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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."

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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, α_s is supposed to go to zero in a special manner. In 1992 (*2*), we predicted that α_s would decrease less fast than expected with Q and, in fact, never go to zero. Three months later, the European electron-positron col-