the greater its resistance and the smaller the current flowing through it. So Henry invented the electrical relay in 1835. This enabled the signal to be sent much greater distances than otherwise possible.

In effect, Henry had invented the telegraph. But he did not patent any of his devices, and it was Morse, another creation scientist, who worked out the details to put the first telegraph to practical use (in 1844). Henry freely helped Morse develop it.

In England, Wheatstone, after a long conference with Henry, produced a second telegraph. In 1830, he discovered the principle of induction (an electric current in a coil can induce a current not only in another coil, but in itself). In 1831, he published a paper describing an electric motor. An electric motor is the opposite of an electric generator: In a generator, mechanical force turns a wheel and produces electricity; in a motor, electricity turns a wheel and produces mechanical energy. One creation scientist (Faraday) had invented the generator to produce the electricity; another one (Henry) described the motor to use that electricity. The two inventions together have changed all modern civilization.

By means of an ingenious experiment in 1846, Henry demonstrated that sunspots were cooler than the rest of the sun.

In 1846, he was elected first secretary of the newly-formed Smithsonian Institution, and quickly made it a clearing house for scientific information. He also helped found the National Academy of Sciences, and was one of its first presidents.

Later still, he set up a system of obtaining weather reports from all over the nation. When the U.S. Weather Bureau began, it used his system. At the funeral of this creation scientist, high government officials were in attendance, including President Hayes.

HERSCHEL-Sir William Herschel (November 15, 1738 - August 25, 1822). German-English astronomer.

In 1757, at the beginning of the Seven Years' War, Herschel's parents managed to send him to England, where he remained the rest of his life. He began his career by becoming a well-known organist and music teacher. Then he taught himself Latin and Italian. The theory of musical sounds led him to a study of optics, and a desire to see the heavens through a telescope. Not able to afford a telescope, he learned how to grind lenses, and then he made his own.

He refused to be satisfied with his first lens, until he had made 200 of them! Then he was ready to produce them perfectly. In 1772, he brought his sister Caroline over from Germany, and she proved an earnest fellow worker in lens grinding and telescope making. Eventually, the pair were producing the finest telescopes available anywhere. By 1774 they were producing the best refracting and reflecting telescopes in the world.

But that was not good enough. Herschel decided to systematically scan the heavens through his marvellous telescopes. Soon he began turning out the first of hundreds of scientific papers and articles on his findings on the mountains of the moon, variable stars, the possibility that sunspot activity could affect agriculture on earth, and more besides.

In 1781, Herschel discovered a new planet which he named Uranus. He was to become the most important and successful astronomer of his time, yet he was entirely self-taught in that occupation. He was the first to discover binary stars, and found 800 of them. He was the first to systematically report on the periods of variable stars, and the first to discover that our solar system was moving in a certain direction (toward the constellation Hercules). He catalogued 2500 cloudy objects, which he called *galactic clusters.* In 1787 he discovered two of Uranus' moons, and, after constructing a 48-inch reflector, on the first night of viewing found two new moons of Saturn. He was the first to time the rotation of Saturn and ascertain that its rings rotated also.

In 1800, he tested various portions of the sun's spectrum for heat, and found that the hottest was just off the red end; he had discovered infrared radiation. In 1816, this creation scientist was knighted.

JOULE-(Jowl or Jool) James Prescott Joule (December 24, 1818 - October 11, 1889). English physicist.

Born into wealth, Joule was frail in health and weakened by a spinal injury in childhood. His father encouraged him to rest and spend his time in study and research, which he so much enjoyed. Supplied with a home laboratory, he was largely self-educated. Above all, Joule loved to measure things. Soon he was publishing papers on heat production by electric motors, the formula for the development of heat by an electric current. Although he later had to manage his father's business, Joule still found time to continue his research. He spent ten years measuring the heat of every process he could think of. In it all, he carefully calculated the amount of work that had entered the system, and the amount of heat that came out. Consistently, a certain amount of work always produced a certain amount of heat, and the formula was called the *mechanical equivalent of heat.*

For years, Joule's discoveries and reports were snubbed by the scientific community because of his lack of formal education. Fortunately, his work eventually came to the attention of William Thomson (later known as Lord Kelvin), who helped him become accepted. The later formulation of the First Law of Thermodynamics (on the conservation of energy) was partly based on Joule's determination of the mechanical equivalent of heat. Consistently thereafter, through the work of such men as Einstein and Pauli, the First Law has been re-established more and more firmly.

Joule collaborated with Thomson in 1852 in analyzing the temperature of gas when it expands, and discovered that freely-expanding gas always falls in temperature. Knowledge of this formula, the *Joule-Thomson effect,* enabled later researchers to obtain extremely low temperatures.

Although living at a time when Darwin's theories were gaining in popularity, Joule, Kelvin, and many other scientists remained conscientious creation scientists. In 1850 Joule was elected to the Royal Society; in 1866 he received its Copely medal; in 1872 and 1887 he was made president of the British Association for the Advancement of Science; and in 1878, he received a lifetime pension from Queen Victoria.

HARVEY-William Harvey (April 1,1578-June 3, 1657). English physician.

Harvey studied medicine at two of the leading European medical schools: Cambridge and Padua. Harvey was in Italy during the time that Galileo went through his heliocentric crisis with the authorities.

