magnetic moments on nearest neighbors. This orientation could result in ordered magnetic structures in which the net magnetization vanished because of exact cancellation of moments in opposite directions. Néel's prediction of the behavior of the magnetic susceptibility of such systems was confirmed in 1938 in experiments on manganese oxide. The first determination of such a structure by neutron diffraction was reported by Shull and colleagues in their work on manganese oxide.[2]

Ferrimagnetic materials have magnetic atoms on two inequivalent sites, or two interpenetrating sublattices, with ferromagnetic interactions between atoms on the same sublattice and antiferromagnetic interactions between atoms on different sublattices. Interactions of this type can result in ordered structures in which all the moments on one sublattice are parallel to each other but antiparallel to the moments on the other sublattice. The first prediction and theoretical description of ferrimagnetism was given by Néel;[3] he also provided a specific model for the magnetic structure of magnetite to explain its magnetic properties. This model was confirmed in the neutron diffraction work of Shull, Ernie Wollan and Wally Koehler.[4] Ferrimagnets exhibit a partial cancellation of moments in opposite directions, resulting in a net magnetization.

We hope these comments have clarified for Robert Mulkern the distinct but related contributions made by these two great scientists.

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Numerus Clausus Led to Hungarian Exodus in 1920s

Maria Ronay is mistaken when she asserts that "there was no anti-Semitism in Hungary" in 1926 (PHYSICS TODAY, March 2002, page 11). She must be, fortunately, too young to remember those days.

After the disintegration of the Austro-Hungarian Empire at the end of World War I, two opposite-colored terror regimes followed (the "red" communist and the "white" rightist), and anti-Semitism in Hungary in the 1920s reached a peak. Although no comprehensive, explicit laws against Hungarian Jews were yet enacted, Jews were barred from practically all government jobs, university positions, and various aspects of public life, and were often harassed. It is true, they still held a prominent role in intellectual life, business, commerce, journalism, the medical profession, and law; nevertheless, they were second-class citizens. Most telling was the Numerus Clausus Act of 1920, which severely restricted admittance of Jewish students to universities. Moreover, Jewish people already admitted to institutions of higher learning frequently were prevented by their right-extremist colleagues from attending classes, and sometimes were even physically assaulted.

Ronay's "proof" that there was no anti-Semitism because the Budapest synagogue "is the largest and most beautiful" in Europe is pointless. As she herself says, that synagogue was built in the 19th century, during the moderate and civil empire.

Hans Bethe is correct in writing that Edward Teller "did not have to leave Hungary in 1926." But Teller was an intelligent and thoughtful man; he must have seen the trouble ahead. Hungarian anti-Semitism eventually led, in 1944, to the extermination—under German Nazi orders but with the enthusiastic support of Hungarian fascists and a considerable portion of the population—of about half a million Hungarian Jews.

Although I lost many friends and relatives to Hungarian anti-Semitism, and although I have been a US citizen for many decades, I still proudly consider Hungary the country of my roots. But history must not be rewritten.

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I disagree with Maria Ronay and Hans Bethe about whether Edward Teller was forced to leave Hungary in 1926. After World War I, Hungary was vastly more repressive of Jews than Germany was. In 1920, the Numerus Clausus Act was passed, which limited the number of Jews who could attend higher education to their proportion of the popu-

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lation. Because Jews at that time comprised an extremely disproportionate percentage of the educated population, the competition for "Jewish" entrance positions at Hungarian universities was stiff. The percentage of Jewish students dropped from a prewar level of about 30% to 5%. Most Hungarian Jews who pursued a higher education were forced to go elsewhere, Teller included.

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Statistical Mechanics May Have Dynamic Future

One may raise the question whether statistical mechanics, which deals mainly with large equilibrium systems, their average properties, and their small parameter fluctuations, will survive into the 21st century in its present form. If it does not survive, what kinds of changes in its conceptual machinery and mathematical description of the equilibrium systems can be expected in the current century?

Appropriate time scales for the survival of statistical mechanics may be assumed by the fact that its basic concepts have not changed substantially for about 100 years, during which time the field has demonstrated a tremendous success. Of course, the relativistic and quantum revolutions have introduced new important ideas and methods.[1–3]

The conceptual foundations of statistical mechanics and the mathematical description of equilibrium systems will likely experience substantial qualitative changes in the 21st century, changes that can be extended to nonequilibrium systems. In this regard, I offer a few guesses about some general directions in which statistical physics may change.

Statistical physics is expected to describe explicitly the stochastic dynamics of small and large random (in time and space) fluctuations of energy and other parameters. Fluctuations of various time and space scales that exist permanently in any equilibrium system reveal that an underworld of agitated, ever-changing microscopic processes exists behind even the most quiescent-appearing macroscopic states. Describing the stochastic dynamics of those fluctuations will require new mathematical tools different from those currently used. One can expect these tools to include multidimensional random functions, especially in systems of interacting particles, and other aspects of the theory of random functions. As a result, statistical physics describing time-dependent fluctuations in equilibrium systems is anticipated to acquire dynamical character.

I also expect that statistical physics will be able to describe the dynamics of both small fluctuations and large short-lived fluctuations (LSLFs) of energy and other parameters. Individual random LSLFs, which are most likely to emerge in small regions, generate peak deviations of the fluctuating parameters (energy and so forth) much greater than mean values of these parameters. Sequences of great random numbers of LSLFs appear permanently in equilibrium systems. Their inclusion in statistical physics requires description of two kinds of substantially different phenomena of finite duration. The first is LSLF formation associated with advanced processes that create within a small region a large, short-term peak deviation of the fluctuating parameters from their mean values. Thus the advanced processes precede the peak. The second kind is LSLF relaxation associated with retarded processes following the peak. In condensed matter, these processes include not only the spontaneous energy enhancement (and reduction) of one or a few strongly fluctuating particles (SFPs) during the finite time but also the accompanying correlated motion of the SFPs' surroundings. The correlated many-body processes involving SFPs and their surroundings will require mathematical tools that take into account the finite "memories" in time and space that characterize LSLF dynamics.

Novel results of fundamental and practical importance will likely develop from the study of LSLF dynamics. Large energy fluctuations (LEF) of atoms and molecules have a critical role in a broad range of rate processes during which LEF-generated fluctuating particles overcome high energy barriers. These processes are studied and applied in physics, chemical physics, material