Newton Vindicated: Sir Isaac Newton and Einstein's Theory of Relativity

A couple of weeks ago I was consulting some of my books on prophecy, and I came across the book, *Observations upon the Prophecies of Daniel, and the Apocalypse of St. John*, by Sir Isaac Newton. The edition that I had was a reprint (duplication) of the 1733 edition printed by J. Darby and T. Browne. This edition had been produced by Arthur B. Robinson of Cave Junction, Oregon, in 1991, and reprinted by the Oregon Institute of Science and Medicine, 2251 Dick George Road, Cave Junction, Oregon 97523 (September 1991, Library of Congress Catalogue Card Number 91-074116, ISBN 0-942487-02-8, price USD19.95 in 1991). Although the book is about prophecy, the introduction contains an interesting note about Newton's theories of physics. I will reproduce the introduction here, along with material from Petr Beckmann's *A History of Pi*, which it references.

Introduction, by Arthur B. Robinson

Isaac Newton was the greatest scientist who has ever lived. It is, in fact, generally accepted that he is probably the greatest scientist who ever will live, since no one, no matter how brilliant, will again be in such a unique historical position.

Isaac Newton was born on Christmas day in 1642 and died in 1727. His most famous work, *Philosophiae Naturalis Principia Mathematica*, was published in 1687.

His discoveries span all aspects of the physical world with special emphasis on experimental and theoretical physics and chemistry and on applied mathematics. He invented virtually the entire science of mechanics and most of the science of optics. During this work, he invented such mathematics as he needed or as interested him including the discipline known as calculus.

Isaac Newton was both an experimental and theoretical scientist. He personally constructed the models and machinery with which he carried out extensive experiments in chemistry and physics. For example, when he invented the reflecting telescope, he first built a brick oven. In that oven he carried out metallurgical experiments to formulate the composition of the mirror. He then made the mirror with which he constructed the telescope.

Of unequaled mental ability during his entire adult life until his death at age 85, Newton's powers are legendary. It is often told, for example, how later in his life a problem in mathematical physics posed by the great mathematician, Bernoulli, was forwarded to Newton from the Royal Society. The problem, to determine the curve of minimum time for a heavy particle to move downward between two given points, had baffled the famous 18th century mathematicians of Europe for over six months. Receiving the problem in the afternoon, Newton solved it before going to bed.

Although the solution was sent to Bernoulli anonymously, he is said to have exclaimed upon reading it, *"tanquam ex ungue leonem -as the lion is known by its claw"* in reference to his recognizing Newton's method.

In addition to his scientific work (Newton would have said as a *part* of his scientific work.), he devoted a substantial portion of his enormous energy to the study of the Bible and Biblical texts and history. He read the Bible daily throughout his life and wrote over a million words of notes regarding his study of it.

Isaac Newton believed that the Bible is literally true in every respect. Throughout his life, he continually tested Biblical truth against the physical truths of experimental and theoretical science. He never observed a contradiction. In fact, he viewed his own scientific work as a method by which to reinforce belief in Biblical truth.

He was a formidable Biblical scholar, was fluent in the ancient languages, and had extensive knowledge of ancient history. He believed that each person should read the Bible and, through that reading, establish for himself an understanding of the universal truths it contains.

Newton's strong belief in individual freedom to learn about God without restraints from any other individual or from a church or government, once almost caused him to give up his position as Lucasian Professor at Cambridge. The matter was resolved when King Charles II made the exceptional ruling that Isaac Newton would not be required to become a member of the Church of England.

Regarding both science and Christianity, Isaac Newton spent his life in intense scholarship, but he left the publication of his work largely to Providence. Much that he wrote has still never been published.

His (and the world's) greatest scientific work, the Principia, was published only after his friend, Edmund Halley, accidentally learned of the existence of Part I which Isaac Newton had written 10 years earlier and put in a drawer. Halley convinced him to finish Parts II and III and allow Halley to publish the work.

Only one book of Newton's about the Bible was ever published. In 1733, six years after his death, J. Darby and T. Browne, published *Observations Upon the Prophecies of Daniel and the Apocalypse of St. John*.