Returning to England in 1602, he became a well-known physician (Francis Bacon was one of his patients), and was eventually appointed court physician to James I and Charles I.

Yet, in spite of this success, Harvey was more interested in medical research than regular practice. In the first 14 years of his medical practice (1602-1616), he had, on the side, dissected over eighty species of animals. A special interest of his was the heart and blood vessels. Other researchers had tried to figure out the purpose of the heart and blood vessels, but it was Harvey that solved the problem. His great asset was persistence and research, instead of speculation and glances at anatomy.

After years of careful examination, Harvey correctly decided that the heart was a muscle; actually a blood

pump. He was astounded at the high degree of planning and intelligence that must have gone into making it in the beginning.

Through actual dissection, he found that the valves which separated the two upper chambers (auricles) of the heart from the two lower chambers (the ventricles) were one-way valves. Blood could go from auricle to ventricle, but not back again.

Then he carefully examined the veins and found that the valves in them, which Fabricius had earlier discovered, were also one-way! This meant that blood in the veins could only travel toward the heart, not away from it. (In later years, Harvey told young Boyle, another creation scientist that it was the valves in the veins which convinced him he was on the right track in his research.)

HOOKE-Robert (July 18, 1635- March 3, 1703). English physicist.

Even in childhood Hooke was recognized as brilliant. Scarred by smallpox, he attended Oxford. In his early 20s, he teamed up with fellow creation scientist, Robert Boyle, in developing the air pump. In 1663 he became a member of the Royal Society, and later became an influential officer. He was an ingenious and capable experimenter in almost every field of science. He did theoretical research into the wave theory of light, gravitational theory, steam engines, and the atomic composition of matter. He was the second to discover a double star. He studied the action of springs and formulated what is today known as Hooke's law. His analysis of the expansion and contraction of spiral springs made possible wristwatches and ship's chronometers with "hairsprings;" no longer were bulky clocks and their pendulums required.

Hooke did outstanding work in the field of microscopy and insects. His data and illustrations were unrivaled in his time. During his discovery of the porous structure of cork, he gave the microscopic holes a new name: cells, which has became a basic word in biology.

It needs to be understood that in Harvey's day, scientists assumed that the blood just sloshed back and forth through the arteries and veins. But Harvey calculated that in one hour the human heart pumped a quantity of blood that was equal to three times the total weight of a man! Since blood could not possibly be formed that rapidly, it had to be the same blood which was being pumped out of the heart through the arteries and then flowing back in through the veins. Blood did not slosh, it circulated.

Harvey also tied off an artery and noted that only the side toward the heart bulged. When he tied off a vein, the side away from the heart bulged.

As early as 1616, he began lecturing on these principles, but it was his 72-page book, Exercitatio De Motu Cordis et Sanguinis (On the Motions of the Hearth and Blood) published in 1628, which settled the matter. Among professionals, this book was to became famous.

But not at first. Harvey received ridicule, patients stopped coming, and learned physicians wrote articles and books against him. Men of science denounced him as a quack. Interestingly enough, their scientific evidence consisted of the theories of Galen, a Greek physician who lived 1400 years earlier! This reminds us of the current controversy over evolutionary theories, which are also based on assumptions and not facts.

By the time Harvey was old, his discoveries were accepted nearly everywhere.

Interestingly enough, there was one loophole in his position: nothing was known about how the blood got from the arteries to the veins. The arteries became smaller and smaller until they could no longer be seen, and then extremely tiny veins appeared out of nowhere. Four years after Harvey's death, Malpighi, another creation scientist, applied the microscope to the wing of a bat-and discovered capillaries-the extremely tiny tubes that connect the arteries with the veins. We now know that those capillaries are so small that the blood cells pass single file through them. Harvey was also one of the first researchers to study the development of the chick within the egg. Harvey was elected president of the College of Physicians in 1654, but declined because of his age.

KELVIN-Lord Kelvin (William Thomson; June 26, 1824 - December 17, 1907). Scottish mathematician and physicist.

The son of an eminent mathematician, Kelvin was an infant prodigy who, by the age of eight, was carefully listening to his father's mathematics lectures. At eleven he entered the University of Glasgow, and finished second in his class in mathematics. After that he studied in Cambridge and then in Paris.

Kelvin collaborated with Joule, another creationist, in discovering the *Joule-Thomson effect.* After researching further into the temperature drop of gas, Kelvin announced in 1848 that the lowest possible temperature that could be achieved was -273°C. It was later discovered that this temperature *(absolute zero,* or 0°K) applied to all matter, not merely to certain gases. Scientists working with low temperatures regularly use the *Kelvin scale,* which uses the same graduation marks as the centigrade scale. The motion *(kinetic energy;* a term introduced by Kelvin), of molecules becomes virtually zero at absolute zero.

The First Law of Thermodynamics specified that energy is never actually lost. Kelvin helped in formulating that law. In 1951 Kelvin deduced from Carnot's work that all energy, even though not lost, gradually becomes unusable. This is the *Second Law of Thermodynamics.* Everything in the universe is gradually running down, or, to say it another way, is gaining *entropy.*

Kelvin invented improvements in cables and galvanometers, in order to make possible the laying of the Atlantic cable. He introduced Bell's telephone into England, and in 1866 was knighted. He improved the mariner's compass, devised new types of sounding gauges, tide predictors, and many other things. He was buried in Westminster Abbey next to Newton.

