Smoky Mountain Astronomical Society

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It's no wonder that truth is stranger than fiction. Fiction has to make sense. Mark Twain

From the President: Scott Byers

From Secretary Dennis Hutcheson, Sept 4:

Dennis and Cassie

I just wanted to let you know. I will go into the Hospital on Sept 16th and will have surgery on Sept 17th. Even though the recovery process is a long one (about 12 weeks) I sure do look forward to getting back to my "normal" life. I am having my aortic heart valve replaced with a mechanical valve that "never" wears out. I ask the Dr. how he knows "never" and who's giving him this information cause I wanted to meet him. Draw back to this valve are the meds that also come along with it: they "never" stop either. From my visit with the surgeon he says that if everything goes well I should go home in about 5 days but will still be very dependant on Cassie and my family to do things for the first 3 weeks or so. Its hard for me to get my head around an open heart surgery to home in 5 days, when my uncle went in for a bypass he was in for 21 days just a few years ago. They tell me I am more likely to get an infection there in the hospital bed than at home. As soon as I am able I will post additional updates or just drop by to say hello.

From Scott Byers, Sept 29:

Just wanted to give you an update. Dennis said he was doing well, and that the doctor was pleased with the operation. Dennis said he was up and walking and had a good appetite. We continue to give him get well wishes and hope his recovery is speedy.

Mike Littleton volunteered to perform Dennis' duties as secretary during his absence, and was approved by the Executive Committee. Thank you, Mike!

Minutes of September meeting

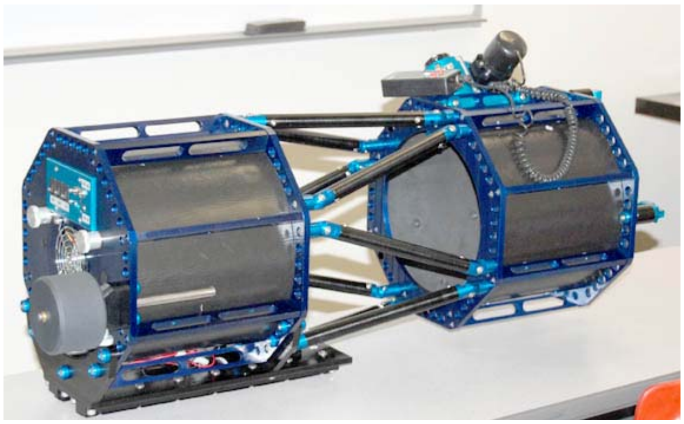
By Mike Littleton

President Scott Byers called the meeting to order at 7:00 PM on Friday, September 27th. There were nine members in attendance and one guest. The first item on the agenda was a pair of requests for presentations on astronomy by local schools. The first request was from Oliver Springs Elementary School for a :45 minute classroom presentation in October. The second was for a night outdoor presentation to home-schooled children at the Martin Luther King, Jr. Community Center in Alcoa.

There was discussion about the then upcoming star party and camping at Bandy Creek at the Big South Fork State Park. A suggestion was made to advertise the event on public television. [Unfortunately, the event had to be cancelled later because of inclement weather.]

The guest at the meeting was Mike Maslona from the US Park Ranger Service at the Great Smoky National Park. Mike has sponsored star parties for the public at Cades Cove in 2005, 2006, and 2007. The 2005 event was cancelled because of rain, but the 2006 and 2007 events were great successes with over 300 and 250 visitors respectively. Mike spoke about this year's event scheduled on Saturday, October 4th. SMAS will set up telescopes in the same field as last year, a quarter-mile field along the loop road from the stables. Because of the experience last year, the public presentation will start one half hour later at 7:30 PM. Public viewing through member telescopes will end at 9:30 PM.

In our main presentation, Brent Holt displayed his home-built 8 inch f/4 Newtonian. Brent ground and polished the main mirror and machined and anodized the parts for the telescope tube and focuser. It was a thing of beauty! Brent intends to use the telescope on a Losmandy G-11 Mount with the Gemini Astronomical Positioning System to image with a SBIG STL-6303E CCD camera.



The meeting was adjourned at 9 PM.

SMAS returns to Cades Cove on October 4

Once again, the Great Smoky Mountains National Park has invited SMAS to set up their telescopes in Cades Cove for an evening of public viewing. While primarily intended for park visitors, it is open to everyone and advertised on local television.

SMAS members who wish to participate are requested to be present at the start of the Cove Loop Road by 6:30 pm on the evening of Oct 4th. Telescopes and laser pointers are needed.

At 6:30, the rangers will escort the SMAS motor caravan down the Loop Road and into the fenced-in observing field. The time is critical, because the rangers will lock the Loop Road gate at dusk, and SMAS late-comers will not be able to drive to the observing field thereafter (although they could walk to it).