In 1988, having learned of this book in the rare books card catalogue of the Library of Congress, I asked to read it. I was astonished when, a few minutes later, I was handed Thomas Jefferson's personal copy. (The book is in excellent condition and has Thomas Jefferson's initials on pages 57 and 137. Two hundred and fifty years ago it was common practice for printers to label the page signatures with capital letters at the bottom of the actual text. Jefferson would turn to the "J" signature and add a"T" before the "J" and then turn to the "T" signature and add a "J" after the "T." In this way he identified his personal books.)

With his prodigious knowledge of ancient history and languages and his unequaled mental powers, Isaac Newton is the best qualified individual in this millennium to have written about the prophecies. His study of the book of Daniel began at the age of twelve and continued to be a special interest throughout his life. Moreover, he writes of the prophecies with a modesty that indicates that he, himself, is in awe of the words he has been given an opportunity to read.

Isaac Newton concluded that it is intended that Revelation will be understood by very few until near the end of history, the time of judgment, and the beginning of the everlasting kingdom of the Saints of the Most High.

Isaac Newton states his belief that these books of prophecy were provided so that, as they are historically fulfilled, they provide a continuing testimony to the fact that the world is governed by the Providence of God. He objected to the use of the prophecies in attempts to predict the future.

On page 251, for example, he writes:

> *"The folly of Interpreters has been, to foretel times and things by this Prophecy, as if God designed to make them Prophets. By this rashness they have not only exposed themselves, but brought the Prophecy also into contempt. "*

Through these 323 pages, he traces human history since the writing of the prophecies. He shows that, according to his scholarship and at his time in the early 18th century, part of the prophecies had been fulfilled and part remained to be fulfilled. In accordance with his evaluation, this is still true in 1991.

Decorated (as are his scientific works) with interesting asides such as derivations of the exact dates of Christmas and Easter and of the number of years during which Jesus taught, and permeated with a depth of scholarship that no longer exists among modem scholars, this book by Isaac Newton may be the most important work of its kind that has ever been written.

The central message of this book for modem readers may not be so much in what it says but in what it is. During his entire life, Isaac Newton continually compared his experimental and theoretical understanding of science with his reading of the Bible. He found the content of these two sources of truth to be so completely compatible that he regarded every word in the Bible to be as correct as the equations of mathematics and physics.

Therefore, throughout this book, Isaac Newton takes each word of the Prophecies to be exactly correct. He never doubts the content. He only seeks to understand it.

He never strays from his determination not to present predictions of the future based upon the Biblical Prophecies. On pages 113 and 114, he does give an identification of the last horn of the Beast and a numerical evaluation of the length of his reign. He also gives the approximate time of the beginning of this reign, but does not add the numbers or make a prediction.

Addition of these numbers, however, places the time of judgment and the beginning of the everlasting reign of the Saints of the Most High approximately in the time period between the years 2000 and 2050.

Are there errors in Isaac Newton's evaluation of the Prophecies? He would reply that he would not have written this evaluation unless he believed it to be without error, but that it is the obligation of Christians to study the Bible and to reach their own conclusions.

In recent years it has become fashionable to say that Newton's laws of motion contained an error (the error of assumption that mass is a constant), and that this was corrected by Einstein's Theory of Special Relativity. As Petr Beckmann has pointed out in his book, A History of Pi, this error never existed.

In the Principia Newton writes,

> *"Lex I. Corpus omne perseverare in statu suo quiescendi vel movendi uniformiter in directum, nisi quatenus illud a viribus impressis cogitur statum suum mutare."*
>
> *"Lex II. Mutationem motus proportionalem esse vi motrici impressx, & fieri secundum lineam rectam qua vis illa imprimitur."*
>
> *"Lex III. Actioni contrariam semper & aequalem esse reactionem: sive corporum duorum actiones in se mutuo semper esse aequales & in partes contrarias dirigi."*

These are the famous three laws of motion.

In translation, the second law reads *"The change of momentum is proportional to the motive force impressed; and is made in the direction of the right line in which that force is impressed."* Newton defines momentum as follows: *"The quantity of momentum is the measure of the same, arising from the velocity and quantity of matter conjointly."*

Or, in the symbolic terms of Newton's calculus, $F = d(mv)/dt$.

