Newton – Science, Faith and the 21st century

Abstracts of presentations

Nathan Aviezer, Bar-Ilan University, Israel

Title: **In Newton's footsteps – science and the Creation description in Genesis**

Abstract: According to Newton, science and the Bible are two sides of the same coin and they complement each other. Newton's thesis on the Creation, as described in the first chapter of Genesis, will be examined. It turns out that there is a complete and impressive compliance between the verses of the Tora taken literally and scientific findings in cosmology, astronomy, geology and biology.

Yosi (Joseph) Avron, Technion, Israel

Title: **An issue with gravity: Newton and Einstein**

Abstract: Einstein theory of gravity, also known as "general relativity", is hard to digest without investing some effort, but it is regularly tested by each one of you when you rely on the GPS to find your way home. I shall give a non-technical account of Einstein's theory of gravity and contrast it with Newton's theory of gravity. In weak gravitational fields, and for non-relativistic motions, Newton's theory gives a good approximation to Einstein's theory. No familiarity with general or even special relativity will be assumed, and no fancy mathematics will be used. I shall also explain how Einstein's theory resolves a conceptual problem raised by Newton in a letter to Bentley.

Zeev Bechler, Tel Aviv University, Israel

Title: **Spinoza, Newton, Einstein: how scientific revolutions are at all possible and how necessary**

Abstract: We are in the middle of a spiritual storm, which began with the criticism that was created against the Newtonian revolution in the 17th century. This movement of criticism is known as the Enlightenment movement, whose culmination was the American Revolution and the French Revolution. Their social and ethical slogans, as they appear in the constitutions they adopted, dealt with man's natural and universal rights, such as various freedoms and equality. The philosophical expression of the freedom revolution was created and published during those revolutionary years by Emanuel Kant. It became the essence of the revolution of enlightenment and modernity and its core turned to be a complex proof that the Truth is not at all possible.
Kant and the Enlightenment continued the tradition established by Socrates and continued by Aristotle and Spinoza. About a century after Kant this tradition has returned and revealed its answer to Newton, from which we have not recovered to this day. It was created by Albert Einstein between 1905 and 1916 and accepted as the glory of scientific creation to this day. Since Einstein was a Spinozistic anarchist, he replaced the Newtonian monotheistic concept of "natural law," by the Kantian concept of "giving shape" to a chaotic world, thus transforming it into an entity ruled by severe mathematical order, for being merely created by the mind.

Uri Ben-Ya'akov, Kinneret Academic College, Israel

Title: **From Newton to Einstein – the changes in the axiomatic foundation of physics**

Abstract: Newton built the theory of mechanics on the model of Euclidean geometry – an axiomatic basis of fundamental principles and concepts, from which are derived, by means of deductive inference rules, predictions whose concordance with experimental observations confirms the correctness of the base. As in Euclidean geometry, some of the axioms of Newtonian mechanics are confirmed by

experience, and are indisputable, while others – those dealing with space and time – are speculative. And as in the transition from Euclidean geometry to non-Euclidean geometries, so also in mechanics, the controversial axioms are those that have changed with the arrival of the theory of relativity.
The lecture discussed the controversial axioms of Newtonian mechanics – their characteristics, the way they were achieved, and how they had to change in the light of the experimental discoveries about light that were not available at Newton's time. In conclusion, a look into the future – general comments on axiomatic systems and possible implications for physical theories.

Paul Greenham, Zirra

Title: **Isaac Newton as a reader: 'bookish' alchemical research**

Abstract: Recent studies of early modern alchemy challenge the assumption that intellectually rigorous and experimentally oriented investigations of the natural world were antithetical to a careful reading and interpretation of authoritative texts. As Tara Nummedal argues, alchemy was "simultaneously bookish, experiential, and experimental," and provides a model for conceiving early modern science in general. Isaac Newton's alchemy is a clear example of this confluence of methods in the investigation of nature. The experimental and theoretical rigour of his chemical experiments have been well attested. Moreover, Newton's chemistry, or "chymistry" in the seventeenth-century context, was thoroughly bound up in an immersive search of the alchemical literature of his day.

In this paper I consider Newton's chymistry in the context of Newton as a reader, investigating the material traces of his textual research in the books of his personal library. Newton's unusual pattern of dog-earing, by which he folded the corner of a page to point to a specific word, name or phrase, allows one to follow his footsteps in his research of texts, as John Harrison discusses in his *Library of Isaac Newton*. Frequently, each fold can be matched to a direct quotation or reference in one of Newton's manuscripts. This method has received less attention than Newton's marginal notes or manuscript compositions and represents an under-explored area of Newtonian scholarship. Additionally, changes in Newton's lists of alchemical books—both desiderata and books in his library—reveal aspects of his developing chymical interests. I argue that Newton's research of symbolic alchemical texts was

as important a component of his chymical investigations as his laboratory practices. I defend the inclusion such textual research—even amongst heavily symbolic texts—in considerations of Newton's experimental methods.

Boris Kriheli & Eugene Levner, HIT, Israel

Title: **Quasi-Newton Trust Region Method and Efficient Search for a Failed Device by Imperfect Robots**

Abstract: In Newton-type mathematical optimization methods, *the trust region* denotes the subset of the region of the objective function which is approximated by a certain model function, usually, quadratic. If an adequate model of the objective function is found within the trust region, then the region is expanded; conversely, if the approximation is poor, then the region is contracted (Sorensen, 1982). The fitness (performance) is evaluated by different authors in different way depending on the objective type and method modifications.

We employ the above idea of the flexible trust region for the search for a failed device by imperfect robots with two types of errors, fault-positive and fault-negative. Instead of using a constant-value confidence level, we introduce and exploit the idea of the flowing (moving) confidence level, which improves the convergence of the search process.

Adir Pridor, HIT, Israel

Title: **Newton and the Hebrew Language**

Abstract: Newton learned, read and wrote Hebrew, yet there are diverse opinions about his mastering of the language. An examination of Newton's writings clearly shows that his fluency in Hebrew was not perfect, but four significant aspects will be presented to illustrate his deep knowledge of the language:

a. The systematic tools Newton applied for learning Hebrew;
b. Cases where Newton has determined that certain Hebrew texts were of lower reliability as compared to other sources;

c. Cases where Newton has dug into the deeper details of Hebrew texts to obtain the precise meaning of the source;
d. Bold revelations, in which he proposed language innovations or deciphering, which illuminate the intention of Scripture.

Newton's very broad control of the sources of Jewish Rabbinic literature will be demonstrated.

Stephen D. Snobelen, University of King's College, Halifax, Canada

Title: **Science and religion in the Thought of Isaac Newton**

Abstract: Isaac Newton is celebrated for his work in mathematics, optics and physics. He was also a deeply religious man who wrote millions of words on theology, prophecy and church history. To what degree did his scientific endeavors interact with the conceptual world of his religion? This talk will examine a series of programmatic statements Newton made about the relationship between theology and natural philosophy. It will also offer illustrative examples of this relationship in his own career. This includes the theological contexts and contents of his great scientific books, the Principia (1687) and the Opticks (1704); his commitments to natural theology and the design argument; his reconciliation of heliocentric astronomy with biblical interpretation; and the similarities between his views of a dynamic cosmos and prophetic history. These points of contact provide insight into the creative and wide-ranging mind of Newton and the nature of his life-long, grand intellectual project to understand God and the universe.