famously described in 1932 as "continuous random networks."[1] If those networks were random, then increasing their connectivity—by replacing divalent atoms like calcium with tetravalent atoms like silicon—should lead to a stiffness transition, which was present in early data. Compositional proximity to a stiffness transition enhances the ability of the melt to develop longer-range order and avoid crystallization by nucleation of crystalline clusters.[2] More recently, purified samples have actually exhibited two stiffness transitions, usually spaced about 10% apart on a suitable connectivity scale. The two transitions bound a new kind of topological intermediate phase, not defined by any kind of conventional symmetry but only by its special nonrandom connectivity. The internal networks associated with this novel phase have properties of great technological importance: They are rigid but still free of internal stress.[3] That combination of properties makes it possible to produce window glass on large scales without having it crack or crystallize.

The discovery of self-organized networks in intermediate phases has generated "constraint theory," a new kind of topological theory of strongly disordered solids. Constraint theory has a strongly non-Newtonian flavor. In crystals, many quantum and statistical properties are described by power-law scaling, but network self-organization is an exponentially complex combinatorial problem. (Mathematicians call such problems "nonpolynomial complete." They are best addressed by the variational methods developed in the late 1700s by Leonhard Euler and Joseph Louis de Lagrange, methods that are the basis of Lagrangian mechanics.) In any case, the identification of many such systems has made possible the development of a new linear algebra for describing them; their properties are at best only marginally accessible to computer simulations on even the largest scales.[4]

The PHYSICS TODAY story concludes on a positive note: our enhanced appetites for a deeper understanding of the transition between localized and delocalized states in materials. There are often two such transitions, and the intermediate phase between them is much more exciting than either transition alone.

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# Publishing perils include single-blind review

The Letters section of the January 2007 issue of PHYSICS TODAY (page 10) contained a discussion about the exacting and often confusing electronic paper submission process as an obstacle to getting published. I think a much more important and corrosive impediment to publication is single-blind peer review.

Peer review is the cornerstone of scientific research and advancement. It recognizes the importance of the objective reality and is a manifestation of the scientific method. It also keeps crackpots and just plain bad science out of the journals.

However, the single-blind peer review system has a fundamental flaw. It allows reviewers to assess the author(s) of a paper along with the scientific content and thereby permits nonscientific considerations to creep in. As is often true in other aspects of professional life, in peer review who you know can be as important as what you know.

Single-blind peer review discourages scientists from publishing in new fields, suppresses research from unknown or unaffiliated scientists, and adds irrelevant considerations to the review of scientific content. It may, in fact, be robbing science of its greatest breakthroughs right now. More than 100 years after Einstein's miracle year, what are the chances that an unknown 24-year-old patent clerk could revolutionize physical law in a peer-reviewed journal today? It seems extremely unlikely.

The arXiv.org server suffers the same problem in that an author must have a personal reference in order to publish; in fact, there the personal relationship is paramount and is presumed to subsume scientific merit.

If journals are really about scientific truth and integrity, and if we believe in the objective reality, peer review must be double blind. The single-blind system is intellectual laziness at best, cronyism at worst.


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# Tuning in to dye laser origins

The historical feature article on "The Early Days of Precision Laser Spectroscopy" (PHYSICS TODAY, January 2007, page 49) misidentified the inventor of the tunable dye laser as Peter Sorokin.

B. B. McFarland and I, both then at Korad Corp, were the actual "inventors" who first demonstrated that device and published the findings.[1] The experimental design with a diffraction grating as one of the resonator cavity mirrors, as discussed in the PHYSICS TODAY article, was first described by us. Tunability was one original aspect of that discovery; another was the narrowband energy efficiency of the laser, funneling a large portion of the original broadband laser emission into the narrow band of a selected wavelength.

Sorokin himself, in a published interview,[2] gave full credit to that paper and its authors, adding that he had "missed the boat completely, . . . just hadn't thought of it," and saying that "Soffer and McFarland's result was a tremendous surprise." The reason for his and everybody's surprise was no doubt the conventional but mistaken belief that the xanthine dye system, and in particular rhodamine 6G, was primarily inhomogeneously spectrally broadened at the relevant time scales. I examined the literature that supposedly validated that belief and found it unconvincing. The same surprising homogeneity story that upset published notions also turned out to apply to the cyanine dye family and the xanthines embodied in plastic,[1] despite their famously long fluorescent lifetimes in solid solution.

That was some 40 years ago. The lesson to be learned now is that we must read everything with considered skepticism.

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**Brewer, Mooradian, and Stoicheff** reply: We attributed the first demonstration of laser emission in organic dyes to the two independent work groups led by Peter Sorokin and Fritz Schäfer (reference 7 in our article).

We also erroneously attributed tunability to them. Although Schäfer and coauthors noted that the laser wavelength of each dye was tunable over a great part of its fluorescence band with changing dye concentration, that was not the narrowband tunability suitable for sweeping over an atomic or molecular spectrum.

Indeed, Bernard Soffer and B. B. McFarland first showed that pulsed dye laser radiation could be tuned with a reflective diffraction grating at one end of the laser cavity; that generally more useful method provided tuning over 400 Å in rhodamine 6G with the requisite narrow output of 0.6 Å (50 GHz).

Later, others replaced the grating with an echelon or Lyot filter to generate much narrower output. However, the technique used most frequently for precision spectroscopy was the extremely monochromatic (MHz) and tunable dye laser emission produced by using the grating at grazing incidence, a method still in use. Also, continuous-wave and broadly tunable dye lasers with linewidths as low as 50 kHz have been observed by frequency-offset locking the dye frequency to a stable reference.

Currently, broad tunability in the near-IR and visible regions with narrow linewidths between 50 and 300 kHz is obtained with a continuous-wave diode laser—a semiconductor chip—using an external cavity that consists of a diffraction grating and a retroreflector. Resolution of this magnitude has permitted precision measurements in fundamental investigations.

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## Science and the White House

John Rigden's article in the June 2007 issue of PHYSICS TODAY (page 47), recapitulating the relationships between American presidents and the scientific community in the past 50 years, is particularly timely in relation to the current intense campaign for that office.

Rigden is unstinting in praising President Dwight D. Eisenhower and his affection for those he called "my scientists," but more is involved in Eisenhower's affection than accidents of personalities.

As a West Point graduate, Eisenhower had a science education that far surpassed that of any other recent American president. To his scientific record should be added his initiative for the Geneva conferences, beginning in 1955, on the peaceful uses of atomic energy.

Without visible evidence to the contrary, it seems no current candidate for the office, except perhaps John McCain, has even a smattering of science education. Most prominent by far in the current crop of presidential aspirants are lawyers. And what do lawyers know about science? I put the following question to a lawyer who is widely recognized as one of the brightest in the profession: What would happen to any law school that imposed a science requirement as a condition for admission? He answered, "It would soon close its doors for lack of applicants."

It is encouraging to know that Angela Merkel, the German chancellor, is a physicist. But that makes the current crop of American presidential candidates look particularly undereducated and therefore questionably qualified to lead history's greatest world power in a scientific age.

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**Rigden replies:** I agree with Lawrence Cranberg's concern about the lack of science in the education of US leaders; however, he does not identify what he means by "science education." He mentions German chancellor Angela Merkel, who has a PhD in physics—a robust science education indeed. Cranberg surely cannot hold that as a standard.

Except in the rarest of instances, the only way departments of physics touch future national leaders is through introductory physics courses. Those equation-driven courses do not, in my judgment, qualify as a science education. I suggest that the value of an introductory physics course, six months after the final exam, is negligible. Specifically, I wager that adults who