Newton did not know whether or not mass was constant, and he was too careful a scientist to assume so by placing it outside the differential. During the next 200 years, physicists assumed, for convenience, that mass was constant and began to write $F= ma$ or $F = m\ dv/dt$. It is this later day shortcut which proved to be incorrect, not Isaac Newton's original law.

Isaac Newton said of himself near the end of his life, *"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, while the great ocean of truth lay all undiscovered before me."*

To Dr. Bentley, he had written, *"When I wrote my Treatise about our System, I had an Eye upon such Principles as might work with considering Men, for the Belief of a Deity, and nothing can rejoice me more than to find it useful for that Purpose."*

Isaac Newton's pebbles and shells formed the basis for the scientific revolution and the industrial revolution which created our current civilization. This demonstration of the incredible power of his discoveries is, however, itself minor in comparison with their role as 17th and 18th century miracles that serve as continuing testimony of the literal truth of the Bible and of the remarkable creations of the Lord.

In my own scientific work, I also have continually compared the Bible with the findings of modem experimental science. Like Isaac Newton, I do not know of any verified scientific facts that are inconsistent with the literal truth of every aspect of the Bible.

I am grateful to have had an opportunity to read Isaac Newton's book about the Prophecies and am publishing this reprint so that others may have this experience.

Thanks are due to the Manley Foundation and Dr. Richard Pooley who helped to finance this reprint; to Bruce Tippery who gave essential help with its production; and also to Andy Hopkins whose similar and independent desire to reprint this book is hereby fulfilled.

This reprint has been made as an exact photographic graphic duplicate of Thomas Jefferson's personal copy.

This reprint is dedicated to my wife, Laurelee, whose death in November 1988 delayed it for these past two years, but whose life caused me to undertake it.

As Isaac Newton wrote in the second edition of the *Principia*:

> *"The true God is a living, intelligent, and powerful being. His duration reaches from eternity to eternity; His presence from infinity to infinity. He governs all things."*

Arthur B. Robinson
Cave Junction
July, 1991

[End of Robinson quote.]

Here follows the material from Petr Beckmann's *A History of Pi*, which Robinson referenced. Although first published in 1991 by The Golem Press / St. Martin's Press, this book was republished in 1993 by Barnes & Noble Books (ISBN 0-88029-418-3), and is currently on sale for USD6.98 in any Barnes & Noble bookstore.

Chapter 13: Newton

Nature and nature's laws lay hid in night God said, Let Newton be, and all was light – Alexander Pope (1688-1744)

There had never been a scientist like Newton, and there has not been one like him since. Not Einstein, not Archimedes, not Galileo, not Planck, not anybody else measured up to anywhere near his stature. Indeed, it is safe to say that there can never be a scientist like Newton again, for the scientists of future generations will have books and libraries, microfilms and microfiches, magnetic discs and other computerized information to draw on. Newton had nothing, nothing except Galileo's qualitative thoughts and Kepler's laws of planetary motion. With little more than that to go on, Newton formulated three laws that govern all motion in the universe: From the galaxies in the heavens to the electrons whirling round atomic nuclei, from the cat that always falls on its feet to the gyroscopes that watch over the flight of space ships. His laws of motion have withstood the test of time for three centuries. The very concepts of space, time and mass have crumbled under the impact of Einstein's theory of relativity; age-old prejudices of cause, effect and certainty were destroyed by quantum mechanics; but Newton's laws have come through unscathed.

Yes, that is so. Contrary to widespread belief, Newton's laws of motion are not contradicted by Einstein's Theory of Special Relativity. Newton never made the statement that force equals mass times acceleration. His Second Law says

$$F = d(mv)/dt$$

and Newton was far too cautious a man to take the *m* out of the bracket. When mass, in Einstein's interpretation, became a function of velocity, not an iota in Newton's laws needed to be changed. It is therefore incorrect to regard relativistic mechanics as refining or even contradicting Newton's laws: Einstein's building is still anchored in the three Newtonian foundation stones, but the building is twisted to accommodate electromagnetic phenomena as well. True, Newton's law of gravitation turned out to be (very slightly) inaccurate; but this law, even though it led Newton to the discovery of the foundation stones, is not a foundation stone itself.

