E Pluribus Boojum: the physicist as neologist

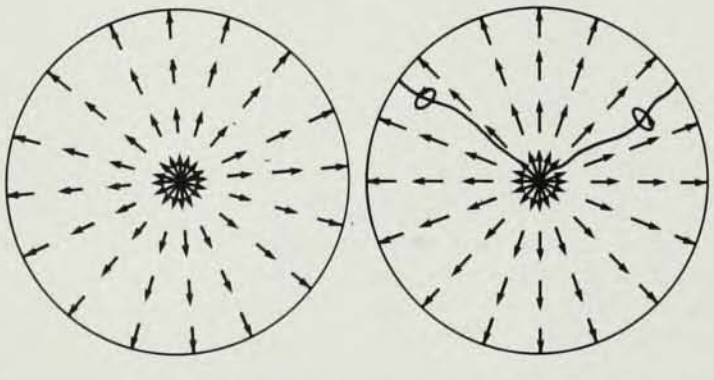
An account—heretofore available only in a *samizdat* edition—of how the word "boojum" became an internationally accepted scientific term, printed in some very distinguished journals.

N. David Mermin

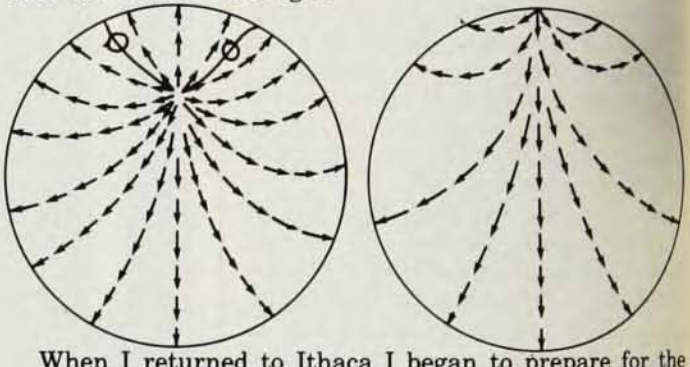
I know the exact moment when I decided to make the word "boojum" an internationally accepted scientific term. I was just back from a symposium at the University of Sussex near Brighton, honoring the discovery of the superfluid phases of liquid helium-3, by Doug Osheroff, Bob Richardson, and Dave Lee. The Sussex Symposium took place during the drought of 1976. The Sussex downs looked like brown Southern California hills. For five of the hottest days England has endured, physicists from all over the world met in Sussex to talk about what happens at the very lowest temperatures ever attained.

Superfluid helium-3 is an anisotropic liquid. The anisotropy is particularly pronounced in the phase known as He^3-A. A network of lines weaves through the liquid He^3-A which can be twisted, bent or splayed, but never obliterated by stirring or otherwise disturbing the liquid.

Several of us at the Sussex Symposium had been thinking about how the local anisotropy axis of He^3-A would arrange itself in a spherical drop of the liquid. The most symmetrical pattern might appear to have lines radiating outward from the center of the drop, like the quills of a (spherical) hedgehog (left diagram below). There is an elegant topological argument, however, that such a pattern cannot be produced without at the same time producing a pair of vortex lines connecting the point of convergence of the anisotropy lines to points on the surface of the drop.



It appeared that if one did try to establish the symmetric pattern of radiating lines then the accompanying vortices would draw the point of convergence of the lines to the surface of the drop, resulting in a final pattern that looked like the one on the right:



When I returned to Ithaca I began to prepare for the proceedings the final text of the talk I had given which examined, among other things, the question of the spherical drop. Although no remarks about the spherical drop were made after my talk, I decided to use the format of the discussion remark to describe the opinion that developed during the week: that the symmetric pattern would collapse to one in which the lines radiated from a point on the surface. I found myself describing this as the pattern that remained after the symmetric one had "softly and suddenly vanished away." Having said that, I could hardly avoid proposing that the new pattern should be called a boojum.

The term "boojum" is from Lewis Carroll's "Hunting of the Snark" and it came to me at my typewriter rather as it had first come to Carroll as he walked in the country. The last line of a poem just popped into his head: "For the Snark was a Boojum, you see." A little distance along it was joined by the next to last line, "He had softly and suddenly vanished away." The hundreds of lines leading to this denouement followed in due course.

Goodness knows why "boojum" suggested softly and suddenly vanishing away to Carroll, but the connection having been made, it was inevitable that softly and suddenly vanishing away should suggest "boojum" to me. I was not unaware of how editors of scientific journals might view the attempt of boojums to enter their pages; I was not unmindful of the probable reactions of international commissions on nomenclature; nevertheless I resolved then and there to get the word into the literature.

There would be competition. Other people at the sympo-

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"He remarked to me then," said that mildest of men,
"'If your Snark be a Snark, that is right:
Fetch it home by all means—you may serve it with greens,
And it's handy for striking a light...

"'But oh, beamish nephew, beware of the day,
If your Snark be a Boojum! For then
You will softly and suddenly vanish away,
And never be met with again!'"

sium had proposed calling my boojum a flower or a bouquet. Philip W. Anderson, who was to win his Nobel Prize the next year, and who appears at several critical moments in my tale, was not at the Sussex Symposium, but he was also thinking about spherical He^3-A, and wanted to call the stable pattern a fountain. It is possible that Anderson's colleague at the Bell Telephone Laboratories, William F. Brinkman, was thinking about boojums at least a year before any of us. But he didn't know it was boojums he was thinking about and didn't bother to call them anything else either. Although he may not know it to this day, Brinkman was to play a role of pivotal importance in boojum's progress.