KEPLER- Johann Kepler (December 27, 1571 - November 15, 1630). German astronomer.

As a child Kepler had smallpox which damaged his body and weakened his eyes. Attending the University of Tubingen to study for the ministry, his brilliance in mathematics was soon recognized. By 1594 he was teaching science at the University of Graz in Austria.

In 1598, he went to Prague and began working with the aged Tycho Brahe. On Tycho's death, all his research papers passed to young Kepler. This represented a lifetime of careful measurements of the apparent motions of the planet Mars. Repeatedly, Kepler tried to figure out how this data could be properly interpreted by mathematics and geometry. He found that the planet moved in an ellipse, or somewhat flattened circle, about the sun. He then applied this concept to data for other planets and their moons.

Kepler also described improvements in telescope manufacture, including double convex lenses, and a compound microscope. In addition, he showed that a parabolic mirror focused parallel rays of light, thus laying the basis for optics and Newton's work.

Using the newly-developed logarithms, he completed revised **tables of planetary motions, and** produced a star map. He **also calculated the** transits of the inner planets in front of the sun. After his death, his calculations were shown to be correct.

LISTER-Baron Joseph Lister (April 5, 1827 -February 10, 1912). English surgeon.

The son of the inventor of the achromatic microscope, Lister studied medicine and became a surgeon. He was thankful he could use the newly-developed technique of anesthesia during operations and amputations. But he was concerned that so many patients died afterward from infections.

Learning of the research work of another creation scientist, Pasteur, he decided to try to kill any germs present at the time of the incision. For this purpose he used carbolic acid (phenol) in 1867, and deaths by infection stopped.

He had thus founded the science of antiseptic surgery, and later research by other scientists improved on the means of doing it.

He was the first physician to sit in the House of Lords, and in 1885 succeeded Kelvin as president of the Royal Society.

MARCELLO MALPIGHI (Mahl-pee'gee) Marcello Malplghl (March 10, 1628 - November 30, 1694). Italian physiologist.

Malpighi is known as the father of microscopy because of his pioneer research with the newly-invented microscope. A physician by training, he lectured at various Italian universities and carried on basic microscope research.

In 1660 he showed that, in the frog, the blood flowed through a complex network of vessels over the lungs. This discovery explained how, through breathing, the blood could carry oxygen throughout the body.

Malpighi's observations of a bat's wing membranes revealed the finest blood vessels, which were eventually named capillaries. These connected the smallest arteries with the smallest veins. This discovery explained the missing link in Harvey's theory of the circulation of the blood.

He studied chick embryos and the respiratory vessels in insects, and found the stomata-small openings-on the underside of leaves.

MAURY-MATTHEW FONTAINE- Maury (January 14, 1806 - February 1, 1873). American oceanographer.

In 1830, at the age of 18, Maury entered the U.S. Navy, and we never would have heard more about him if he had not been lamed in a stagecoach accident in 1839. He was retired from active duty and given an office job as superintendent of the Navy Depot of Charts and Instruments.

Frankly, nothing was expected of him, but Maury surprised everyone and did a prodigious amount of work. He studied ocean winds and currents, and distributed specially-prepared logbooks to captains of ships so he could collect further data. He studied the Gulf Stream, and called it "a river in the ocean." His research received international recognition because ocean voyages were shortened as captains were now able to work with the currents instead of fighting them.

In 1850 he developed a set of ocean depth charts of the Atlantic to aid in the laying of the transatlantic cable. Recognizing that international cooperation was needed to properly study the ocean, he convened an international conference, which was held in Brussels in 1853.

The work of Maury laid the foundation of the United States Naval Observatory, and he is considered the father of oceanography. To the consternation of many scientists, however, he refused to accept evolutionary teachings.

In later years, he invented an electric torpedo and taught physics at the Virginia Military Institute. He is honored today by Maury Hall at the Naval Academy at Annapolis. In 1930 he was elected to the Hall of Fame for Great Americans.

MAXWELL-James Clerk Maxwell (November 13, 1831 • November 5, 1879). Scottish mathematician and physicist.

Early recognized as having unusual mathematical ability, he contributed a paper on oval curves to the Royal Society of Edinburgh. It was so well done that they refused to believe that a 15-year old had produced it.

In 1857, Maxwell showed that the rings of Saturn consisted of particles, instead of being solid or liquid.

Analyzing movement of gas particles in 1860, he co-developed the *Maxwell-Boltzmann kinetic* theory of gases in relation to temperature. This showed that temperature and heat were velocity of molecules and nothing else.

Maxwell conceived a theory of color perception which was to form the basis for the later development of color photography.

Between 1864 and 1873, he placed into mathematical form the lines of force found in a magnetic field. His work verified that electricity and magnetism always exist together, so his work is usually referred to as the electromagnetic theory.

Maxwell showed that the speed of electromagnetic radiations was constant, that it was equivalent to the speed of light, and that that speed was 300,000 kilometers per second [186,000 miles per second]. (It has since been refined to 299,792.5 kps [186,282 mps].) Because the speed of light was identical to other radiations, he decided that light itself was produced by an oscillating electric charge. Later researchers found that to be correct. Maxwell also predicted that many other radiations would be found-far beyond the infrared and ultraviolet, which were yet unknown that has proven true also.

