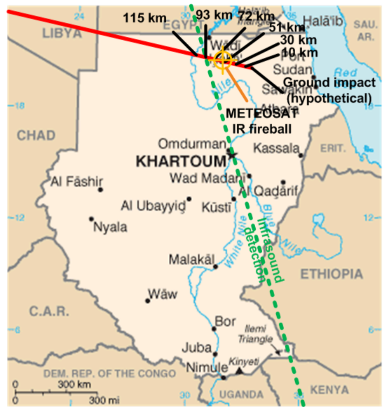
Meteroid Hits Sudan
TC3 Makes Impact

by Alicia Swift

Astronomers have a reason to celebrate this month. For the first time ever on Tuesday, October 7, 2008, Meteroid 2008 TC3 fell to earth, making it the first such body to be observed and tracked as it followed its course.



Burning up before hitting the ground, it was still noteworthy due to the "570 astrometric and almost as many photometric observations" which "were performed in less than 19 hours and reported to the Minor Planet Center" (Wikipedia). Other tests were done to determine the makeup of the meteroid, which can be determined from the color spectra of the fire.

The meteroid entered the earth's atmosphere above Sudan, travelling at 8.0 miles per second. It exploded above the ground, making it a special type of meteroid called a bolide. The term bolide is derived from the Greek word, bolis, which means a missile or to flash. When it exploded, it released between 1.1 and 2.1 kilotons of energy.

The Times, a British newspaper, reported that an airliner 1400 km away saw the flash from the bolide.

NOBEL CONTINUED

effect, cannot make up his mind and constantly switches from one bowl to the other. By the laws of quantum physics, the oscillation comes to life as a new particle, a boson.

In the years that followed, Nambu studied the dynamics of quarks, suggesting they were held together by gluons carrying a color quantum number to and fro. "He did this in 1965, while the rest of us were floundering about," Gell-Mann says. (Nambu, however, believed the quarks to be observable and assigned them integer electrical charges, an error that Gell-Mann and others corrected.) In 1970, perusing a complex mathematical formula on particle interactions, Nambu saw that it described strings. In the 1980s his "string action" became the backbone of string theory.

In 2008 Yoichiru Nambu was awarded the Nobel Prize in Physics for "the discovery of the mechanism of spontaneous broken symmetry in subatomic physics". His previous honors include the Wolf Prize in Physics, the National Medal of Science, the Dannie Heineman Prize for Mathematical Physics, the J. Robert Oppenheimer Prize and the Order of Culture from the government of Japan.

Over time, Nambu became known as a seer, albeit a shy one. "I can think of no one who gives such good advice," Witten says. Pierre M. Ramond of the University of Florida observes that the directions of particle physics were often predicted by Nambu's papers--encrypted in the footnotes.

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James Stankowicz

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George CB Ling

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Arthur Ianuzzi
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CALL FOR WRITERS

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This Week in Physics History

by J. Stankowicz

November 9

1921 - Einstein is awarded the Nobel Prize in Physics for his work on the photoelectric effect. Einstein also developed relativity, demonstrated that matter is made of atoms, and showed the equivalence between mass and energy, but you can only win one Nobel prize in each field.

1934 - Carl Sagan, an author and astronomer, is born. Sagan was known for his scientific writing for laymen.

November 11

1930 - Hugh Everett III, known for developing the many-worlds interpretation of quantum mechanics, is born. The 'many-worlds' hypothesis says that each possible outcome of a measurement is realized in a different universe, and is an alternative interpretation to wave-function collapse.

November 12

1842 - John Strutt, 3rd Baron Of Rayleigh, is born. He won the 1904 Nobel Prize in Physics for the discovery of argon, and also studied Rayleigh scattering and Rayleigh waves.

November 15

1630 - Johannes Kepler, known for his laws describing planetary motion, dies. Kepler's laws, derived empirically, were later given a theoretical basis by Newton's law of gravity.

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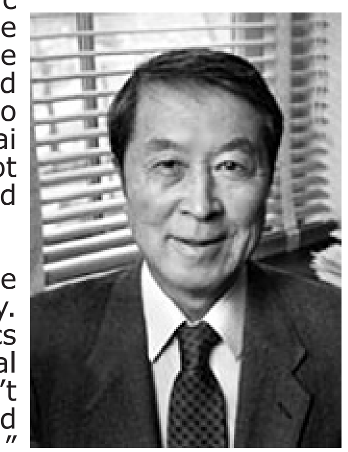
The World Needs Ditch Diggers/ Nobel Laureates in Physics too:
Yoichiro Nambu

by Steven Hocman

Born in Tokyo in 1921, he was two when the city was destroyed by an earthquake. His family then settled in the outskirts of Kyoto in the town of Fukui. In his childhood he attended one of the then abundant militaristic schools in Japan. In the early morning in the middle of winter, he would walk a over a kilometer to school to learn Samurai sword fighting, barefoot on bare floors in unheated halls.