Newton's achievement in discovering the differential and integral calculus is, in comparison, a smaller achievement; even so, it was epochal. As we have seen, the ground was well prepared for its discovery by a sizable troop of pioneers. Leibniz discovered it independently of Newton some 10 years later, and Newton would not have been the giant he was if he had overlooked it. For Newton overlooked nothing. He found all the big things that were to be found in his time. and a host of lesser things (such as a way to calculate 77) as well. How many more his ever-brooding mind discovered, we shall never knoa, for he had an almost obsessive aversion to publishing his works. The greatest scientific book ever published, his Principia, took definite shape in his mind in 1665, when he was 23; but he did not commit his theories to paper until 1672-74. Whether he wrote them down for his own satisfaction or for posterity, we do not know, but the manuscript (of Part 1) lay in his drawer for ten more years, until his friend Edmond Halley (1656-1742) accidentally learned of its existence in 1684. Halley was one of the world's great astronomers; yet his greatest contribution to science was persuading Newton to publish the Principia, urging him to finish the second and third parts, seeing them through the press, and financing their publication. In 1687 this greatest of all scientific works came off the press and heralded the birth of modern science.

Isaac Newton was born on Christmas Day, 1642, in a small farm house at Woolsthorpe near Colsterworth, Lincolnshire. At Grantham, the nearest place that had a school, he did not excel in mathematics in the dazzling way of the wonderchildren Pascal or Gauss, but his schoolmaster, Mr. Stokes, noticed that the boy was bright. If there was any omen of young Isaac's future destiny, it must have been his habit of brooding. Going home from Grantham, it was usual to dismount and lead one's horse up a particularly steep hill. But Isaac would occasionally be so deeply lost in meditation that he would forget to remount his horse and walk home the rest of the way.

When he finished school, there came the great turning point of Newton's career. His widowed mother wanted him to take over the farm, but Stokes was able to persuade her to send Isaac to Cambridge, where he was first introduced to the world of mathematics.

What if Stokes had not been able to persuade Mrs. Newton? There are many similar questions. What if Gauss's teacher had not prevailed over Gauss's father who did not want his son to become an "egghead"? What if G.H. Hardy had paid no attention to the mixture of semi-literate and brilliant mathematical notes sent to him by an uneducated Indian named Ramanujan? The answer, no doubt, is that others would eventually have found the discoveries of these men. Perhaps this thought is some consolation to you, but it leaves me very cold. How many little Newtons have died in Viet Nam? How many Ramanujans starve to death in India before they can read or write? How many Lobachevskis languish in Siberian concentration camps?

However, Newton did go to Cambridge, where he was very quickly through with Euclid, and soon he mastered Descartes' new geometry. By the time he was twenty-one, he had discovered the binomial theorem for fractional powers, and had embarked on his discovery of infinite series and "fluxions" (derivatives). Soon he was correcting, and adding to, the work of his professor and friend, Isaac Barrow. In 1665 the Great Plague broke out, in Cambridge as well as London, and the university was closed down. Newton returned to Woolsthorpe for the rest of the year and part of the next. It is most probable that during this time, when he was twenty-three, with no one about but his mother to disturb his brooding, Newton made the greater part of his vast discoveries. "All this was in the two plague years 1665 and 1666," he reminisced in old age, "for in those days I was in the prime of my age of invention, and minded mathematics and [natural] philosophy more than at any time since." Asked how he made his discoveries, he answered, "By always thinking unto them," and on another occasion, "I keep the subject constantly before me and wait till the first dawnings open little by little into the full light." Newton retained these great powers of concentration throughout his life. He succeeded Barrow as Lucasian Professor of Mathematics at Cambridge (1669), and relinquished this post to become Warden of the Mint (1696) and later (1699) Master of the Mint; in 1703 he was elected President of the Royal Society, a position which he held until his death in 1726. In his later years he spent much time on non-scientific activity, but remained as astute a mathematician as ever, amazing men by the ease with which he solved problems set up to challenge him.