MERCATOR-(Mer-kay'ter) Gerardus Mercator (March 5, 1512 - December 2, 1594). Flemish geographer.

The great voyages of discovery had begun by the time Mercator graduated from the University of Louvain in 1532. Good maps were necessary, and so the young man founded a geographical institute at Louvain University two years later.

He began the preparation of a lengthy series of maps, using instruments that he himself designed, plus a lot of mathematical calculations. Religious persecution nearly cost him his life, so he fled to Protestant Germany in 1552 and there continued his work as cartographer to the Duke of Cleves.

In 1568, he made his great improvement in mapmaking. Drawing flat maps of spherical surfaces is difficult, but Marcator devised a way to partially do it. He made a cylindrical *projection*, today known as a Mercator *projection. This* is the shape of the world most often seen on a world map.

To understand it, take a globe of the world and place a light at the center of it. Then place a cylinder of paper around it which only touches the sphere at the equator. The light shining through the globe traces an image onto the rolled-up paper. THAT is the Mercator projection. All the meridians of longitude (north-south lines) are equidistant and parallel, and the parallels of latitude run horizontal and parallel. The result is a round world portrayed on a flat map. As one goes farther north or south the east-west distances become wider than they really are, and the latitudinal (east-west) lines gradually lengthen the closer they are to the poles. The result is that such places as Antarctica, Canada, Greenland, and the northern Soviet Union are portrayed much larger than they actually are.

But there was a decided advantage for navigators, in that, following a constant compass direction, a route appeared straight on a Mercator projection, but curved on any other.

NEWTON- Sir Isaac Newton (December 25, 1642. March 20, 1727). English scientist and mathematician.

In childhood, this frail child occupied himself constructing devices such as sundials, kites, and water clocks. In school he seemed somewhat slow. Then he was taken out of school to help on the farm, but his uncle, a college teacher thought he might have ability and urged the family to send him to Cambridge. While there he was an average student, who worked on little projects in his room.

Sent home to escape the plague, which had arrived in London, he had already in his spare time worked out the very important binomial theorem in mathematics,-a formula of great importance which no one before his time had ever thought of. On his grandmother's farm he one day watched an apple fall from a tree, and began to think through gravity. (Newton was strictly honest, and he himself said the apple story was true.)

This young man decided that "the rate of fall was proportional to the strength of the gravitational force and that this force lessened according to the square of the distance from the center of the earth." That was his famous Inverse square law. Yet Newton questioned whether he could be right, so he set that idea aside for 15 years, until he had developed an entirely new mathematical system for reanalyzing such problems.

At this same time, the 23-year-old Newton conducted experiments on the farm, which were scientific breakthroughs in the field of optics. Among other things, he discovered that white light contained all the colors, and the prism merely separated them. When his experiments became known, Newton became famous. Returning to Cambridge, he remained there for 30 years. At the age of 27, he became a professor of mathematics at the school. He was only required to give about eight lectures a year; the rest of the time he could spend in research. Elected to the Royal Society in 1672, he went on to invent calculus.

Then he developed the particle theory of light, and turned his attention to telescopes. Refractors were getting about as large as they could without producing aberrations, so he invented the reflecting telescope, which used mirrors instead of lenses.

In 1684, Christopher Wren, the well-known architect, offered a reward to anyone who could solve the problem of the laws governing the motion of heavenly bodies. Halley (the one who predicted the return of the comet bearing his name) asked Newton if he could solve it. He replied, yes, he already had-20 years before, while back on his grandmother's farm after that apple fell!

Halley then asked him how did the planets move, and Newton replied, "In ellipses." "How do you know?" "Why, I calculated it" was the reply. Urged by Halley to work out the calculations again, and this time write them down, Newton wrote a book. Eighteen months later Principia Mathematlca was published. It is generally considered the greatest scientific work ever written. Later in life, Newton wrote a large book of commentary on the Bible, which he had a deep respect for. He said that the Bible contained solid, worthwhile principles which helped people, and which had greatly helped him think more clearly and live a better life.

In 1696, a Swiss mathematician challenged Europe's scholars to solve two problems. The day after Newton saw it, he anonymously mailed him the correct answers. Upon reading them, the challenger said, "I recognized the claw of the lion." In 1716, when Newton was 75, Leibniz stated an extremely difficult mathematical problem specifically to stump Newton. Newton solved it in an afternoon.

In 1696, this highly-honored creation scientist was appointed master of the British mint-and reorganized that branch of the government. In 1703, he was elected president of the Royal Society. In 1704 he wrote Optlcks, to summarize his research in that field. In 1705 he was knighted by the queen. At his death he was buried in Westminster Abbey. The atheist, Voltaire, who was visiting London at the time, said, “England honors a mathematician as other nations honor a king."

Two famous statements by Newton are worth repeating: "If I have seen further than other men, it is because I stood on the shoulders of giants."

"I do not know what I may appear to the world; but to myself I seem to have been only like a boy playing on the seashore, and diverting myself in now and then finding a smoother pebble or a prettier shell than ordinary, whilst the great ocean of truth lay all undiscovered before me."

MORSE-Samuel Finley Breese Morse (April 27, 1791 - April 2, 1872). American artist and Inventor.

