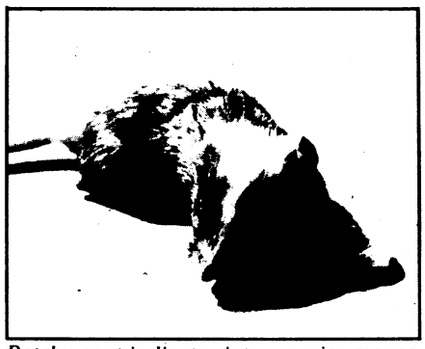
A mouse of two species

The fine art of producing living patchworks has expanded into a new range of possibilities with animals composed of cells from two distinct species. Manipulation of embryos in recent years has created chimeric mice with six parents (SN: 10/14/78, p. 261) and others partly descended from tumor cells (SN: 1/27/79, p. 60). In 1973, scientists attempted to construct a rat-mouse combination by introducing rat cells into mouse embryos. Although the rat cells functioned early in gestation, the pups born appeared to be pure mouse.

To avoid such massive selection against one set of cells, Janet Rossant recently put together embryonic cells of two mouse species. She reasoned that these cells would be more likely to interact normally than would cells of widely disparate species. She chose to work with the standard laboratory mouse species, *Mus musculus,* and a smaller, pointy-nosed, wild species from Asia called *Mus caroli.* "When I say 'wild,' I mean wild," Rossant told the meeting in Washington of the Gerontological Society. Behavioral differences between the two species are pronounced, and the species don't interbreed.

When Rossant introduced cells from a wild-mouse embryo into a laboratory-mouse embryo, and implanted it into a laboratory-mouse foster mother, more than 80 percent of the pups born contained cells from both species. Because the lab mouse is white and the wild mouse is agouti (a grizzled gray), many chimeras are obvious by their coat color. Individual mice vary in the distribution of species characteristics, including behavior. Rossant says that the more the chimeric mouse looks like *M. caroli,* the less docile is its behavior.



Rossant

Patchy coat indicates inter-species mouse.

The scientists also have examined the distribution of an enzyme that is distinguishable between the two species. They find that internal tissues can contain cells of both species types, and in skeletal muscle cells of the two species can fuse normally to make extended cells with a mixed enzyme type.

The chimeric mice, unlike natural cross-species progeny such as the mule, can mate with the original species and produce offspring. Even the germ cells can be of mixed origin; one chimeric female, mated with *M. musculus,* produced both *M. musculus* and hybrid pups.

The intention behind this research really is not to blur species lines, but rather to provide tools for tracing how early embryonic cells contribute to a developing animal. Rossant and collaborators at Brock University in Ontario, Canada, are working to find antibodies that will bind only to cells of one mouse species or the other. With such markers they hope to map the descendants of embryonic cells of each species and thus determine which give rise to each adult tissue. □

DNA rules: Revisions, not exemptions

In a revision of the rules for recombinant DNA research, National Institutes of Health director Donald S. Fredrickson last week basically agreed with the recommendations of the Recombinant DNA Advisory Committee (SN: 9/29/79, p. 214), but he quibbled with their wording. In September the committee proposed that experiments involving the enfeebled bacteria *Escherichia coli* K-12, used in the vast majority of recombinant DNA experiments, be "exempted" from the guidelines except for a few special instances. Those experiments, however, still would be required to meet the minimal (P1) safety requirements described by the guidelines. Those requirements include decontamination of biological wastes and a prohibition against pipetting material by mouth.

In his proposal, published in the Nov. 30 FEDERAL REGISTER, Fredrickson states that he would not exempt those experiments from the guidelines, but simply lower their safety requirements to P1 and require them to be registered with a local institutional biosafety committee, rather than with the national Office of Recombinant DNA Activities. For experiments in which recombinant DNA is deliberately programed to produce plant or animal proteins in the bacteria, Fredrickson proposes that the local committee must give prior approval. "I remain committed to shifting responsibility to local institutions for adherence to uniform, sensible guidelines," he says.

Frederickson says that the word "exempt" should be reserved for experiments in which no special safety requirements and no registration are required. He points out that keeping the experiments under the guidelines means that industrial scale-up of experiments to more than 10 liters still needs prior NIH approval. The guideline revisions are available for public comment until December 30. □

Channeling radiation from electrons

Looking at a venetian blind from one angle a person will find the view totally blocked and nothing of the outside visible. Shifting the head radically changes this impression. Channels open between the slats, and at the proper angle the outside becomes almost totally visible. The same trick can be played with a crystal: At the proper orientation clear channels open up between the planes of atoms that make the crystal lattice — provided the observer is an electron or a positron or similar particle.

A charged particle moving through one of those channels should have a bumpy ride because of the forces exerted on it by the atoms of the lattice, and as a result it should radiate light or X-rays. In fact a group of experimenters from Stanford University, the Lawrence Livermore Laboratory and Oak Ridge National Laboratory reported last spring that they had succeeded in demonstrating such channeling radiation using positrons as the radiators (SN: 5/12/79, p. 311). The effect is the source of intense, highly directed, tunable beams of X-rays.

Now the same group, Richard L. Swent, Richard H. Pantell and Mark J. Alguard of Stanford, Barry L. Berman and Stewart D. Bloom of Livermore and Sheldon Datz of Oak Ridge, report in the Dec. 3 PHYSICAL REVIEW LETTERS that they have succeeded with electrons.

They started with positrons, Berman said in an interview with SCIENCE NEWS, because positrons are "easier to use." There was a theoretical prediction of how the channeling radiation spectrum from positrons would look. There was none for electrons. Positrons have positive charge as do the ions in the crystal lattice. The mutual repulsion between them as the positrons move down the channel produces back and forth kicks that can be analyzed according to classical physics, "a classical harmonic oscillator potential," as Bloom called it in the same interview. In the radiation spectrum, this meant a single peak wavelength for a given channel and a given positron energy.

When the experimenters did the experiment with electrons, they found a family of lines in the spectrum instead of a single peak wavelength. As soon as they saw that family of lines, says Bloom, they knew they had to use quantum mechanics to explain it. The forces between the negative electrons and positive lattice are better analyzed by a model that takes electron and lattice as a total system and speaks of discrete quantum mechanical energy states (bound states) of the system. The family of spectral lines represents transitions between different bound states. In their Dec. 3 publication the group stresses the finding that quantum mechanics must