The first step toward assuring the adoption of "boojum" was easily accomplished. The discussion remarks, including my nomenclatural proposal in the guise of a discussion remark, received the usual minimal editorial attention. Shortly thereafter the word "boojum"—albeit encumbered by quotation marks—made its maiden appearance in the literature of modern physics.

Maki and Hall (see also their prepared talks) both felt that the yozh would be unstable. They disagreed on the fashion in which it would disappear, but it was my impression that both favored the texture of fig. 3c as that prevailing after the yozh had softly and suddenly vanished away. Hall proposed calling it the "flower texture," but I personally think that "boojum" is more to the point.

Note my use of the word "yozh" to describe the symmetric pattern. "Yozh" is Russian for "hedgehog." I have never forgotten the word since studying Russian for the PhD language requirement, because it is only two letters long in Cyrillic. Since a Russian physicist, writing in Russian, had introduced the term, I used "yozh" instead of the increasingly popular "hedgehog" in the text of my paper. This effort to make an English word out of "yozh" failed utterly. Little did I then suspect that I would one day succeed in making a Russian word out of "boojum."

Published boojums

My next step was clearly to publish something which put my nomenclatural proposal to use, calling a boojum a boojum without fanfare or quotation marks. I wasn't ready to fight with editors of journals, but I was to deliver a paper on superfluid helium-3 at a conference to be held on Sanibel Island in January 1977, and the conference proceedings were to be published as a book. The form of my contribution to the Sanibel proceedings as well as the intensity of my interest in the boojum was considerably influenced by a series of letters I exchanged with Phil Anderson that fall.

Our correspondence was somewhat constrained by the fact that although I knew I was writing to Anderson, he—at least for a while—did not know he was writing to me. I had been sent the text of a paper by Anderson and Gerard Toulouse to referee for *Physical Review Letters*. Anderson and Toulouse argued that He^3-A might not be as good a superfluid as people had expected, producing an ingenious reason why what might appear to be a conventional permanent supercurrent could in fact lose its flow.

I saw a possible flaw in their argument. The surface of a container has a rather peculiar effect on the anisotropy axis of He^3-A. The local axes are forced to line up perpendicular to the surface at the boundaries of the liquid (as they are in the pictures of the spherical drops shown above). Although this seemed to be of no relevance to the argument of Anderson and Toulouse, I worried that it might, in fact, invalidate the mechanism they proposed for the disappearance of the supercurrent. I suggested that such questions should be cleared up before the paper was published. In the only mildly acrimonious correspondence that ensued, the authors and I both started to realize that the ability of the surface to stabilize the supercurrent was indeed relevant, but that this stabilizing power could be lost if there was even a single boojum (none of us called it that) on the surface.

This was interesting enough for their paper to appear (though without the word boojum), and I found myself more committed than ever to establishing the term. It was now evident that boojums were more than an inert feature of the structure of He^3-A drops; they had a vital role to play in the most fundamental property of the liquid, its superfluid flow. Furthermore it was no longer a bad idea about the pattern in spherical drops that was softly and suddenly vanishing away, but the supercurrent itself, whose soft and sudden vanishing could be triggered by a well placed boojum. My nomenclatural impulse had acquired the character of a prophetic vision.

In "The Hunting of the Snark," a boojum is a singular variety of snark with the alarming ability to bring about the soft and sudden vanishing away of anyone encountering it. The boojum in He^3-A, being a point at which anisotropy axes

N. David Mermin, professor of physics at Cornell University is coauthor of the world's funniest solid state physics text. In 1968 he published the only Elizabethan drama that is explicitly Lorentz invariant, and his article extolling the pleasures of computing log(2) has been reprinted for the moral improvement of mathematicians. Undeterred by the Matthew Effect, he does physics under the pseudonym of N. D. Mermin.

in different directions all meet, is a mathematical singularity. A singularity in He^3-A responsible for the vanishing of a supercurrent *had* to be called a boojum.

Accordingly, at the appropriate point in my paper for the Sanibel Symposium, I let loose a flock of boojums:

> This twisted boojum is shown at the bottom of the torus in the cross section in which it resembles the hyperbolic twistless boojum of Fig. 10 (but note that the cross section perpendicular to the page will resemble the circular boojum). If either of the booja encircles its part of the torus (see inset) then two quanta are subtracted from the circulation about the entire torus.

Inspection of this spectrum reveals that I had adopted "booja" as the plural form. As we shall see this turned out to be a serious error. I believe it was the one false step I made in an otherwise impeccable campaign, though publishing this article may turn out to have been the second.

The editor of the proceedings approved "boojum"; indeed, he allowed it to appear in the index, where it can be seen in the company of better established but, I would have said far less poetic technical terms in B:

BCS theory, 112, 379
BW state, 130, 186–188, 190
Boojum, 17, 21, 29
Borders, 5, 7, 12
Breathers, 59, 74
Bose-Einstein condensation, 287, 293, 303, 307, 405

The Sanibel Symposium took place during the remarkably cold winter of 1976–77. Many of the people who suffered through the heat of the Sussex Symposium found themselves together again, six months later, experiencing the coldest Florida January on record. They were rewarded by the first public lecture (mine) in which the word "boojum" was used in its new scientific context. (Anderson also spoke at Sanibel but he called the boojum a fountain.)