In 1697, for example, Jean Bernoulli I(1667-1748) posed a problem that was to become famous in the founding of the Calculus of Variations: What is the curve joining two given points (see figure above) such that a heavy particle will move along the curve from the upper to the lower point in minimum time? The problem is so difficult that it is not, for example, usually included in today's undergraduate engineering curriculum. It was received by the Royal Society and handed to Newton in the afternoon; he returned the solution the next morning, and according to John Conduitt (his niece's husband), he solved it before going to bed! The solution was sent to Jean Bernoulli without signature, but on reading it he instantly recognized the author, as he exclaimed, *tanquam ex ungue leonem* (as the lion is known by its claw).

[End of Beckmann quote.]

For a little more biographical information about Newton, the following is found in Michael H. Hart's The 100: A Ranking of the Most Influential Persons in History (Citadel Press / Carol Publishing Group, 1978, 1992).

Chapter 2: Isaac Newton (1642 – 1727)

Nature and Nature's laws lay hid in night: God said, Let Newton be! and all was light. – Alexander Pope

Isaac Newton, the greatest and most influential scientist who ever lived, was born in Woolsthorpe, England, on Christmas Dav, 1642, the same year that Galileo died. Like Muhammad, he was born after the death of his father. As a child, he showed considerable mechanical aptitude, and was very clever with his hands. Although a bright child, he was inattentive in school and did not attract much attention. When he was a teenager, his mother took him out of school, hoping that he would become a successful farmer. Fortunately, she was persuaded that his principal talents lay elsewhere, and at eighteen, he entered Cambridge University. There, he rapidly absorbed what was then known of science and mathematics, and soon moved on to his own independent research. Between his twenty-first and twenty-seventh years, he laid the foundations for the scientific theories that subsequently revolutionized the world.

The middle of the seventeenth century was a period of great scientific ferment. The invention of the telescope near the beginning of the century had revolutionized the entire study of astronomy. The English philosopher Francis Bacon and the French philosopher Rene Descartes had both urged scientists throughout Europe to cease relying on the authority of Aristotle and to experiment and observe for themselves. What Bacon and Descartes had preached, the great Galileo had practiced. His astronomical observations, using the newly invented telescope, had revolutionized the study of astronomy, and his mechanical experiments had established what is now known as Newton's first law of motion.

Other great scientists, such as William Harvey, who discovered the circulation of the blood, and Johannes Kepler, who discovered the laws describing the motions of the planets around the sun, were bringing new basic information to the scientific community. Still, pure science was largely a plaything of intellectuals, and as yet there was no proof that when applied to technology, science could revolutionize the whole mode of human life, as Francis Bacon had predicted.

Although Copernicus and Galileo had swept aside some of the misconceptions of ancient science and contributed to a greater understanding of the universe, no set of principles had been formulated that could turn this collection of seemingly unrelated facts into a unified theory with which to make scientific predictions. It was Isaac Newton who supplied that unified theory and set modern science on the course which it has followed ever since.

Newton was always reluctant to publish his results, and although he had formulated the basic ideas behind most of his work by 1669, many of his theories were not made public until much later. The first of his discoveries to be published was his ground-breaking work on the nature of light. In a series of careful experiments, Newton had discovered that ordinary white light is a mixture of all the colors of the rainbow. He had also made a careful analysis of the consequences of the laws of the reflection and refraction of light. Using these laws, he had in 1668 designed and actually built the first reflecting telescope, the type of telescope that is used in most major astronomical observatories today. These discoveries, together with the results of many other optical experiments which he had performed, were presented by Newton before the British Royal Society when he was twenty-nine years old.

Newton's achievements in optics alone would probably entitle him to a place on this list; however, they are considerably less important than his accomplishments in pure mathematics and mechanics. His major mathematical contribution was his invention of integral calculus, which he probably devised when he was twenty-three or twenty-four years old. That invention, the most important achievement of modern mathematics, is not merely the seed out of which much of modern mathematical theory has grown, it is also the essential tool without which most of the subsequent progress in modern science would have been impossible. Had Newton done nothing else, the invention of integral calculus by itself would have entitled him to a fairly high place on this list.