Nambu attended the Tokyo Imperial University. Of his studies, physics caused him special trouble: "I couldn't understand entropy and flunkedthermodynamics." Yet, possibly inspired by Hideki Yukawa, the pioneer who realized that particles transmit force, Nambu chose to continue for a master's in physics.

Nambu's continued studies were cut short as the class graduated six months early so that its members could be drafted. In the army Nambu, possibly overlooked for his physics skills, initially dug trenches. After a year he was assigned to help develop shortwavelength radar: "To test our system, I set it up on a hilltop and hired a boat to take a metal rod out into the ocean. You could see it with your bare eyes--but not with our radar."

After the war Nambu left for Tokyo to take up a long-awaited research position. All that these researchers knew of scientific developments in the West came from sporadic issues of Time magazine. Later, journals in a library set up by the Occupation forces helped to fill in the gaps. After moving to Osaka City University in 1949, Nambu published a formula describing how two particles bind, now known as the Bethe-Salpeter equation. Along with others, he also predicted that strange particles should be created in pairs. His office-mate, Ziro Koba, a student of Tomonaga, kept Nambu informed about his professor's work. A group of solid-state physicists in a neighboring office also provided stimulating company.

In 1952 Nambu was invited to visit the Institute for Advanced Study in Princeton, New Jersey. In 1957,after having moved to Chicago, he proposed a new particle that was met with suspicion. The omega was discovered the next year in an accelerator. Nambu had heard J. Robert Schrieffer describe the theory of superconductivity that he had just devised with John Bardeen and Leon N. Cooper. The talk disturbed Nambu: the superconducting fluid did not conserve the number of particles, violating an essential symmetry of nature. It took him two years to crack the puzzle.

Imagine a gator faced with two bowls of equally enticing food. Being identical, the bowls present a twofold symmetry. Yet the gator arbitrarily picks one bowl. Unable to accept that the symmetry is entirely lost, Nambu discovered that the gator, in

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who we are

UP is a monthly undergraduate physics newsletter sponsored by the University of Florida's chapter of the Society of Physics Students, for students, by students. We seek to strengthen the undergraduate physics community at the University of Florida by providing a forum for undergraduates to share their views and experiences with each other and to act as a source of information for opportunities and events in physics.

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what's UP
in this issue

God and Science: Can the Two Cohere?

Can Science Disprove Religion?

by Art Ianuzzi

In the beginning, there was not a distinction between religion and science. Mankind had collected various simple observations of the surrounding world and had drawn some basic conclusions about the rules that governed the universe. The rest was called religion.

Anthropologists have hypothesized that the human mind, however it came to be, is innately capable of various tasks. We have the ability to learn quickly how to predict what will happen to an object that is flying through the air, and we don't need to be explicitly taught that jumping off of a high cliff is not a good idea. Now this is not to say that these skills are instinctual – they are learned – but they are learned implicitly, without direct conscious effort.

This level of understanding was sufficient so long as the rules governing the behavior of a particular phenomenon coincided with the observable and intuitive nature of things. At some point, however, mankind was forced to develop a body of knowledge that contained principles that were not intuitive – that in some cases were counter-intuitive.

In our first science classes, the great majority of us were perplexed, at least for a moment, by the fact that an object in motion tends to stay in motion. What a silly idea this is, since, after all, we have never seen such behavior. But, after some period of time we developed some model in our minds that allowed for this concept to be reconciled with what we know of the world.

Science today has become very disparate from religion in that, for cultural and logistical reasons, the two pursuits are not tied together in the way that they were when people believed that the earth was flat and that the sun revolved around it – and that god made it that way. As people began to grasp the very unintuitive laws of nature, science became more and more alienated by the religious community.

At some point though, we all decided that science was becoming too useful to ignore, and the disciplines of science and religion were officially separated, thanks, in part, to an idea called the separation of church and state. Nowadays, religion serves to educate the soul, while science educates the mind. This is, perhaps, because people are only able to answer certain questions with science, while other questions that transcend science can only be answered by religious ideals.

To ask if science can disprove religion is equivalent to asking if an accountant can build a skyscraper. The accountant may have lots of ideas about doing the job, but picturing some meek accountant in a business suit walking the high iron would probably give most of us a good laugh. In the same way, people have questions about the universe in which they live that cannot be answered, today, by science. In fact, science can break down in some cases in the face of such basic questions. Why?

So, at the moment, religion is effectively safe from science. It is conceivable, at least in principle, that science could become such an effective description of our environment, that spiritual principles beyond one's own relationship and experience with the universe are no longer necessary. Integrating the answers to the big questions with anecdotes that involve a uniquely human experience, or attributing various phenomenon to a power that we are by definition unable to understand will become obsolete.

This process may be as inevitable as the replacement of a geocentric universe with our current understanding of astrophysics, or the abandonment of the principle that metaphysical phenomenon cause disease in favor of demonstrable biological processes. In any case, the fact remains that any philosophy, religious or scientific, must continue to offer people some type of practical benefit in understanding our existence, otherwise it is quickly forgotten.