He started out as a successful artist who made little money. But then, in the 1830s, he started carrying out electrical experiments. Morse decided to build an electrical telegraph, but quickly realized he lacked the electrical knowledge to do so. By accident he met the creation scientist, Joseph Henry, who patiently over a period of time answered every question he put to him.

Morse then decided to obtain financial backing for his project, and had the bulldog determination needed to carry it through to completion. After patenting the device in 1840, he lobbied Congress into appropriating $30,000 to

construct a 40-mile telegraph from Baltimore to Washington. Completed in 1844, it worked. The first message, sent by Morse in a dot-and-dash code he had devised, was “What hath God wrought?"

NAPIER-(Nay'pee-ur) John Napier (1550 -April 4, 1617). Scottish mathematician.

Napier, who grew up amid religious warfare in Scotland, was an earnest Christian. In 1594 he devised the exponential method of expressing numbers (22 5 4; 23 5 8; etc.), and spent 20 years working out complicated formulas for obtaining exponential expressions for various numbers, including trigonometric functions needed so much in astronomical calculations.

He called these new numbers logarithms, or "proportionate numbers." In 1614, he published his tables of logarithms, which were not improved on for over a century. Scientists everywhere eagerly grasped them. Now it was possible to do complex multiplication and division, simply by adding or subtracting numbers.

Napier became famous for his logarithms, so much so that few today remember that it was Napier who also invented the decimal point-and thus gave us decimal fractions.

PASCAL-(Pas-kal') Blaise Pascal (June 19, 1623-August 19,1662). French mathematician and physicist.

Pascal was a sickly child that nearly died in infancy. But he was later seen to be a mental prodigy. By the age of 9, he was reinventing Euclid's first 32 theorems; at 16, he published a book on conic sections that was more complete than that of anyone before his time. When he was 19, he had invented a calculating machine operated by cogged wheels which could add and subtract. Pre-electronic cash registers in the 20th century were based on it.

Shortly after that, he laid the basis of the modern theory of probability. Turning to physics, Pascal studied fluids and came up with Pascal's principle, which is the basis of the hydraulic press, which Pascal then described in theory.

Turning to the atmosphere, Pascal correctly theorized the relation of atmospheric weight to altitude, and predicted that a barometer could identify altitude by sensing atmospheric weight. This was shortly afterward proven.

In 1654, Pascal decided to devote the remainder of his life to religious studies, and, after a lifetime of being chronically ill, he died at the age of 39.

PICARD-(Pee-kahr') Jean Picard (July 21,1620 - July 12, 1682). French astronomer.

Picard was a creation scientist who first became an astronomer, and later in life became a priest. In 1655 he became professor of astronomy at the College de France and was one of the charter members of the French Academy of Sciences. He helped found the Paris Observatory, and searched through Europe for capable men to work in it.

Picard was the first astronomer to use the telescope-not merely for observation-but for the accurate measurement of small angles. He also obtained the best clock mechanisms available to record time and time intervals in astronomic observations.

Picard was the first person since the Greeks to measure the earth with any accuracy. Using a star instead of the sun, Picard arrived at almost the exact measurement.

PRIESTLY-Joseph Priestly (March 13, 1733 -February 6, 1804). English chemist.

Priestly was frail, but early revealed a brilliance of mind. In his youth he studied a variety of languages, ancient and modern, but never studied science formally. Yet it was in that field that he did his outstanding work.

In 1766 he met Benjamin Franklin who was in London in a vain effort to solve the taxation problem and avert the Revolutionary War. As a result, Priestly decided to enter a career in science.

Priestley researched into electricity and was the first to discover that carbon is an electrical conductor. He then wrote an important history of electrical research in 1769, followed by another on the history of optics. He predicted that electricity would eventually become important in chemical research.

Fermenting a grain produces a certain gas. Priestly noted that this gas snuffed out flames, was heavier than air, and part of it dissolved in water. Priestly had found carbon dioxide. Priestly studied more gases and found nitrous oxide, ammonia, sulfur dioxide, and hydrogen chloride. He also isolated oxygen.

Later he investigated and named rubber from a South American tree recently brought to Europe.

PASTEUR-(Pas-teur') Louis Pasteur (December 27, 1822 - September 28, 1895). French chemist.

Pasteur was an average student in school, although showing talent in mathematics. He was interested in art and wanted to become a professor of fine arts. But then he attended a series of chemistry lectures by Jean Dumas, and was determined to succeed as a chemist. Immediately his grades in science classes improved.

Upon graduation, this creation scientist began a lifetime of top-flight research work. He received the Rumford medal from the Royal Society for his first research work (separating tartaric acid crystals into both clockwise and counterclockwise planes under polarized light). Ten years later he showed that living creatures only have left-handed amino acids. The implications of both discoveries were important, because of what they revealed about the shape of molecules.

These and similar chemical discoveries gave him a succession of professorial appointments and made him a member of the Legion of Honor. But his research discoveries in biology and medicine were to far overshadow in importance what he had accomplished in chemistry.

In 1856, a Lille industrialist asked the young chemist to solve the problem of why certain liquids (such as wine, beer, and milk) fermented, and what could be done to prevent it. Under the microscope, Pasteur found that such liquids normally contained different types of yeast cells, that fermentation did not require oxygen, and that it was lactic acid yeast which was causing the souring. The solution he offered was to gently heat the liquid to 120°F. He said that this would kill any yeast in the solution, and, if immediately stoppered, the liquid would not sour. That process is today called pasteurization.