While telescopes and paraphernalia are being set up, SMAS will provide sandwiches and drinks (and Ann Bridges' banana pudding!) in the observing field (strictly for SMASers, not the public).

At 7:30 pm, NPS rangers will organize the public attendees at the start of the Cove Loop Road and direct them to the observing area. They will be walking, not driving. Public attendees should dress warmly and bring a canvas chair or blanket on which to sit. A flashlight is also recommended.

Closing time is 10:00 pm. Rangers will unlock the gate to let us out.

The Large Hadron Collider at Geneva was turned on for the first time recently, and achieved full power. But only for a little while. One of its big transformers burned out, and there was an electrical connector between adjacent superconducting magnets that melted down. Correcting these malfunctions will take a couple months, but in the meantime the entire project will enter its winter hiatus (to save expensive electrical power).

So what was learned? Essentially, that the engineering concept worked OK. Some folks had their doubts.

As for the research programs of the particle physicists, those will have to wait for next year to begin. Now the question gets more involved: What might be learned?

The NY Times published the following article by Columbia Professor Brian Greene. It is an educational masterpiece for the layman, beautifully written and summarizing the theories and the goals that this fantastic machine was designed to explore. It is reproduced here with acknowledgement and thanks. The original article is available for downloading at
http://www.nytimes.com/2008/09/21/science/21collider.html

The New York Times

September 12, 2008

The Origins of the Universe: A Crash Course

By BRIAN GREENE

THREE hundred feet below the outskirts of Geneva lies part of a 17-mile-long tubular track, circling its way across the French border and back again, whose interior is so pristine and whose nearly 10,000 surrounding magnets so frigid, that it's one of the emptiest and coldest regions of space in the solar system.

The track is part of the Large Hadron Collider, a technological marvel built by physicists and engineers, and described alternatively as heralding the next revolution in our understanding of the universe or, less felicitously, as a doomsday machine that may destroy the planet.

After more than a decade of development and construction, involving thousands of scientists from dozens of countries at a cost of some $8 billion, the "on" switch for the collider was thrown this week. So what we can expect?

The collider's workings are straightforward: at full power, trillions of protons will be injected into the otherwise empty track and set racing in opposite directions at speeds exceeding 99.999999 percent of the speed of light   fast enough so that every second the protons will cycle the entire track more than 11,000 times and engage in more than half a billion head-on collisions.

The raison d'ˆtre for creating this microscopic maelstrom derives from Einstein's famous formula, E = mc2, which declares that much like euros and dollars, energy ("E") and matter or mass ("m") are convertible currencies (with "c"   the speed of light   specifying the fixed conversion rate). By accelerating the protons to fantastically high speeds, their collisions provide a momentary reservoir of tremendous energy, which can then quickly convert to a broad spectrum of other particles.

It is through such energy-matter conversion that physicists hope to create particles that would have been commonplace just after the big bang, but which for the most part have long since disintegrated.

Here's a brief roundup of the sort of long-lost particles the collisions might produce and the mysteries they may help unravel.

Higgs Particles

One of the mysteries that continues to stump physicists is the origin of mass. We can measure with fantastic accuracy the mass of an electron, a quark and most every other particle, but where does mass itself come from?

More than 40 years ago, a number of researchers, including Peter Higgs, an English physicist, suggested an answer: perhaps space is pervaded by a field, much like the electromagnetic fields generated by cellphones and radio broadcasts, that acts like invisible molasses.

When we push something in the effort to make it move faster, the Higgs molasses would exert a drag force   and it's this resistance, as the Higgs theory goes, that we commonly call the object's mass. Scientists have incorporated this idea as a centerpiece of the so-called standard model   a refined mathematical edifice, viewed by many as the crowning achievement of particle physics, that since the 1970s has described the behavior of nature's basic constituents with unprecedented accuracy.

The one component of the standard model that remains stubbornly unconfirmed is the very notion of the Higgs' "molasses" field. However, collisions at the Large Hadron Collider should be able to chip off little chunks of the ubiquitous Higgs field (if it exists), creating what are known as Higgs bosons or Higgs particles. If these particles are found, the standard model, more than a quarter-century after its articulation, will finally be complete.

Supersymmetric Particles

In the early 1970s, mathematical studies of string theory revealed a striking step toward Einstein's unfulfilled dream of a unified theory   a single theory embracing all forces and all matter. Supersymmetry, as the insight is called, is mathematically complex but has a physical implication of central relevance to the Large Hadron Collider.

For every known species of particle (electrons, quarks, neutrinos, etc.), supersymmetry implies the existence of a partner species (called, with physicists' inimitable linguistic flair, selectrons, squarks, sneutrinos, etc.) that to date has never been observed.

Physicists believe these "sparticles" have so far evaded detection because they're a good deal more massive than their known counterparts, thus requiring more powerful collisions for their copious production.

