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Eskimo roller

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that they have shown that the eight-vertex model is equivalent to the two-dimensional Ising model with next-nearest-neighbor interactions and special four-spin interactions.

Speculations. As Michael Fisher (Cornell University) suggested to us, if you break the symmetry of the eight-vertex model by taking some of the interactions to be slightly different, you go back to the ordinary Ising model with a logarithmic specific heat. You get two logarithmic specific heats close to each other, a kind of double transition; where they come together something special has to happen, and this special point is what Baxter has found. If this is the case, Baxter's special critical point resembles conceptually the tricritical point observed in He^3–He^4 mixtures, Fisher said. You can think of it either as the end point of a line of critical points or a place where lines of two critical points come together.

Kadanoff reported that he and Wegner had shown[4] that although the Baxter work calls universality into question, the widely believed concept of scaling holds in the neighborhood of a point at which the Baxter solution reduces to the Onsager solution. Kadanoff feels that the direct experimental implication of Baxter's solution is slight. However, now that we know the solution has critical exponents that depend continuously on a parameter, he said that we must look at real three-dimensional phase transitions to see whether they in fact do have this property.

Recently A. M. Polyakov and A. A. Migdal (Landau Institute in Moscow) have emphasized the analogy between critical phenomena and relativistic quantum field theory.[5] Last year Kenneth Wilson (Cornell) pointed out that there is a field theoretic model, the Thirring model, which has continuously variable exponents[6] (like the Baxter model). In field theory these exponents are called "anomalous dimensions." Because of the analogy to critical phenomena, the existence of the Thirring model was a warning that universality might break down, but before Baxter's work apparently no one took this warning very seriously.

The flexibility inherent in the variable exponent offers great opportunity for further theoretical efforts. —GBL

References

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Eskimo roller. Actually James C. Sindelar is not an eskimo but an associate professor of electrical engineering at New Hampshire Technical Institute. He wrote the winning entry in the competition, sponsored by the Old Town Canoe Company, advertised in the January issue of *physics today;* our photograph shows him in the slalom kayak that was awarded as the competition prize.

The problem posed for the competition was: How does a kayaker who finds himself head down underwater succeed in righting himself? Similarly, how can one learn to execute the complete "Eskimo Roll"—a deliberate 360-degree rotation from head-up to head-up?

Sindelar's entry, an 1800-word treatise on the Eskimo Roll, included historical background, an analysis of the dynamics of the motion, and a discussion of the effect of boat hull shape on the ease of carrying out the maneuver.

Apparently Alaskan and Greenland eskimos originally learned the trick as a means of survival in Arctic waters; later they developed variations of the roll as a sport. Nowadays the sport has been taken up by US and European whitewater kayakers.

For the physics of the motion, Sindelar divides the 180-deg righting movement into two parts—a 90-deg motion that brings the kayaker's body up to the water level, followed by another 90-deg motion up to the vertical. He shows that maximum efficiency is obtained if the body is extended at first, to derive greater torque from the sweeping paddle, and then moved closer to the boat's roll axis to minimize the moment of inertia (just as in the classical example of the spinning ice skater who draws in arms and legs to speed up the spin towards the end).

The shape of the boat, Sindelar says, has a considerable effect on the effort required to execute the roll. Perhaps surprisingly, he finds that the less stable boats often prove more difficult to roll than do the stable designs. This is because greater stability implies a center of gravity that rises higher above its normal minimum height when the boat is tipped 90 deg from its equilibrium position. So a stable boat stores potential energy in this position, just when the kayaker needs an extra push to get him over and when his available torque with the paddle happens to be at a minimum. —JTS

An applications-oriented approach to atmospheric science

The Atmospheric Sciences and Man's Needs: Priorities for the Future, a recent report of the Committee on Atmospheric Sciences of the National Academy of Sciences, discusses objectives and priorities for US atmospheric research in the 1970's.

The report calls for an applications-oriented approach to atmospheric science, with emphasis on improved weather prediction and experimental weather modifications. One recommendation of the report is the continued support of GARP (the Global Atmospheric Research Program), "to extend the range of useful prediction into the one- to two-week period." As well as increasing the accuracy of long-range weather predictions, the calculating and measuring equipment used in the global program will have application to global modeling techniques that should lead to an improved understanding of air-pollution dynamics.

If the recommendations of the report are adopted, local weather forecasting may be improved by the "Pilot Local Weather Watch," a system that would automatically issue radio and television warnings to people in areas endangered by sudden storms.

The report was prepared by a group of 55 atmospheric researchers during the summer of 1970 and the ranking of priorities was established by a steering committee under the direction of Robert G. Fleagle of the University of Washington. Copies can be obtained from the Printing and Publishing Office, National Academy of Sciences, 2101 Constitution Avenue, N.W., Washington, D. C. 20418, for $3.25 per copy. □