

PHYSICS AT SOUTHERN

Volume 41, electronic issue #4
April 27, 2000

Published once in awhile
For students, past & present, and friends of the Department

(SAU logo here)
logo here)

(Physics Dept

FLASH

There will be big news under this headline in the next issue, scheduled for early next week.

A LOOK BACK

Vol. 15, No. 1
Aug. 27, 1974

The Great Computer Break-In (edited for this issue)

In March of 1973 we were again offering "Issues in Physical Science and Religion" on the Keller plan. Test questions are stored in databases on the HP 3000; the computer creates tests based on random selections from the database for a given section of the class; the computer does all the "paperwork" associated with grading the test. Students are able to have the computer administer tests to them at times of their own choosing (but no more than once a day). The students must pass a test before being allowed access to the next test. This type of teaching is known as the Keller plan, or the Personalized System of Instruction. A student, not a member of the class but an employee of the college computer industry, felt challenged to break the masking code by which these tests were protected. He succeeded by obtaining a copy of a test as students see it on the terminal and also having a copy of the same test as it appears in the computer library, scrambled by the masking code. We were aware of his progress and really no cheating was involved. However, the computer trade journals -- six or seven of them -- got hold of this and made a nationwide story about it which led readers to think that the student was cheating (and, incidentally, that by doing so he broke the 7th Commandment!). I have met people in various places across the country who have read these articles and who received a somewhat unfavorable impression of Southern Missionary College because of it. The college computer industry subsequently offered the masking code unscrambling program for sale. This offering caused some hard feelings on the part of Hewlett-Packard, which provided the masking code. (HP eventually corrected the

problem and developed a working relation with Southern wherein such loopholes were reported to them in return for some nice equipment.) We have built a dozen or more safeguards into the testing system to avoid similar sorts of problems.

FALL/WINTER 1999 ISSUE OF "COLUMNS"

In the previous issue of "Physics at Southern," you were apprized of the superb cover article on pp. 4 to 6. Those of our readers who have fond memories of our 26 years in Daniells Hall may have noticed reference to that period in the piece about the Daniells Hall renovation.

PERSONALS

Chris Carlson '94 writes:

Wow, teaching group theory sounds like fun! I still remember fondly the time we spent working on that project. But, I'm sure that I too would some refreshing on it now. Can you believe it's been 6 years since I left SC, and 10 since I started there?!? Time flies!

Well, the job search has finally ended!! I've accepted a job with Micron Technology, Inc. They make high-density DRAM (one of only 4-5 companies in the world and the only one in the US) and are located in Boise, Idaho. I will be working the their R&D division on high-k dielectrics (k means dielectric constant). They are starting to use the same materials, i.e., (Ba,Sr)TiO₃, that I've studied to help cram more and more capacitors into a smaller and smaller area. I think it will be a very interesting and fun job. I will start there at the end of the summer after I finish writing my thesis.

A paper of mine that just came out [attached as pdf file -- ed] and we've got a couple more in the works too. Please give our best to everyone there at SAU (still not used that new name).

Bryan James, returning as a junior after a year at WWC, writes:

We still have 6+ weeks of school. I'm looking at getting back in early June. It looks like my dad is going to build another house, so I'll be involved in that. Dean Magers is also pushing me to work with him in the dorm this summer. I appreciate the info you [Dr. Hansen] gave me regarding physics [work] opportunities, but I think I'll [work in] Collegedale this summer.

Greg Kinne, Physics minor in the early 1970s, writes:

I'm involved with a new project [that] is very exciting. I've started Global Telescope Network, Inc. We have been in business about 1.5 years now and are dedicated to deploying robotically controlled telescopes in locations on the globe. Each telescope (.25 meters approx) will be connected to the Internet and be accessible from any browser. We are considering placing one 2 meter scope for scientific work at each

at each site also. We're VERY excited about this. A number of engineers are working with us on the project. All these scopes will be available for use from schools and universities world wide. We also hope to host private telescopes for interested universities on our network.