A wealth of calculations strongly suggests that the collider will have that power.

The discovery of sparticles would be a monumental achievement, taking us far beyond Einstein by establishing a deep link between nature's forces and the particles of matter. Such a discovery also has the potential to advance our understanding of dark matter   the abundant matter that permeates space but does not give off light and hence is known only through its gravitational influence. Many researchers suspect that dark matter is composed of sparticles.

Transdimensional Particles

A tantalizing idea considered since the early part of the last century is that the universe might have more than the three spatial dimensions of common experience.

In addition to the familiar left/right, back/forth and up/down, physicists have contemplated additional directions that are curled up to such a small size that they've so far eluded discovery.

For many years Einstein was a strong proponent of this idea. He had already shown that gravity was nothing but warps and curves in the familiar dimensions of space (and time); the new idea posited that nature's other forces (for example, the electromagnetic force) amounted to warps and curves in additional, as yet unknown, spatial dimensions. Difficulties in applying the idea mathematically resulted in Einstein ultimately losing interest. But decades later, string theory revived it: the mathematics of string theory not only requires extra dimensions but has shown how to resolve the issues that flummoxed Einstein.

And now, remarkably, there's a chance   albeit a small one   that the collider may find evidence for the extra dimensions. Calculations show that some of the debris produced by the proton collisions may be ejected out of our familiar spatial dimensions and crammed into the others, a process we'd detect by an apparent loss of the energy the debris would carry.

The unknown is just how powerful the collisions need to be for this process to happen, a number itself determined by another unknown: just how small the extra dimensions, if they exist, actually are. The more tightly they're curled, the harder it would be to cram anything in them and so the more energetic the required collisions.

Should the Large Hadron Collider have the power necessary to reveal extra dimensions of space to overturn our belief that length, width and height are all there is   that would rank as one of the greatest upheavals in our understanding of the universe.

Micro Black Holes

Now for the possibility that's generated the fuss.

Recent work in string theory has suggested that the collider might produce black holes, providing physicists with a spectacular opportunity to study them in a laboratory.

The common conception is that black holes are fantastically massive astrophysical bodies with enormous gravitational fields. But in reality, a black hole can have any mass. Take an orange and squeeze it to a sufficiently small size (about a billionth of a billionth of a billionth of a meter across) and you'd have a black hole   with the mass of an orange.

Physicists have realized that the collider's proton-proton collisions might momentarily pack so much energy into such a small volume that exceedingly tiny black holes may form   black holes even lighter than the one theoretically created by the orange, but black holes nevertheless.

Why might one worry that this would be a problem? Because black holes have a reputation for rapacity. If a black hole is produced under Geneva, might it swallow Switzerland and continue on a ravenous rampage until the earth is devoured?

It's a reasonable question with a definite answer: no.

Work that made Stephen Hawking famous establishes that tiny black holes would disintegrate in a minuscule fraction of a second, long enough for physicists to reap the benefits of having produced them, but short enough to avoid their wreacking any havoc.

Even so, some have worried further that maybe Dr. Hawking was wrong and such black holes don't disintegrate. Are we willing to bet the fate of the planet on an untested insight? And that question takes us to the crux of the matter: the collisions at the Large Hadron Collider have never before occurred under laboratory settings, but they've been taking place throughout the universe   even here on earth   for billions of years.

Cosmic rays   particles wafting through space   constantly rain down on the earth, the other planets and the wealth of stars scattered throughout the galaxy, with energies far in excess of those attainable by the Large Hadron Collider. And since these more powerful collisions haven't resulted in astrophysical calamities, the collider's comparatively tame collisions most assuredly won't either.

Should any of the particles described above be produced at the Large Hadron Collider, from Higgs particles to black holes, corks will rightly pop in physics departments worldwide. But the most exciting prospect of all is that the experiments will reveal something completely unanticipated, something that forces us to rethink our most cherished explanations.

Confirming an idea is always gratifying. But finding what you don't expect opens new vistas on the nature of reality. And that's what humans, including those of us who happen to be physicists, live for.

October 2008

SUN	MON	TUE	WED	THU	FRI	SAT
UTK—roof of Neilson Physics Building on The Hill at UT 1st & 3rd Fridays TAO —Tamke-Allan Observatory Public Stargaze Watts Bar Lake, Roane County 1st & 3rd Saturdays			1	2	3 UTK	4 GSMNP CadesCove Star Party TAO
5	6	7	8	9	10 SMAS Meeting PSTCC 7 pm	11
12 **SCRAPS depends** **Upon its friends**	13 **Help!** **Help!**	14	15	16	17 UTK	18 TAO
19	20	21	22	23	24	25 SMAS Star Party UC
26	27	28 New moon	29	30	31