A boojum in Erice

Returning from cool Florida to frigid Ithaca, I set to work preparing a set of lecture notes that I delivered that June at a summer school in Erice, a mountain-top Sicilian town three thousand feet straight above the sea, whose streets and alleys are paved in geometrical patterns of massive stones, polished smooth by feet and wheels. The views in all directions were spectacular and the weather was neither too hot nor too cold. Occasionally a cloud would settle over the mountain top for a day or two sending cool mists swirling through the steep alleyways. The perfect place to meet a boojum, though nobody ever did.

The boojum did make a casual but prolonged appearance in one of my lectures. The index entry in the published volume was worthy of a fully mature technical term:

BCS gap, 175, 242, 244, 258
Boltzmann equation, 129
Bogoliubov-Zubarev method, 274
Boojum, 214
 circular, 223
 hyperbolic, 223
 and sound attenuation, 224
 and superflow, 224
Bose-Einstein condensation, 198
Bose liquid, 36

A month later I talked about boojums at a conference in New Hampshire. No proceedings were published, but several Russians attended the meeting and it seemed important to get them thinking boojum too. I had hoped that the first person plural future form of the Russian verb to be ("budyem", more or less pronounced "BOODyim") would make them receptive to the term, but I was never then or thereafter able to convince any Russian that the two words resembled each other in any way. No matter. The Russians took to boojums at once, and one even said a boojum or two in his own talk. The weather was once more

FROM THE ANNOTATED SNARK BY MARTIN GARDNER (SIMON AND SCHUSTER, 1962)

They sought it with thimbles, they sought it with care;
 They pursued it with forks and hope;
They threatened its life with a railway-share;
 They charmed it with smiles and soap.

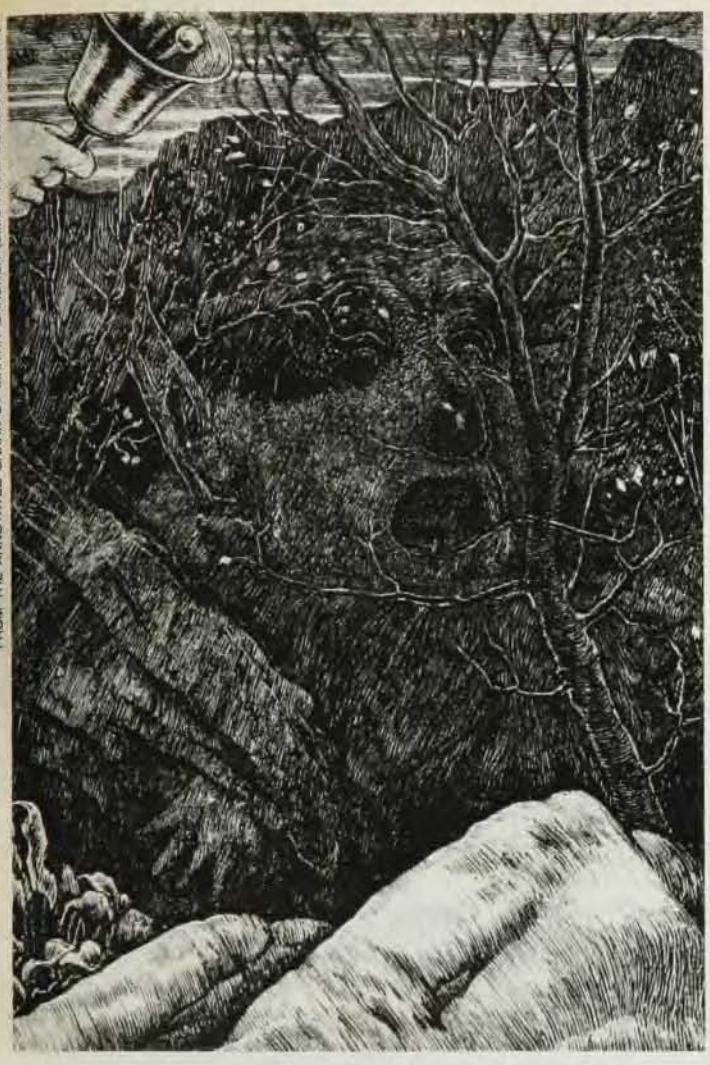
decidedly boojumish. I believe Concord recorded several of the hottest July days in its history. The temperature was 102 or 104, and Lake Winnipesaukee, in which many of us swam before, after, and sometimes during lectures, was as warm as a bath.

I returned from New Hampshire convinced that the boojum was ready to make its debut in an established scientific journal, but before I could consider how to bring this about there were two alarming developments.

Chia-Ren Hu, whom I had first met at Sussex and again at Sanibel, became interested in boojums, and wrote a paper, "Exact Solution of a 'Boojum' Texture in He^3-A." He sent it to the *Journal of Low Temperature Physics* and in due course received a letter from the editor, which read in part

> I have just received the comments of our referee on your paper and I enclose a copy of them. As you will see, he considers that the paper should be published provided the word "Boojum" be replaced with a suitable scientific word or phrase in the title, abstract, and text (p. 4, lines 8 & 17; p. 6, line 6). I too as General Editor concur unreservedly in this requirement. If you are willing to make such changes, we shall be happy to publish the paper.

Dr. Hu sent this communication on to me, together with a copy of the report of the referee who actually recommended only the removal of the boojum from the title. Dr. Hu informed me that it was his plan to substitute for the word "boojum" the acronym "SOSO" (for "singular on surface only"). Appalled at the imminent possibility of my boojum



FROM THE ANNOTATED SNARK BY MARTIN GARDNER (SIMON AND SCHUSTER, 1962)

In the midst of the word he was trying to say,
In the midst of his laughter and glee,
He had softly and suddenly vanished away—
For the Snark *was* a Boojum, you see.

turning into a SOSO, I wrote immediately to the General Editor, dissenting unreservedly from his conclusions:

Professor John G. Daunt
Editor, Journal of Low Temperature Physics

Dear Professor Daunt:

I have received from C.-R. Hu a copy of a referee's report on his article on surface point singularities in superfluid He^3-A, recommending that the word "boojum" be removed from the title, accompanied by a copy of a letter from you stipulating that the word be removed from the abstract and text as well. I agree that the term has not gained the currency to warrant its use in a title, but there is no reason for it to be excised from the text provided proper citations are given.