James Nelson, Physics minor in the early 1990s, writes:

Hi Doc! Cisco [yes, the company that shot up to dominance in the internet router business -- ed] has certainly grown since we came back out to CA, hopefully it will keep doing that. John Chambers knows people and his business extremely well, and treats the employees exceptionally well.

Things are going well here, we are moving this week from Vallejo (70 miles -> Cisco) to South San Jose (~17 miles -> Cisco), a much nicer commute! Plus I'll be able to take light rail to work.

QUOTE

In the company of friends, writers can discuss their books, economists the state of the economy, lawyers their latest cases, and businessmen their latest acquisitions, but mathematicians cannot discuss their mathematics at all. And the more profound their work, the less understandable it is.

-- Adler, Alfred

A LOOK FORWARD

May, 2009: The Consortium of Adventist Physics Departments is formed. The original proposal for this Consortium was made a generation ago. Each department contributes its strengths to all students' education. In some cases this happens by having the students (and special friends, if any) study at a campus for a year and in some cases by having professors visit a campus. Of course this moving around requires a large financial commitment, but fortunately the combined Physics alumni of all the NAD colleges and universities provided the commitment.

RESEARCH PUBLICATION

A chapter entitled "Numerical Solutions of the Laplace Equation in Chemical Spaces," by Ray Hefferlin, has appeared in "Discrete Mathematical Chemistry," the most recent of the Series in "Discrete Mathematics and Theoretical Computer Science." The series is edited by the American Mathematical Society. This chapter is the first of three contributions to the field. The second one (logically speaking) appeared several months ago (chronologically speaking). The third one, coauthored by student Jonathan Knoll, is currently under review.

One of the solutions which the contributions explain was noticed in 1981 and set aside as a coincidence. Then a spreadsheet exercise done by Dr. Chris Hansen in 1997 brought it to mind and suggested a more rapid method of obtaining them. The work was done in 1998-1999.

THE LAST LAUGH

(This item is of unknown origin. It has been edited numerous times, and has been confirmed in talks with railroad personnel. The last large paragraphs about the Space Shuttle is wonderful, so please look at it even if you know all the rest

of the stuff -- ed.)

The US standard railroad gauge (distance between the rails) is 4 feet 8.5 inches. Why was that gauge used? Because that's the way they built them in England, and English expatriates built the US railroads.

Why did the English build them like that? Because the first rail lines were built by the same people who built the horse-drawn trams, and that's the gauge they used.

Why did they use that gauge then? Because they used the same jigs and tools that they used for building wagons of that wheel spacing.

Why did the wagons have that particular odd wheel spacing? Well, if they tried to use any other spacing, the wagon wheels would break on some of the old, long-distance roads in England, because that was the spacing of the wheel ruts.

THE LAST LAUGH, CONTINUED

So who built those old rutted roads? The first long distance roads in Europe (and England) were built by Imperial Rome for their legions. The roads have been used ever since. And the ruts? Roman war chariots first made the initial ruts, which everyone else had to match for fear of destroying their wagon wheels and wagons. Since the chariots were made for, or by, Imperial Rome, they were all alike in wheel spacing.

Thus, we have the answer to the original question. The United States standard railroad gauge of 4 feet, 8.5 inches are made just wide enough to accommodate the hoof-tracks pairs of Roman war-horses.

And now, the twist to the story...

There's an interesting extension to the story about railroad gauges and horses' tracks. When we see a Space Shuttle sitting on its launch pad, there are two big booster rockets attached to the sides of the main fuel tank. These are solid rocket boosters, or SRBs. Thiokol makes the SRBs at their factory at Utah. The engineers who designed the SRBs might have preferred to make them a bit fatter, but the SRBs had to be shipped by train from the factory to the launch site. The railroad line from the factory had to run through a tunnel in the mountains. The SRBs had to fit through that tunnel. The tunnel is just so much wider than the railroad track, and the railroad track is about as wide as two horses' behinds.

So, the major design feature of what is arguably the world's most advanced transportation system was determined by the width of a horse's rear!

(Dr. Hefferlin is solely responsible for this issue.)