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those superconducting samples in
which the Cooper pairs form at tem-
peratures 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 pro-
posal 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 dis-
cussed in our 1990 paper is the con-
cept that phase winding is a manifes-
tation 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 super-
conducting phase coherence in these
materials to d-band blockers such as
zinc, or to other localizing agents
such as praeosdymium. The exist-
ence of localized pairs on the insulat-
ing side of the superconductor/insulator
phase boundary can explain the
anomalously long ranged proximity
tunneling observed recently in
YBCO/PBCO multilayers. Here, re-
gions of a high- T_c YBCO superconductor
are separated by spacers that are
driven insulating by replacing
yttrium with praeosdymium.³ The
praeosdymium leads to Cooper pair lo-
calization, 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 spac-
ers, thus leading to long-range phase co-
herence in the multilayer samples.

References

1. S. Doniach, M. Inui, Phys. Rev. B **41**, 6668 (1990).
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Quarternionic QM Updates Provided at ASI Web Site

Readers of David Finkelstein's re-
view 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 pa-
per, cowritten with Andrew Millard,

addresses issues raised in Finkel-
stein's review concerning the trace ac-
tion 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. S-
vavilov, writing with B. M. Bolo-
towsky in your December 1995 issue
("Letters," page 11), pleads that his
uncle's role in the discovery of Čer-
enkov radiation, as well as other sci-
entific 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 sup-
port 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 Ser-
gei Vavilov was probably the first sci-
entist to observe a nonlinear optic ef-
fect. In 1926, with Vadim L. Levshin,
he found a reduction in the absorp-
tion 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 intro-
duced 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 pas-
sage in our 1995 article entitled "A His-
tory of Optics and Optoelectronic Phys-
ics in the Twentieth Century,"² in
which we discuss Vavilov's contribu-
tions. 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 fol-
lowed the experimental paper of his stu-
dent Pavel Čerenkov,⁴ in *Doklady
Akademii Nauk SSR* in which he cor-
rectly 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 fluo-
rescent 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 *Uspekhii fizicheskikh
nauk* in 1973 and 1975.⁵ The essays
include two by Ilya Frank, a col-