Then Pasteur chose to step into a full-blown controversy over the origin of life. The aged Biot warned him to stay out of it, but Pasteur ignored the warning. Because this point is a subject of concern in this present three-volume set of books (especially chapter 9), we will view it here in some detail:

A century earlier, Lazzaro Spallanzani had run experiments showing that when a vessel is heated, no life afterward forms within it. But in Pasteur's day, the spontaneous generation advocates-especially Ernst Haeckel-maintained that Spallanzini had, by his experiments, destroyed vital principles in the air-and this prevented lifeless chemicals from changing into living creatures.

Pasteur was a fervent creation scientist, and he was determined to enter this controversy. He was certain that there was no evidence that life sprung spontaneously from chemicals. So he devised an experiment in which the air in the vessel was not heated.

Pasteur showed that dust in the air included spores of living organisms and that by introducing dust into nutrient broths he could cause the broth to swarm with organisms. The next step, then, was to show that if the dust was kept out, no organisms could form in the broth. In 1860, the year after Darwin's book was published, Pasteur boiled meat extract and left it exposed to air, but only by way of a long, narrow neck bent down, then up. Although unheated air could circulate throughout the tube, the dust particles would settle in the entry-way bottom curve. As a result, the meat extract did not spoil; no decay took place; no organisms developed. Haeckel could not say that "vital principles" in the air had been destroyed by heating the air.

Pasteur announced the results at a meeting of the Sorbonne on April 9, 1864. A committee of scientists, under the direction of Dumas, studied the experiments and found them conclusive. There was no doubt that Pasteur was right and that the theory of "spontaneous generation" had been disproved.

This experiment, incidentally, greatly helped scientists develop better techniques for sterilizing nutrient cultures, and thus aided the science of bacteriology.

By this time, Pasteur was considered the greatest chemist in all of France. In 1862, a disease in southern France threatened to wipe out the silkworm industry. Traveling south, Pasteur examined the silkworms with his microscope, and found a tiny parasite was infesting both the worms and the mulberry leaves that were fed to them. Pasteur ordered all infested plants and worms immediately destroyed. This was done and the silkworm industry in France was saved.

Pasteur's attention was now fully turned toward communicable disease, and he developed the germ theory of disease, which said that germs could cause disease and they could be passed from one person to another.

During the Franco-Prussian War, he urged physicians to boil their military hospital instruments and steam their bandages in order to prevent death by infection. To whatever extent this was done, outstanding success followed. So in 1873, Louis Pasteur, who had no medical degree, was made a member of the French Academy of Medicine. .

Next he studied anthrax, a fatal domestic animal disease. He determined that infected animals must be killed and buried deep, and any animal surviving it would thereafter be immune. Pasteur then developed a vaccine to inoculate the herds. Similar methods were established against chicken cholera and rabies (hydrophobia). As a result of his work, the Pasteur Institute was established in 1888.

RAMSAY-(Ram'zee) Sir William Ramsay (October 2, 1852 . July 23, 1916). Scottish chemist.

Ramsay was the son of a civil engineer, and had a strong body, and good mechanical and thinking ability. After studying chemistry, he took positions at various British colleges and universities.

Researchers had found that a mystery was connected with nitrogen, and Ramsay suspected that another gas was mixed with it. In 1894 he experimented and found spectroscope lines of what clearly was' a new gas. He named it argon.

The next year he found helium. It had earlier been named when found in spectra of sunlight. In 1898 he found the rare gases neon, krypton, and xenon. In 1903 he helped another researcher who found the last of these Inert gases, radon. Knighted in 1092, he received the Nobel Prize in 1904.

RAYLEIGH-Lord Rayleigh (John WIlliam Strutt; November 12, 1842 - June 30, 1919). English physicist. Born into wealth, he showed remarkable mathematical ability at Cambridge. Elected to the Royal Society in 1879, he succeeded Maxwell, another creation scientist, as director of the Cavendish Laboratory at Cambridge the same year. Research into wave motion became his specialty. He worked out an equation of the variation between light-scattering and wavelength of electromagnetic waves. This confirmed that it was light-scattering in the atmosphere which caused the sky to appear blue. He next developed equations for black-body, long-wave radiation wavelength distribution.

Rayleigh studied sound waves, water waves, and earthquake waves. His work, along with that of Rowland in America, established accurate determinations of absolute units in electricity and magnetism.

Turning next to chemistry, he found that the atomic weights of oxygen and hydrogen was not 16:1, but 15.882:1. This led him to the discovery that nitrogen sometimes had the wrong weight. Ramsay, another creation scientist, checked into that and found that a new gas, argon (which constitutes about 1 percent of the atmosphere), had been included in the weight of atmospheric nitrogen.

Rayleigh received the Nobel Prize in 1904, and the next year was elected president of the Royal Society. In 1908, he became the chancellor of Cambridge University.

REDI-(Ray'dee) Francesco Redi (February 18, 1626. March 1. 1697). Italian physician.

Redi received a medical degree at the University of Pisa in 1647. In the year 1668, he performed a very important scientific experiment.

For thousands of years, people thought that small creatures, such as worms, frogs, and flies, automatically came to life when manure, mud, pond water and similar non-living substances changed into these living organisms!