The term "boojum" is now in wide use in the field of superfluid helium-3. It first appeared at the Sussex Symposium (August 1976) and can be found in print in *Physica*, **90B + C**, 1 (1977). The term appears again in the proceedings of the Sanibel Symposium (January 1977) to be published by Plenum within a month or two. There its literary origins are explained and its use justified. Briefly, a boojum is a singular beast, the appearance of which causes the observer to "softly and suddenly vanish away." This is precisely the role played by the boojum in He^3-A. If a boojum is in the container it can catalyze the decay of the supercurrent. Such a process is unique to He^3-A and it requires a new nomenclature. The word "boojum" is sanctified by Webster's unabridged (2nd ed.) where it is defined essentially as I have done above. It is therefore as respectable a term as the currently fashionable "hedgehog" (and rather more respectable than "quark").

In addition to the two citations mentioned above, the term "boojum" will appear in print in the proceedings of the June 1977 Erice Summer School on Quantum Liquids, to be published by North Holland this fall; it appears in a recent preprint of a *review* article by Brinkman and Cross; it appears in a recent preprint from the Landau Institute; and it was widely used and understood in discussions at last month's Gordon Conference on non-equilibrium phenomena in quantum liquids, attended by most of the world's experts on superflow in He^3-A.

In short, "boojum" has now been used in the field for a year as a technical term meaning, quite precisely, "any surface point singularity the motion of which can catalyze the decay of a supercurrent." The term is specific, apt, and recognized by Webster. It has the virtue of being easily pronounced in Russian (since it is a homonym for the first person plural of the Russian verb to be). It is already in print in one reputable journal and will appear in print in at least five other places within half a year.

To ask that Dr. Hu resort to circumlocutions in the text of his article serves no linguistic or esthetic purpose, and obscures the physical significance of the point he wishes to make. Now that I have told you a little more about the meaning and widespread use of the term, may I urge you to let him reintroduce it in his text.

Sincerely yours,
N. David Mermin
Professor of Physics

The reference to the dictionary is important. If Hu's paper had mentioned a "flower texture" or a "fountain texture" chances are it would not have sounded alarms in the editorial office. It had occurred to me that if "boojum" were in the dictionary the character of the dispute would change. Not surprisingly, dictionaries readily at hand did not contain "boojum," but I did find it listed as an ordinary common noun in a copy I have at home of Webster's Unabridged, which I had won as an American history prize in high school in 1951. This was a few years before the appearance of the notorious 3rd edition, a fact of central importance in what was to follow. Had I not won the American history prize thirty years ago, "boojum" would not today be an internationally accepted scientific term.

My argument that "boojum" was a harmless common noun did not persuade Professor Daunt:

My editorial Board and myself maintain a policy of asking our contributors to avoid the use of words or strings of letters in titles or in abstracts, the meanings of which may not be immediately recognised by our international reading subscribers and fellow physicists. Moreover we extend the policy to require contributors to define such words or letter complexes clearly if they wish to introduce them in the text of articles. There have been many occasions in the past when I have asked authors to accept this policy of ours and I assure you that Dr. Hu is by no means the first author to be requested to make changes in this regard.

I myself was well aware of the meaning that you have attached to the word "Boojum" since, amongst other occasions, I was in your audience at Sanibel last year. I am, of course, aware of its origin. However, at the moment it is not only my opinion, but also that of the reviewers of Dr. Hu's paper, that the physico-technical meaning of the word is insufficiently known to the international audience of our Journal to warrant its use as Dr. Hu wished to use it in his paper.

I look forward to the time when your new word may

gain international acceptance and in the meantime I am maintaining active discussions about it with my Board of Editors and other reviewers of our Journal.

I was taken aback at the news that Daunt was actually present at Sanibel, carrying as it did the clear implication that he had seen through my bluff and bluster and knew as well as I did that all of my impressive array of published appearances of "boojum" were due to my authorship alone. Although I approved in general of the policy he was defending, I did feel that he and his editorial board were disappointingly unable to spot a good exception to the rule when one landed in their laps. I was also taken in by his argument about international readers. Only later did I learn that the boojum appears not only in "The Hunting of the Snark," but also in "La Chasse au Snark," "Die Jagd nach dem Schnark," "La caccia allo Snarco," "Snarkjakten," and "Snarkejagten," to name only a few. All I got out of the exchange was a certain quiet pleasure in trying to imagine some of the active discussions among the board of editors and reviewers.

Clearly the gauntlet had been thrown down. To his credit, Daunt was as ruthlessly impermissive with the odious SOSO as he had been with my gentle boojum, but it was now essential that "boojum" appear in print in the most authoritative and widely circulated of all the international journals of physics: *Physical Review Letters*.

Lexicographic complications

Of central importance to the success of this enterprise was the second alarming development. I received the text of a review of recent developments in the theory of superfluid helium-3 by W. F. Brinkman and M. C. Cross, both of Bell Labs. Leafing through the section of greatest interest to me, I was mortified to read

> the expected configuration for a sphere is the "boogum" shown in Fig. 3.

