***Joseph F. Traub***
*Computer Science Department,*
*Columbia University,*
*New York, NY 10027, USA*
*E-mail: traub@cs.columbia.edu*

■

## Strength of Spider Silk

In the Perspective by David A. Tirrell "Putting a new spin on spider silk" (5 Jan., p. 39) (*1*) and in This Week in Science in the same issue (p. 9), comments are made about the "superior" and "unmatched" strength and toughness of spider silk. These comments have romantic interest, but they are not correct according to numbers published elsewhere. The following table, although not comprehensive, makes the point.

| Material | Tensile strength (GPa) | Energy to break ($J/m^3$) |
|---|---|---|
| Spider silk (*1*) | 1 | 10 |
| Kelvar (*1*) | 4 | 3 |
| Spectra (*2*) | 5 | 8 |
| Fused silica (*3*) | 14 | 220 |
| Graphite (*4*) | 20 | 15 |
| Silicon (*4*) | 16 | 2 |
| Beryllium oxide (*4*) | 25 | 26 |

The *lowest* tensile strength on this list is that of spider silk. The toughness (energy to break) of the silk is more competitive, but it is no match for the mighty fused silica. Furthermore, the chemical and thermal stabilities of spider silk are mediocre compared with the rest of the list. Finally, silica fiber is much, much cheaper to produce than commercial quantities of spider silk. So let's put the romance aside and pay some attention to the "video tape."

***John J. Gilman***
*School of Engineering and Applied Science,*
*University of California,*
*Los Angeles, CA 90095–1595, USA*

### References and Notes

1. D. A. Tirell, *Science* **271**, 39 (1996).
2. S. Kavesh, Allied-Signal Corp., private communication. Spectra is a highly oriented polyethylene commercial fiber.
3. W. B. Hillig, in *Modern Aspects of the Vitreous State* (Butterworths, Washington, DC, 1962), p. 186.
4. A. Kelly and N. H. Macmillan, *Strong Solids* (Clarendon, Oxford, UK, 1986), p. 391.

■

## "New Physics"?

James Glanz (Research News, 9 Feb., p. 758) heralds the recent experimental results of the Collider Detector at Fermilab (CDF) group as evidence for "new physics." The opinions as to what this "new physics" may be seem divided. Some hope that the observed deviations are the signal for the long sought "super-symmetry." Others think they are a sign that the quark itself may be composed of something (preons). Still others are postulating "cousins" of the Z particle.

A less dramatic explanation of the observed deviations exists: the Standard Model is correct, but its properties are different from what theoretical physicists have thought. Most theoretical predictions in the Standard Model come from a technique called perturbation theory (PT). While PT has produced incredibly accurate predictions in electro-weak interactions, there are good reasons to believe that in the theory describing strong interactions, quantum chromodynamics (QCD), PT may lead to incorrect predictions (*1*).

An important prediction of PT is the way the strong coupling constant, $\alpha_s(Q)$, is supposed to run with the energy, $Q$. QCD is supposed to include the property called "asymptotic freedom": as $Q$ increases, $\alpha_s$ is supposed to go to zero in a special manner. In 1992 (*2*), we predicted that $\alpha_s$ would decrease less fast than expected with $Q$ and, in fact, never go to zero. Three months later, the European electron-positron col-

lider LEP of CERN started producing results showing precisely that type of deviation.

The CDF results also can be interpreted as measuring an $\alpha_s$ larger than predicted by PT within the Standard Model. While this effect could conceivably signal "new physics," it agrees qualitatively with our prediction. In fact, we speculated (*1*) that perhaps the running of $\alpha_s$ might be obtained from the PT formula by replacing the so-called QCD scale $\Lambda$ by the energy dependent quantity $\sqrt{\Lambda^2 + (\gamma Q)^2}$ (corresponding to mean field critical behavior). We choose $\Lambda$ and $\gamma$ so that $\alpha_s$ agrees with the measured values at 5 and 91 gigaelectron volts; then the modified formula for the running of $\alpha_s$ leads to a cross section at the highest CDF energies that is more than 40% higher than the PT prediction, in general agreement with the experimental results.