The Duality of Science and God

by Daniel Bannoura

People sometimes think it is odd, or even disingenuous, for a person to be both a physicist and a theist. Yet to someone like myself who is both a Physics student and a Christian, it seems to be a natural and harmonious combination. The basic reason is simply that science and theology are both concerned with the search for truth. In essence then, they complement each other rather than contrast one another. Of course, the two disciplines focus on different dimensions of truth, but they share a common conviction that there is an undisputed and objective truth to be sought. Certain philosophical critiques notwithstanding, the pursuit of truthful knowledge is widely accepted goal in the scientific community. Scientists believe that they can gain an understanding of the physical world that will prove to be reliable and persuasively insightful within the defined limits of a well-winnowed domain. In the same manner, blind obedience and unquestioned faith aren't the doctrines of the Bible, and every Christian is required to test everything (1 Thess 5:21) and exercise his or her senses to discern between good and evil, truth and falsehood (Heb 5:13-14).

However, science and theology differ fundamentally due to the limitation that is put on the scientific method. Actually, theology has and needs to be put aside for science to make any progress. That is not a methodological decision that we made, but it is actually wrapped up in the nature of the scientific approach. At the core of the scientific method is the requirement of taking control over and manipulating things. In fact, I'd think that all the experimentalists here at the Physics department would agree that the most important part of the scientific experiment are what we call controls. When we do science, we take an object to study, remove it from its natural environment, manipulate it with tests and see how it reacts and changes. This is how

CONTINUED ON NEXT PAGE - "Science and God"

Spotlight on Science

APPLIED MATHEMATICS

by Victor Albert

Throughout the last 100 years, science has fragmented into a mess of various disciplines, most of which overlap each other. This section attempts to clear up and organize the various scientific kingdoms and phyla one topic at a time. This is only an attempt, as the distinctions among the fields are almost always debatable. This month we deal with the huge umbrella field of applied mathematics.

If there's a field that fits well under the definition of "vague categorization," it's applied mathematics. To distinguish it from pure mathematics, this field has practical applications. If one wants to study pure mathematics, one often does it because he/she wants to study the abstractions, not the applications. In other words, almost nobody cares about pure mathematics, but pure mathematicians don't care about that.

Before I get into its various subcategories, there's another important distinction. Doing applied mathematics and using it are two different things. For example, a physicist using an algorithm for solving differential equations is using applied math, while a numerical analyst trying to develop a more efficient algorithm is doing applied math. (A mathematician proving that the equations can be solved is doing pure math.)

This field has had a rich history in that there used to be no distinction between physicists and applied mathematicians. Nowadays, physics has evolved into a separate field, but mathematical physics is still sometimes considered a branch of applied math, i.e., you can approach it from either the math or the physics side. Some of the main branches that applied mathematicians do research in are:

Dynamical systems
(differential equations):
Predict long-term behavior of a system with given initial conditions. These are your regular "ball rolling down an inclined plane" physics problems, except the number of balls is now almost infinite, and their starting velocities are random. In other words, this is the field of large scale simulation.

Fluid Mechanics
(vector calculus):
Predicting how water flows, how ink interacts with water, how tornadoes form, etc. Still much work to be done here and an excellent career opportunity.

Numerical Analysis
(programming):
The field of how to solve problems on a computer. Also deals with developing methods that are faster than the current ones. Some creativity is required as most of the time, the most straightforward methods have already been discovered.

Mathematical Biology and Neural Networks
(probability):
Pretty self-explanatory. These two new-comers are thriving areas of research. Once people figured out that large groups of animals, cells, molecules, or neurons can be modeled, these two took off.

Science and God Continued

science works and it really cannot work any other way for we need to insure that our experiments can be repeated and that our observations are accurate to conclude that our correlations have some kind of foundation in a cause and affect relationship. Contrasting this with the encounter of God; the approach of science cannot be the approach to God, just as the supernatural, by definition, cannot be controlled or contained using the scientific method.

Since it's in the very nature of science to obscure God from experimentation, it cannot recognize, methodologically, the importance or centrality of God. Consequently, the more trust and emphasis we put on the scientific method, the more eclipsed God is going to become in our intellectual and personal lives. I'm not being critical of science but rather critical of assigning to science an exclusive value that is far beyond what we give to other means that can be used to gain knowledge, in particular, those other means that are concerned with the encounter of God like Philosophy, Natural Theology, Apologetics, and personal experiences and testimonies. The aforementioned need not replace the scientific method we undertake, but they ought to arise as a necessary compliment to help each one of us tackle the necessary and monumental questions of truth, meaning, and destiny.

Therefore, I encourage you, if you have not done this already, to pick up a Bible and read it with a sincere heart and a mentality that thirsts after truth and understanding. If you cannot do that, please grab a book by Christian apologists like C. S. Lewis and Ravi Zacharias, or check the writings of notable Christian scientists like John Polkinghorne, Vern Poythress, and John Lennox. As C. S. Lewis once said; "Christianity, if false, is of no importance, and if true, of infinite importance. The only thing it cannot be is moderately important."