The careful reader of my letter to Daunt will notice that I tried to make the best of even a bad business like this, but here was clearly a new kind of trouble. The manuscript was being circulated prior to publication, but would assume an authoritative position when it did appear. It was essential to set the spelling straight. I thought I would simply cite Webster to Brinkman and, being in my office rather than at home, went to the nearby Physical Science Library to look up the exact citation. I was appalled to find:

> **boogum** or **boojum** (perh. fr. **boojum**, an imaginary creature in *The Hunting of the Snark* by Lewis Carroll (C. S. Dodgson) 1898 Eng. mathematician & writer; fr its grotesque appearance): a spiny tree (*Idria columnaris*) of the family Fouquieriacea chiefly of Lower California, sometimes arching over and rooting at its tips.

The library edition of Webster's was the third. Back at home I read again the lucid and concise second edtion:

> **boojum**, n. In Lewis Carroll's *Hunting of the Snark*, a species of snark the hunters of which "softly and suddenly vanish away."

I compared the two editions on snark:

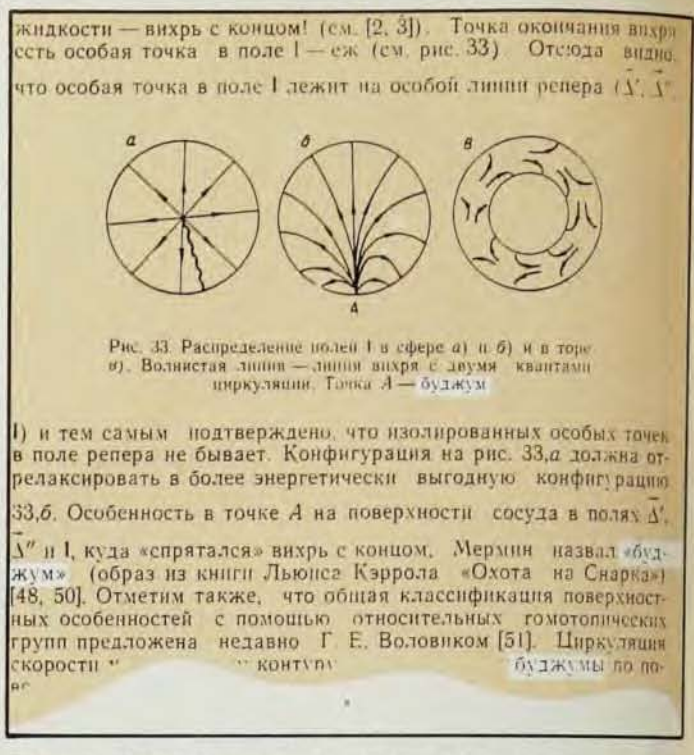
2nd edition:

> **snark**, n. (A blend of *snake* and *shark*). A nonsense creature invented by Lewis Carroll (Charles L. Dodgson), in his poem, *The Hunting of the Snark* (1876). One variety is known as the *boojum* (which see).

3rd edition:

> **snark** (prob alter of snork) dial Brit: snore, snort.

In some ways this was absolutely uncanny. One has to understand, to begin with, that physicists from Bell Labs have a celebrated and annoying habit of disagreeing with you and being right, or agreeing with you but getting there first. More than once had Brinkman casually corrected public slips of mine, or pointed out politely that some of my more beautiful thoughts had already been thought by him—



жидкости — вихрь с концом! (см. [2, 3]). Точка окончания вихря есть особая точка в поле l — еж (см. рис. 33). Отсюда видно, что особая точка в поле l лежит на особой линии репера ($\vec{\Delta}'$, $\vec{\Delta}''$

Рис. 33. Распределение полей l в сфере *а*) и *б*) и в торе *в*). Волнистая линия — линия вихря с двумя квантами циркуляции. Точка *A* — буджум

l) и тем самым подтверждено, что изолированных особых точек в поле репера не бывает. Конфигурация на рис. 33,*а* должна отрелаксировать в более энергетически выгодную конфигурацию 33,*б*. Особенность в точке *A* на поверхности сосуда в полях $\vec{\Delta}'$, $\vec{\Delta}''$ и l, куда «спрятался» вихрь с концом. Мермин назвал «буджум» (образ из книги Льюиса Кэррола «Охота на Снарка») [48, 50]. Отметим также, что общая классификация поверхностных особенностей с помощью относительных гомотопических групп предложена недавно Г. Е. Воловиком [51]. Циркуляция скорости " " контуру буджумы по по-

The first Russian boojums: part of a page of a preprint from the Landau Institute in Moscow. Note the inflection of *budzhum* (with its several different cases), contrary to the earlier views of A. J. Legett.

as I would have realized had I troubled to read the proceedings of last year's (or even the year before's Scottish Summer School, for example. If you look again at the picture on page 46 of a boojum in He^3-A and think of a tree, "arching over and rooting at its tips," you do indeed begin to wonder whether it shouldn't, in fact, be called a boogum instead. This was not to be the last time that the telephone company threatened to snatch my boojum away from me.

On the other hand, who could favor the entry in the 3rd edition? I took a firm line, writing Brinkman a letter of which I can find no copy. I do have his reply, which suggests that I must have struck him as raving incoherently about California trees and abominable revisions of once noble dictionaries. After some empty but soothing remarks he replied that "boogum" was a typist's slip which would be corrected before the article reached print. (It was not.)

As a result of this unfortunate episode I not only felt it essential to get "boojum" into the most distinguished of journals with the greatest possible speed, but also realized it would be necessary to ward off the upstart "boogum" while doing so.

