letters

Icosahedral boron molecules form rhombohedral crystals. The newly found quasicrystals don't seem to consist of packed icosahedra, but they do have icosahedral symmetry.

There is nothing surprising about isolated molecules having icosahedral symmetry. That occurs not only in boron compounds, but also in organic carbon chemistry.[1] In fact, isolated molecules can belong to any one of the infinite number of three-dimensional point groups.

Periodic crystals, on the other hand, can belong only to one of the 32 point groups that are consistent with translational symmetry. The icosahedral and pentagonal point groups are not among these 32.

Sites within a crystal have a point-group symmetry that is a subgroup of that of the crystal. When a molecule is incorporated in a crystal structure, its symmetry is either reduced or remains the same. It becomes that of the site. The point-symmetry group of the crystal can be a higher symmetry than that of the molecules in the crystal, but it must be one of the 32.

All these points are easily visualized. Diatomic molecules have an infinite rotation axis, a very high symmetry. No crystalline packing of such molecules will place molecules in an environment with such a symmetry. Low-symmetry units can be packed in symmetric arrays to give rise to higher-symmetry crystal rotation axes, but except for glide planes or screw axes, such axes do not go through the individual units, which retain their low symmetry.

Indeed there are boron crystals with periodically arranged molecules that are approximately icosahedral. But Berezin correctly calls these crystals rhombohedral. That crystallographic symmetry is definitely not icosahedral! The molecules are not in an icosahedral environment. Careful measurement reveals that they have been distorted by that environment and are no longer packing units with strict five-fold axes in their geometries. Having so many different nonequivalent atoms is the result of having lost symmetry, not the other way around.

It is not necessary that the recently discovered icosahedral metallic solids have icosahedral packing units. In one such alloy Mössbauer evidence indicates[2] the iron atoms are not at centers of icosahedra. In this regard these solids are like Penrose tiles, which individually have low symmetry but pack in an aperiodic pattern with a noncrystallographic ten-fold symmetry.

The observation that a solid has icosahedral symmetry implies that it can't be periodic. The observation of a crystal of periodically packed boron molecules definitely implies that no five-fold rotation axes have survived.

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J. W. Cahn
National Bureau of Standards
8/85

Warning to vacuum users

Recently we became aware of a phenomenon that is of danger to the users of vacuum systems. Any improperly grounded metal portion of the vacuum chamber, in the presence of millitorr local pressures (0.1 Pascal and higher), may expose personnel to lethal voltages during ionization-gauge operation—especially during degassing of the gauge. Sufficient plasma can be generated by the gauge at these pressures that the floating metal parts of the chamber can become electrically coupled to the gauge anode and can thus be lifted to within 20–40 volts of the anode potential. In the measurement mode, the chamber may be lifted to about 160 volts above ground. When the gauge is being degassed by electron bombardment, the chamber has been measured at as high as 900 V above ground, with some controllers, under these conditions.

All ionization-gauge tubes and controllers that I have tested to date have shown this effect. Please check the grounds on your vacuum chambers—they play an important role in your safety.

Charles F. Morrison
Granville-Phillips Company
Boulder, Colorado
8/85

Apartheid

The racial laws of apartheid in South Africa deprive all nonwhites of the most elementary rights of a citizen. It is therefore with dismay that we see PHYSICS TODAY (March 1985, page 177), the official voice of the American Institute of Physics, accept advertisements from the University of Stellenbosch and the University of South Africa, Pretoria. The violations of fundamental human rights in South Africa are not on par with those of other African states or the Soviet Union. What we are talking about is the unambiguously codified legislation of repressive practices blatantly proclaimed and enforced by South African courts. It is totally irrelevant whether these uni-

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letters

versities claim to be racially neutral. They are subject to the laws of apartheid and must comply. It is hard for us to imagine that a freedom-loving American physicist would accept a position anywhere in South Africa or care to live in such a society.

Exhortations of the civilized world continue to be ignored. It is time we unequivocally show our disapproval. If this hurts South African physicists, maybe they should think of emigration. Others have done it. We subscribe to your journal and like it.

A. Bhattacharya
Murray Goldman
T. Schaffer
Community College of Philadelphia
4/85 *Philadelphia, Pennsylvania*

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While perusing the March issue of PHYSICS TODAY, I encountered several prominent advertisements for positions at the University of South Africa. Individual physicists and The American Physical Society have taken a prominent role in protesting abuses of human rights around the world. I question the propriety of PHYSICS TODAY publishing advertisements from an institution that explicitly practices racial discrimination.

According to the fine print at the head of the Information Exchange section, readers of PHYSICS TODAY are to assume that "unless otherwise stated in the advertisement," the advertisers "wish to receive applications from qualified persons regardless of race, age, national origin, religion, sex or physical handicap." Although the advertisements from the University of South Africa make no mention of the laws of apartheid in South Africa, I doubt that the University intends to make appointments "regardless of race."

Charles Hyde-Wright
Massachusetts Institute of Technology
4/85 *Cambridge, Massachusetts*

Physics and politics

I wish to bring to the attention of the physics community the following incident:

I was invited to participate in the "Winter school and international colloquium on exactly solvable problems in condensed matter and relativistic field theories," which was held in Panchgai, India, from 30 January to 12 February 1985. I was to be a member of the American delegation whose travel expenses were covered by a special grant from NSF. The invitation was issued well in advance by the meeting's organizers from the Tata Institute at Bombay.

Despite their considerable efforts, however, the Indian government refused me a visa on the grounds of my holding an Israeli passport.

The meeting took place with some (too few!) delegates canceling their participation in protest.

I believe that a country that cannot assure free access to scientists who wish to participate in a scientific meeting should not be accepted as a suitable host for an international conference in the future. Nor do I believe that NSF should fund the travel of an American delegation to a country pursuing this policy.

Natan Andrei
Rutgers University,
6/85 *New Brunswick, New Jersey*

RESPONSE FROM THE TATA INSTITUTE: We are surprised and dismayed by the reaction of Natan Andrei, which we feel is unwarranted. The sanctions suggested by him can only have undesirable effects as far as interactions between international scientific communities are concerned

Andrei suggests that India should not be allowed to host international conferences and that NSF travel funds should not be made available to US delegations visiting India, because he claims that the Indian Government pursues the policy of not granting visas to Israeli passport holders. Such a policy does not exist as far as we are aware; we have had several Israeli scientists attending conferences in India in the last few years with valid visas and landing permits. The incident involving Andrei was unfortunate, insofar as we could not have the benefit of his expertise; however it is factually incorrect to assert that he was denied a visa because he holds an Israeli passport. The precise reason for the delay in granting a visa is unknown to us; indeed all governments in the world would appear to regard the granting of a visa as a prerogative, with no public justification thought necessary.

Andrei's suggestion, in a broader sense, is a case for politicizing physics further—with the right to withhold expertise being used to exert pressure on governemtns at the expense of the scientific communities of those countries. We feel that this would be counterproductive in the long run, and suggect a more balanced attitude towards the issue.

B. V. Sreekantan
Tata Institute of Fundamental Research
8/85 *Bombay, India*

Correction

July, page 69—In the second paragraph, the phrase in brackets should read "integral quantized Hall effect." □