Newton's most important discoveries, however, were in the field of mechanics, the science of how material objects move. Galileo had discovered the first law of motion, which describes the motion of objects if they are not subjected to any exterior forces. In practice, of course, all objects are subjected to exterior forces, and the most important question in mechanics is how objects move under such circumstances. This problem was solved by Newton in his famous second law of motion, which may rightly be considered the most fundamental law of classical physics. The second law (described mathematically by the equation $F = ma$) states that the acceleration of an object (i.e., the rate at which its velocity changes) is equal to the net force on the object divided by the object's mass. To those first two laws, Newton added his famous third law of motion (which states that for each action i.e., physical force--there is an equal and opposite reaction, and the most famous of his scientific laws, the law of universal gravitation. This set of four laws, taken conjointly, form a unified system by means of which virtually all macroscopic mechanical systems, from the swinging of a pendulum to the motion of the planets in their orbits around the sun, may be investigated, and their behavior predicted. Newton did not merely state these laws of mechanics; he himself, using the mathematical tools of the calculus, showed how these fundamental laws could be applied to the solution of actual problems.

Newton's laws can be and have been applied to an extremely broad range of scientific and engineering problems. During his lifetime, the most dramatic application of his laws was made in the field of astronomy. In this area, too, Newton led the way. In 1687, he published his great work, the *Mathematical Principles of Natural Philosophy* (usually referred to simply as the *Principia*), in which he presented his law of gravitation and laws of motion. Newton showed how these laws could be used to predict precisely the motions of the planets around the sun. The principal problem of dynamical astronomy-that is, the problem of predicting exactly the positions and motions of the stars and planets-was thereby completely solved by Newton in one magnificent sweep. For this reason, Newton is often considered the greatest of all astronomers.

What, then, is our assessment of Newton's scientific importance? If one looks at the index of an encyclopedia of science, one will find more references (perhaps two or three times as many) to Newton and to his laws and discoveries than to any other individual scientist. Furthermore, one should consider what other great scientists have said about Newton. Leibniz, no friend of Sir Isaac's, and a man with whom he engaged in a bitter dispute, wrote: "Taking mathematics from the beginning of the world to the time when Newton lived, what he has done is much the better part." The great French scientist Laplace wrote: "The *Principia* is preeminent above any other production of human genius." Lagrange frequently stated that Newton was the greatest genius who ever lived, while Ernst Mach, writing in 1901, said: "All that has been accomplished in mathematics since his day has been a deductive, formal, and mathematical development of mechanics on the basis of Newton's laws." This, perhaps, is the crux of Newton's great accomplishment: he found science a hodgepodge of isolated facts and laws, capable of describing some phenomena but of predicting only a few; he left us a unified system of laws, which were capable of application to an enormous range of physical phenomena, and which could be used to make exact predictions

In brief summary like this, it is not possible to detail all of Newton’s discoveries; consequently, many of the lesser ones have been omitted, although they were important achievements in their own right. Newton made significant contributions to thermodynamics (the study of heat) and to acoustics (the study of sound); he enunciated the extremely important physical principles of conservation of momentum and conservation of angular momentum; he discovered the binomial theorem in mathematics; and he gave the first cogent explanation of the origin of the stars.

Now, one might grant that Newton was by far the greatest and most influential scientist who ever lived but still ask why he should be ranked higher than such major political figures as Alexander the Great or George Washington, and ahead of such major religious figures as Jesus Christ and Gautama Buddha. My own view is that even though political changes are of significance, it is fair to say that most people in the world were living the same way 500 years after Alexander's death as their forebears had lived five centuries before his time. Similarly, in most of their daily activities, the majority of human beings were living the same way in 1500 A.D. as human beings had been living in 1500 B.C. In the last five centuries, however, with the rise of modern science, the everyday life of most human beings has been completely revolutionized. We dress differently, eat different foods, work at different jobs, and spend our leisure time a great deal differently than people did in 1500 A.D. Scientific discoveries have not only revolutionized technology and economics; they have also completely changed politics, religious thinking, art, and philosophy. Few aspects of human activity have remained unchanged by this scientific revolution, and it is for this reason that so many scientists and inventors are to be found on this list. Newton was not only the most brilliant of all scientists; he was also the most influential figure in the development of scientific theory, and therefore well merits a position at or near the top of any list of the world's most influential persons.

Newton died in 1727, and was buried in Westminster Abbey, the first scientist to be accorded that honor.

[End of Hart quote.]