There are two problems facing one wanting to get "boojum" into *Physical Review Letters*. The first is getting the article into *Physical Review Letters*; the second is getting the boojum into the article. I had been thinking about some puzzling aspects of supercurrents in He^3-A that I had learned about at Erice. When I returned to Ithaca from New Hampshire and continued pondering the problem with some associates, the resolution became apparent. While not an earthshaking advance, it was a likely candidate for one of the major discoveries of the week, and *Physical Review Letters* seemed an entirely appropriate vehicle.

Without any distortion of our central point, I was able to introduce a remark about boojums. Anticipating resistance to the boojums even if the article were accepted, I carefully supplied footnotes documenting the scientific and literary origins of the word. I even added a reference to Webster's second edition. I had no doubt this would be excised by the editor, but I hoped it would convey to him the fact that "boojum" was, after all, no more than an ordinary English common noun, and therefore not a candidate for

rigorous editorial scrutiny. Mindful, however, of the mess I would land in if they happened to check my citation with the third edition, I added the phrase

In this, as in many matters, the views of the 3rd edition should be spurned.

Then I sent the manuscript off.

Surprisingly soon after an associate editor of *Physical Review Letters*, Gene Wells, phoned me in my office. Our article had been accepted, he told me. Instantly I readied myself for the central battle of the campaign. *Physical Review Letters* does not announce the acceptance of papers by telephone, unless something is up, and I knew what was up: boojums!

There was a small problem, he explained; in the second paragraph we used a word. . . . I gave him the essence of my letter to Daunt. To my gratification he acknowledged that this might be a case where a judiciously selected exception could fortify the general rule against neologisms. But the term needed to have a rigorous justification. For example *Physical Review Letters* was even taking a strong stand against "instanton." I congratulated him. But "boojum" was something else. Was it? he wanted to know, and then he put me through a cross-examination such as I have not had since my PhD qualifying exam. What aspect of the Boojum was pertinent? What was it that vanished away? Could the metaphor be construed as mixed? And, perhaps most importantly, if they let me get away with "boojum" would I be back to them with "snark"?

I swore then and there a solemn oath never to try to make the word "snark" an internationally accepted scientific term. I promised never again to try to introduce any new word at all. "Boojum" would be quite enough for me; indeed, the ways things were going it might turn out to be altogether too much.

Wells said they would have to discuss the matter. Some time later he called again. "Boojum" had been approved. But there was the important question of the plural. I had used the form "booja" in our manuscript, not because I favor Latin plurals, but because I had always thought that Boojums was a common name for a rather unpleasantly fluffy kind of beribboned cat. We considered the possibilities. I had already discussed the question that summer in New Hampshire with A. J. Leggett of the University of Sussex, who has made profound contributions to the theory of superfluid helium-3 and who did an undergraduate degree in classics at Oxford. Leggett's position was simple: It would be evident to any ancient Roman that boojum was a word of foreign origin, and words of foreign origin are indeclinable. Therefore if one did want to form a latinate plural that plural should be not "booja" but "boojum." One boojum, two boojum.

I liked Leggett's logic, but had persisted in using "booja" in the belief that superfluid He^3-A was complicated enough without the added problem of distinguishing singular from plural. Now, however, *Physical Review Letters* and I were setting a standard for the generations to come. I thought (incorrectly, as we shall see) that Leggett's argument against "booja" was unassailable. Wells frowned on "boojum" for the same reasons that I did, and that left us only with "boojums", so "boojums" the plural became.

It was pointed out to me more than two years later at Harvard by Wendell Furry (who, curiously enough, was on the committee that raked me over the coals at my PhD qualifying exam) that the question of the plural is definitively resolved by Carroll himself, the very first time the word appears in the poem:

"For although common Snarks do no manner of harm,
Yet I feel it my duty to say,
Some are Boojums—" The Bellman broke off in alarm,
For the Baker had fainted away.

I like to think that we arrived at our plural by the same logic that Carroll (a celebrated logician and himself an Oxford man) had followed.

In spite of our concern over the correct plural, when the article appeared a citation in footnote five used the rejected plural form "boojum." I pointed this out in a short note to the editors; soon thereafter the following notice appeared on the Errata page:

STABILITY OF SUPERFLOW IN ^{3}He-*A*. P. Bhattacharyya, T. -L. Ho, and N. D. Mermin [Phys. Rev. Lett. **39**, 1290 (1977)].

In the second sentence of the first paragraph following Eq. (7), the symbols K_b and c_0 should be interchanged. The point being made is unaltered by this transposition.

In Ref. 5, "boojum" should read "boojums."

The debut of "boojum" as a fully authorized scientific term was quiet and dignified:

. . .Surface current can be reduced (with an accompanying reduction to bulk current) by the motion of a special type of surface point singularity (a "boojum").[5,6] The relative importance of these mechanisms depends on details of the pinning, nucleation, and equilibrium populations of boojums, as well as on the energetics of vortex texture formation

I was surprised to find that my lexicographic footnote had not been deleted:

[4]N. Webster, in *New International Dictonary* (Merriam, Springfield, Mass., 1934), 2nd ed., p. 308. See also p. 2379. (In this, as in many other matters, the views of the third edition should be spurned.)

