those superconducting samples in which the Cooper pairs form at temperatures well above T_c.

Such infrared absorption bands were subsequently observed by Dirk Van der Marel and collaborators at the University of Groningen and were reported in a paper published in 1995.[2] Their work supported our proposal that it is the phase winding mechanism that leads to the lowering of T_c in the underdoped samples.

Another significant consequence of the phase winding mechanism discussed in our 1990 paper is the concept that phase winding is a manifestation of the tendency of Cooper pairs to localize in this region of the high-T_c phase diagram. This leads to an extraordinary sensitivity of the superconducting phase coherence in these materials to d-band blockers such as zinc, or to other localizing agents such as praesodymium. The existence of localized pairs on the insulating side of the superconductor/insulator phase boundary can explain the anomalously long ranged proximity tunneling observed recently in YBCO/PBCO multilayers. Here, regions of a high-T_c YBCO superconductor are separated by spacers that are driven insulating by replacing yttrium with praesodymium.[3] The praesodymium leads to Cooper pair localization, which is overcome by the injection of mobile Cooper pairs from the adjoining YBCO. The injected pairs can then propagate the phase of the order parameter for hundreds of angstroms through the insulating spacers, thus leading to long-range phase coherence in the multilayer samples.

References

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Quarternionic QM Updates Provided at ASI Web Site

Readers of David Finkelstein's review of my book *Quarternionic Quantum Mechanics and Quantum Fields* (June, page 58) may want to know that I have set up a page at the Institute for Advanced Study's Web site on which I briefly describe new work on topics discussed in the book and indicate how the relevant papers can be obtained. One such paper, cowritten with Andrew Millard, addresses issues raised in Finkelstein's review concerning the trace action principle. The Web page is at http://www.sns.ias.edu/~adler/Html/quaternionic.html.

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More on Vavilov's Contributions to 20th-century Physics

Sergei Vavilov's nephew Yu. N. Vavilov, writing with B. M. Bolotowsky in your December 1995 issue ("Letters," page 11), pleads that his uncle's role in the discovery of Čerenkov radiation, as well as other scientific achievements, be more fully recognized in the West.

We agree that Sergei Vavilov was a distinguished figure in 20th-century physics, and, in particular, we support the suggestion that the term "Vavilov-Čerenkov radiation" be used more widely in the West.

What Yuri Nikolaievitch and his colleague omitted to say, but may be of interest to your readers, is that Sergei Vavilov was probably the first scientist to observe a nonlinear optic effect. In 1926, with Vadim L. Levshin, he found a reduction in the absorption of light by uranium glass with an increase of intensity of 454 nm light from a high-intensity spark source.[1] And it was Vavilov who introduced the term "nonlinear optics" into the literature, in a passage in his 1950 book *Mikrostruktura sveta* ("The Microstructure of Light").

We include a translation of that passage in our 1995 article entitled "A History of Optics and Optoelectronic Physics in the Twentieth Century,"[2] in which we discuss Vavilov's contributions. In fact, in our discussion of the discovery of Čerenkov radiation, we point out that Vavilov was the author of a 1934 paper,[3] which immediately followed the experimental paper of his student Pavel Čerenkov,[4] in *Doklady Akademii Nauk SSR* in which he correctly postulated fast electrons as the origin of the new phenomenon.

We also describe a brush that Vavilov had with Fritz Weigert in 1922, when Vavilov incorrectly disputed Weigert's claim to have observed polarized fluorescent light at a time when it was universally believed not to be polarized.

We would also like to draw your readers' attention to two useful sets of biographical essays about Vavilov that appeared in *Uspekhi fizicheskikh nauk* in 1973 and 1975.[5] The essays include two by Ilya Frank, a col-