Our scenario would have dramatic implications, requiring a reevaluation of many predictions made in the past three decades in particle and condensed matter physics. The theories affected would range from "strings" to thin magnetic films.

***A. Patrascioiu***
*Department of Physics,*
*University of Arizona,*
*Tucson, AZ 85721, USA*
***E. Seiler***
*Max-Planck-Institut für Physik,*
*Föhringer Ring 6,*
*D-80805 Munich, Germany*

#### References

1. A. Patrascioiu and E. Seiler, *Phys. Rev. Lett.* **74**, 1924 (1995).
2. ———, "Expected deviations from perturbative QCD at 1 TeV or less" (preprints MPI-Ph/92-18 and AZPH-TH-92-06, Max-Planck-Institute für Physik, Munich, Germany, and Department of Physics, University of Arizona, Tucson, AZ, January 1992), in: *Rencontre de Physique de la Vallée d'Aoste*, M. Greco, Ed. (Edition Frontières, Gif-sur-Yvette, France, 1992), pp. 125–131.

■

## Antihydrogen

Physicists at Fermilab, under the leadership of Rosanna Cester, have already synthesized antihydrogen, albeit unwittingly (A. Watson, Research News, "Physicists produce first antiatom," 12 Jan., p. 147). Cester's group planned in the late 1980s an experiment, codenamed E760, to study charmonium states produced by intercepting an intense beam of antiprotons with a hydrogen gas jet target (http://fn760b.fnal.gov). Charles Munger and his colleagues recognized this serendipitous antihydrogen production and are finishing the construction of a suitable detector at Fermilab in order to confirm the phenomenon (http://fnala.fnal.gov/e862). Munger's group, in addition, is planning to measure one of antihydrogen's fundamental spectroscopic transitions, the Lamb shift. Antihydrogen atom production with this technique is rare; the cross section is estimated to be a few picobarns. This corresponds to the production of a few antihydrogen atoms per week for a beam of $10^{13}$ antiprotons, crossing a dense gas target of $10^{13}$ atoms per square centimeter a million times a second. Fermilab's Antiproton Accumulator is scheduled to get a new feeder accelerator, the Main Injector, by 1999 and ambitious plans are under way for the addition of a permanent magnet antiproton storage ring. These upgrades at Fermilab will guarantee a copious source of antiprotons in the United States.

***Dimitri Dimitroyannis***
*Department of Physics,*
*Northwestern University,*
*Evanston, IL 60208*
*E-mail: dad239@nwu.edu*
*World Wide Web: http://ceres.phys.nwu.edu*

■

## Dominance in Crayfish

I am an 8th-grade student at Westland Middle School in Bethesda, Maryland. I read with interest the article "Neurobiology: Social status sculpts activity of crayfish neurons" by Marcia Barinaga (Research News, 19 Jan., p. 290), which discussed the report "The effect of social experience on serotonergic modulation of the escape circuit of crayfish" by Shih-Rung Yeh *et al.* in the same issue (p. 366).

A statement in Barinaga's article says that male crayfish display dominance behavior toward other males. My 1995 school science fair project was on the subject of fighting and dominance behavior in crayfish. I paired crayfish, videotaped their encounters, and noted the resulting dominance behavior. I carefully noted the sex of the crayfish. I discovered that not only males fight males, but females fight males and females fight other females. In general, one cannot predict which animal will finally be dominant. That is, females or males can show dominance in a mixed fight. I also observed that relative size or the absence of a claw were not predictors of dominance.

***Justine H. Lange***
*4221 Dresden Street,*
*Kensington, MD 20895, USA*

■

## Amide Cleavage by a Ribozyme: Correction

Pertaining to our report "Cleavage of an amide bond by a ribozyme" (13 Jan. 1995, p. 237) (*1*), we recently obtained data