Almost a year later I was at a conference on low temperature physics in Grenoble (where I gave a talk, the subsequent publication of which led to the first "boojum" in *Journal de Physique*; the weather was unpleasantly but not remarkably hot and humid). At an outdoor barbecue I happened to meet Gene Wells. After several glasses of wine he confided to me that my lexicographic footnote had won the day for the boojum. It seems that the weight of opinion among the editors was against the term. However the editor-in-chief, George Trigg, had loathed the third edition of Webster's for many years. The unprecedented opportunity I had handed him to print a brisk attack on it in his own journal was more than he could resist; he forsook one set of linguistic principles for a higher one, and let the boojum in.

Having launched the boojum in the grandest style I could manage, I felt my job was done. Whether the ship would stay afloat or softly and suddenly vanish away was in the hands of my fellow physicists. My tension during this long period of waiting was alleviated by an interesting correspondence with Sam Trickey. Trickey edited the proceedings of the Sanibel Symposium. Readers of the article in *Physical Review Letters* were referred to my paper in *Quantum Fluids and Solids*, ed. S. B. Trickey *et al.*, for mathematical details about boojums. I discovered after the article appeared that at least one colleague concluded from the juxtaposition of Trickey and the boojum that the entire thing was a colossal hoax on my part. I convinced him that I was serious, but he was unappeased. He had worked in the office of the Scientific Adviser to the President. "Wait till Proxmire sees *this*!" he warned.

Trickey had a godfatherly interest in the success of the boojum, having allowed me to print "boojum" and "booja" many times in his book. He also entered the word in the index and let me insert among the technical drawings a copy of an illustration of the Baker, being warned by an elderly uncle of the disastrous end that awaits the finder of a boojum. Upon the appearance of the article in *Physical Review Letters* I received a congratulatory note from Trickey who was, however, puzzled by the reference to the dictionary. I had cited the 1934 printing of the second edition; he had looked in the 1930 printing and found nothing at all. "Boojum" was not there. Furthermore

"snark" was only listed below the line, where it was dismissed as "VAR of snore."

This discovery set us both off on searches that have yet to conclude. I found a 1940 printing of the second edition that agreed with the 1934 printing except that the risk to hunters of the boojum was that they might "softly and *silently* vanish away." Trickey found a 1951 printing in which it is the boojum itself that softly and suddenly vanishes away. Had boojum fever infected the editors of so staid a publication? Were they enlisting the boojum to help them trap plagiarists? I wish I knew.

While Sam Trickey and I were flipping to the copyright page of many a heavy volume, I again received for review from *Physical Review Letters* a paper of which P. W. Anderson was an author. And it had boojums. The word, in fact, appeared in title, abstract, text, *and* a figure caption. Anderson had just won his Nobel prize. If the paper appeared nothing could sink the boojum. Eagerly I read it, and realized with dismay that it was wrong. I thus faced an unusual moral dilemma.

Relations between authors and referees are, of course, almost always strained. Authors are convinced that the malicious stupidity of the referee is alone preventing them from laying their discoveries before an admiring world. Referees are convinced that authors are too arrogant and obtuse to recognize blatant fallacies in their own reasoning, even when these have been called to their attention with crystalline lucidity. All physicists know this, because all physicists are both authors and referees, but it does no good. The ability of one person to hold both views is an example of what Bohr called complementarity.

In this case, however, the referee wanted the paper to appear more than the authors could have imagined. I nevertheless did the honorable thing. Believing that at best I would be rewarded with invective and abuse and at worst, if I was truly persuasive, I would prevent the culminating moment of my own hard fought campaign, I wrote a long thoughtful report, listing all of my objections.

I received a most courteous reply, thanking me for my help. Many of my suggestions were adopted and many of my objections were deftly and effectively dealt with. The central one was not, though the resubmittal letter politely but firmly insisted that it was.

What to do? The harmony could not survive another exchange of letters. I had been wrong before, particularly with authors associated with Bell Laboratories. And the paper, even though—or, I should say, if—wrong, was undoubtedly thought provoking.

I let it through. And it looked glorious. I display only the grand opening, but there were boojums all the way through:

Boojums in Superfluid ^{3}He-A and Cholesteric Liquid Crystals

D. L. Stein, R. D. Pisarski, and P. W. Anderson
Department of Physics, Joseph Henry Laboratories, Princeton University Princeton, New Jersey 08540

(Received 26 January 1978)

Because of the similarity of their order parameters, there are close analogies between defects of He-*A* and cholesteric liquid crystals. In particular, boojums, originally predicted for He-*A*, should exist as well in cholesterics. Certain textures experimentally observed and reported in the literature are identified as boojums. A topological analysis is given, and the effects of boojums on dynamical properties of cholesterics are discussed.

Resumé.—On présente une analyse topologique des configurations de surface et de volume dans les cholestériques et les nématiques. On rappelle et illustre la procédure de Volovik pour combiner défauts de surface et de volume; le problème de la torsion dans les cholestériques est discruté suivant le point de vue de Cladis *et al*. Les considérations sont appliquées aux boojums cholestériques. On étudie également la question des textures non singulières, et on propose une texture stable de type soliton pour un cholestérique. Enfin on considère le problème d'un nématique dans une sphère, et on présente les différentes solutions.

As I was learning, however, things have a curious way of softly and suddenly going awry, when boojums are concerned. I was not to go unpunished for my breach of professional ethics, though retribution was another two years coming.

Meanwhile there were promising developments, of which I mention only two. Here is the first French boojum:

It happens to occur in a translation of the English abstract of an English language paper published in a French journal, but for all that it is the kind of clipping one can send to the editor of the Journal of Low Temperature Physics with no little satisfaction.