This theory was called spontaneous generation. Common folk and deep thinkers (including Aristotle) believed in spontaneous generation. One of the best examples, in their thinking, of this was decaying meat, which produced maggots which hatched into flies.

At about the time that Redi was born, the English physician, William Harvey, wrote a book establishing the circulation of the blood. In it, Harvey noted that it was entirely possible that spontaneous generation might not be true, and that small eggs laid by living creatures had merely hatched. Redi decided to test this idea of Harvey's.

In 1668, he put a variety of meats into eight flasks, then sealed four of them, and left the other four open to the air. Flies could enter the four that were open, and those were the only ones that bred maggots. Next, desiring air to circulate through all eight flasks, he performed the experiment again; but this time with gauze over the openings of four of them. Once again, only the four open flasks bred maggots.

Redi concluded that maggots came from fly eggs, and not from spontaneous generation. Incidentally, this was the first scientific experiment on record when controls were used.

The spontaneous generation theory did not die because of Redi's experiment, for soon Leeuwenhoek discovered microbes, and because they seemed to appear out of nothing, it was thought that they originated by spontaneous generation. The theory of spontaneous generation was believed by many scientists until the middle of the 19th century, at which time another creation scientist, Louis Pasteur, performed a special experiment which totally collapsed the possibility that the theory could be true.

Yet, ironically, that did not eliminate belief in the theory of spontaneous generation. For Charles Darwin's 1859 theory, which came to be known as evolution, required spontaneous generation. Evolution in all its forms (Darwinism, neoDarwinism, Saltation theory, etc.) absolutely requires spontaneous-generation. Yet scientific research has repeatedly disproved the possibility that spontaneous generation can occur. Redi in 1668 was the first scientist to disprove it, Spallanzani in 1768 was the second, and Pasteur in 1860 was the third. But evolutionary theory survives because its advocates consistently ignore the mountain of scientific evidence opposed to it.

RIEMANN-(Ree'mahn) Georg Friedrich Riemann (September 17, 1826 - July 20, 1866). German mathematician.

The son of a Lutheran pastor, Riemann planned to become a minister, but was so talented in mathematics that

he majored in that field at the University of Gottingen and graduated in 1851.

Although he died of tuberculosis at the young age of 39, he still accomplished much in mathematical research. His best-known contribution to science was a non-Euclidean geometry, published in 1854, that was different than any devised earlier. (His was keyed to geometry on a curved surface.) A half-century later, Einstein based his work on Riemann's non-Euclidian geometry.

SPALLANZANI- (Spahl-/ahn-tsah'nee) Lazzaro Spallanzani (Janaury 12, 1729 - February 11, 1799). Italian biologist.

Spallanzani graduated from the University of Bologna in 1754, and then became a priest to help support himself. He taught at several Italian universities, collected natural history specimens in Turkey in 1785, and visited Naples in 1788 while Vesuvius was erupting.

His primary contribution to science was an experiment done in 1768. Earlier, in 1668, Redi had established that creatures visible to the eye did not originate by spontaneous generation from non-living materials. But many scientists still believed that microscopic creatures came to life by spontaneous generation.

What Spalianzani did was simple enough: He boiled solutions for 45 minutes and then sealed the flasks. No microorganisms appeared In the solutions regardless of how long they stood. Spallanzani found that some of these organisms survived brief boiling, but that none escaped lengthy boiling.

Spallanzani concluded that microorganisms appeared In such solutions only because they were already there; either in the solution, in the air around it, or on the inside of the flask. Clearly, no spontaneous generation occurred, no matter how long the matter remained inside the flasks. In later years, Spallanzllni carried out two other pioneering experiments. In 1779, he showed that sperm cells had to make actual contact with egg cells in order for fertilization to occur.

In the 1790s, he tried to figure out how bats flew in the dark. He covered their eyes and found they navigated and avoided obstacles just fine. But when he covered their ears, they became helpless. Spallanzani was astounded. How could bats see with their ears? If he had taped shut their mouths, he might have come closer to the answer. Bats emit cries with their mouths which they hear with their ears. It was not until the 20th century that scientists discovered those ultrasonic sound vibrations and the principle of radar which bats use.

SWAMMERDAM- (Svahm'-er-dahm) Jan Swammerdam (February 12, 1637 - February 17, 1680). Dutch naturalist.

Swammerdam studied medicine at Leiden University, but afterward spent his time studying things under the microscope. He collected 3,000 species of insects, placed them under the microscope and drew excellent pictures of their anatomy. The drawings were as good as anything produced later, and he is considered the father of modern entomology-the study of insects.

He was the first to show that muscles change shape but not volume. He also found the reproductive organ of insects, which aided in disproving the spontaneous generation theory.

In 1658 he announced a special discovery: he had found the red blood corpuscle (which we now know to be that unit of the blood which carries oxygen to the cells, and carries off carbon dioxide, lactic acid, and other wastes).

STENO-(Stay'noh) Nicolaus Steno (January 11, 1638 - December 5, 1686). Danish anatomist and geologist.

Steno was raised a Lutheran and later converted to Catholicism. Obtaining his medical degree from Leiden in 1664, he eventually became court physician to the Grand Duke Ferdinand II of Tuscany.

Steno carried out many research projects in animal and human anatomy. He found the parotid gland duct (the salivary gland near the front of the back of the jaw), and the fibril nature of muscles. He discovered the pineal gland in animals. Steno was one of the first to decide that fossils were the remains of ancient animals which had died and been petrified.