Even better was the first Russian boojum. It occurred in a preprint I received last year from the Landau Institute. *Mermin nazval "budzhum,"* it declares: Mermin called it "boojum." It goes on to explain that the word is taken from *Lyuis Kerrol's "Oxota na Snarka."* The Russian boojum was a counterexample to Leggett's theory that highly inflected languages would treat the word as indeclinable, and demonstrated that *booja* could have been an acceptable plural. In one page I found the nominative plural (*budzhumi*), the genitive plural (*budzhumov*), and, my favorite, the instrumental singular (*budzhumom*).

I sent a copy of that page to Leggett. His reply was in the finest tradition of science and linguistics:

> I bow, however reluctantly, to the wisdom of the majority. I anticipate that we shall now presumably be getting, from Accra, reports of M'BOOJUM and from Singapore of BOOJUM-BOOJUM, while those investigated by Olli Lounasmaa will presumably behave BOOJUKSESTI.

On Tuesday, 3 June 1980 my long delayed comeuppance arrived through the unexpected medium of *The New York Times*. An article appeared on whimsy in scientific nomenclature. It talked about quarks for a while, turned to Lewis Carroll, and then finally, at the end, it said

> Some snarks are dangerous to hunt, of course, because they may actually be boojums—beings that annihilate their hunters by making them disappear forever. Boojums found their way into science thanks to Philip W. Anderson, a 1977 Nobel Prize winner, who needed them as personae in a difficult notion about the broken symmetries of nature.

This terrible thing was brought to my attention, with a smirk, by my own graduate student. "Bell Labs always wins out in the end" he cheerily opined, and danced off.

There was only one thing to do. I wrote a short but firm letter to the *Times*, and gave it to my trusted friend and colleague, N. W. Ashcroft, to send under his own name. He joined the fight with such fine spirit that the version published in the *Times* on 17 June was his own revision of my original letter. I give here the rare but still surviving *urtext*:

> Scientists may be addicted to whimsical nomenclature as Malcome Browne suggests (June 3) but in important matters like priority they are deadly serious. Philip W. Anderson did indeed use the term "boojum" to express a difficult notion about the broken symmetries of nature. However N. David Mermin introduced "boojum" for the same purpose over a year before in at least three publications prior to Anderson's venture in boojology. The last of these required Mermin to do extensive battle with the editorial board of one of the world's most distinguished journals of physics, who rightly regarded themselves as guardians of the purity of scientific discourse, and yielded only after Mermin presented a most cogent case that "boojum" was apt. This hard fought test paved the way for Anderson's easy reference to boojums in title, figure caption, and text in that same journal, as well as for the subsequent appearance (just last month) of the first French boojum and Russian budzhum.

Anderson has, as Browne notes, a well deserved Nobel Prize in physics, but Browne's nomenclatural accolades in the quite unrelated matter of boojums are due to Mermin, if truth itself is not to softly and suddenly vanish away.

The day after Ashcroft's letter went off I received a nice note from Anderson:

Dear David:

I note a depressingly typical example of the Matthew effect in today's *Science Times*. Do you want me to try to correct it? He didn't talk to me or anybody who knew anything.

Regards, and sorry
Phil

I sent back a cheery reply, passing it off as a case of *sic transit gloria boojorum*. I did, however, ask what the Matthew effect was. I got an immediate reply: "Matthew effect: R. Merton: 'to him that hath shall be given, etc.' " I knew R. Merton hadn't said that, and turning to my Bible found that "etc." stood for "but from him that hath not shall be taken away even that which he hath." There I was, once again at the wrong end of the Matthew effect, and not even knowing it until I was told.

But he who deals in boojums does not stay down for long. The *Times* printed Ashcroft's letter; it has yet to print Anderson's reply to Ashcroft's letter (pointing out that while I invented the name, we both independently invented the object). And in that vast land beyond the Bell System where *The New York Times* cannot be had for love or money, they will all shortly be learning that *Mermin nazval budzhum*.

The slavic boojum

The slavic boojum is especially dear to me. I spent the winter of 1978–79 visiting Leggett in Sussex. It was the coldest English winter since 1962–63 (the last winter I had spent in England). In February Leggett and I lectured at a winter school in the little Polish town of Karpacz, in the Sudeten mountains near the Czech border. My fried Ashcroft from Cornell was also a lecturer at the school, and I met him at London airport so we could fly on to Warsaw together. We landed during a lull in the worst Warsaw blizzard of the decade, but the story of our epic journey from Warsaw to Karpacz will have to be told elsewhere. My only point is that the weather was being boojumish again.

So I talked about boojums at the Polish winter school. In the audience were two distinguished physicists from the Landau Institute, where boojums had by then been known and discussed for some time. Because most of the audience knew Russian better than English, when I introduced the boojum I wrote on the blackboard in my crude Cyrillic the first person plural form (*budyem*) of the Russian verb to be, as an aid in pronunciation. Ashcroft, who was sitting near the two Russians, reported to me later that their heads immediately flew together and from their conference emerged an endless stream of sound: "Boojum, boojum, boojum, boojum, boojum...." Boojum fever, we decided, but on thinking it over I have managed to reconstruct the conversation he overheard. It was completely rational:

Academician K (straining to decipher my handwriting): Budyem?

Academician A (more used to the wretched calligraphy of foreigners): Budyem.

Acad. K (puzzled and suprised): Budyem?!

Acad. A. (explaining why): Budyem—budzhum.

Acad. K (like all Russians, oblivious to any resemblance between the two words): Budyem—budzhum??

Acad. A (confirming this, with more than a touch of disapproval): Budyem—budzhum.

And so on.

I didn't write a word about boojums in the proceedings of the Karpacz Winter School. I didn't need to. □