He also set forth the first law of crystallography.

STOKES-Sir George Gabriel Stokes (August 13, 1819 - February 1, 1903). British mathematician and physicist.

Stokes, a pastor's son, graduated from Cambridge in 1841 with highest honors in mathematics. Within a few years, he became a Cambridge mathematics professor; secretary, and then president of the Royal Society.

He developed Stokes' law, which explains cloud motion, wave subsidence, resistance of water to ship

movements, and a variety of other things.

Stokes introduced the word, fluorescence, and did research into it, along with sound and light. He was the first to show that ultraviolet light passed through quartz, but not through ordinary glass.

In 1896 he suggested that the newly-discovered X-rays were electromagnetic radiations, akin to light rays. He received the Rumford medal of the Royal Society in 1852 and its Copely medal in 1893.

DURER-(Dyoo'-rer) Albrecht Durer (May 21, 1471 - April 6, 1528). German art geometrician.

Durer was not only a highly-talented artist, but also a skilled craftsman. An earnest Christian, he lived at the time of the 16th century reformation, and was a personal friend of Martin Luther. One of the greatest artists of history, he was also the inventor of the art of etching. He worked in oils, engraving, woodcuts, as well as etching.

Like Leonardo da Vinci, Durer's interest in art drove him into scientific research. In 1525 he published a book on geometrical constructions, using the straightedge and compass. His discoveries made possible more exact three-dimensional pictures on two-dimensional surfaces. It is considered the first surviving text on applied mathematics. Not only did he explain how to do it, he also provided careful mathematical proofs for his formulas, which included complex curves. He also devised and published mathematical formulas for body proportions.

VIRCHOW-(fihr'-khoh) Rudolph Carl Virchow (October 13, 1821 - September 5, 1902). German pathologist.

Obtaining his medical degree at the University of Berlin in 1843, he became a well-known surgeon, and later university professor. In 1845, he was the first to describe leukemia, and went on to specialize in cellular pathology (the study of how cells become diseased).

In 1860, Virchow stated what became a famous axiom: "All cells arise from cells." This statement, accepted by all scientists today, actually has more meaning than most scientists recognize.

Yes, all living cells today only come from other living cells. But so it has always been! This fact renders the self-origin of life (spontaneous generation) totally impossible. Life must come from life. It can never come from non-life.

Virchow refused to accept Pasteur's germ theory of disease. Virchow considered disease to arise from problems within the body, not from germ invasion from without. In actuality, both concepts are at times correct.

In later years, Virchow went into politics and rapidly rose to high positions in the German government. A thorough despiser of Darwin's theory, he voted in the Reichstag (the German national congress) for a law that banned the teaching of Darwin's theory in the public schools.

WATT -James Watt (January 19, 1736 - August 19, 1819). Scottish engineer.

A frail child with chronic migraines, Watt was taught at home by his mother. As a young man, he went to London and completed an apprentice as a tool and instrument maker, then joined the faculty of the University of Glasgow.

Conversations with a chemist, Joseph Black, about latent heat turned his mind toward the possibility of designing an efficient steam engine. Those in operation (Newcomen steam engines) were produced too little power for the amount of fuel they required.

After repairing a Newcomen in 1764, he set himself to the task of improving on it. He added a second chamber to hold the heated steam, so the first chamber would not have to be reheated each time. Within five years (1769), he had made a far more efficient steam engine, that did its work much more quickly.

In addition, he introduced steam from both sides. In this way the piston could be driven by air pressure in both directions. In 1774 he began manufacturing and selling them. In 1781 he devised mechanical attachments that converted back-and-forth piston movement into rotary movement of a wheel. .

Watts' steam engine rapidly replaced the Newcomen, and by 1800 five hundred of his engines were working in England. His invention quickened modern history, for it began the industrial revolution, lessened home piece-meal work and farm work, and increased cities and slums.

Watt also invented a centrifugal governor that kept the energy output of the steam engine steady, and never too large or too small.

In 1783 he tested a strong horse to see how much it could lift and the distance it could lift it in one second. He defined this amount as 550 foot-pounds per second, or, as he called it, "one horsepower. " When the metric system was later devised, the standard was called "one watt, " with one horsepower equaling 746 watts.

In 1800 Watt retired and received an honorary doctorate from Glasgow University, and election to the Royal Society.

WOODWARD-Robert Burns Woodward (April 10, 1917 - July 8, 1979). American chemist.

Even as a boy, Woodward tinkered with chemistry. Entering the Massachusetts Institute of Technology at 16, he displayed such extraordinary ability in chemistry-and such poor aptitude in some other fields-that, instead of flunking him, the faculty assigned him to a special program. Four years later at the age of 20 Woodward had, not a B.A., but a Ph.D.

He immediately accepted a position on the staff of Harvard. In 1944 Woodward, with Doering, succeeded in synthesizing quinine. This was a total synthesis from chemicals, and not from any animal or plant product. By 1951 he was synthesizing such steroids as cholesterol and cortisone. In 1954 he synthesized strychnine and lysergic acid. In 1956 he synthesized reserpine, and in 1960 chlorophyll. Many more syntheses were to follow. Woodward received a National Medal of Science Award in 1964 and the Nobel Prize for chemistry in 1965.