perimentation with different methods of tillage and planting to see which is most effective. In some tracts the ground has been plowed, in some it has been disk harrowed, in some places not tilled at all. Seeding has been by a Nesbitt seed drill, by a highway salt spreader and by hand. Disking and the salt spreader seem the preferred methods for the future with broadcasting by hand over the cables and in tight places.

Warkins remarks on the irony of using such "agronomic methods" to reestablish a natural ecosystem. In fact, some of the acreage planted by the Nesbitt drill still shows signs of having been planted in rows, hardly a primeval feature. In defense Warkins says that this seems to be the only efficient way to reestablish prairie on such large tracts. Agronomy goes so far indeed that established plots are harvested with a combine in the fall to provide seed for new plots.

The basic scheme is to let the main prairie grasses, bluestem grass (genus *Andropogon)* and Indian grass *(Sorghastrum nutans),* get a good start and then introduce the less numerous species, especially the forbs, which include the prominent wildflowers and broadleaved plants. Warkins intends to write his master's thesis on the results of his experimentation with various methods of introducing forbs into the grassy plots. This can even include setting seedlings by hand (from agronomic to horticultural methods). To aid this effort there is a forb garden in the center of the tract, which provides seeds and seedlings. On the market, Warkins says, forb seeds can cost $100 per pound.

All this raises the philosophical question whether what one gets from this activity really resembles a natural prairie. Warkins points out that a prairie is a constantly changing thing. The mix of species and their interrelationships are not static. What one has here is a mixture of native species in reasonably authentic proportions, and the future of the experiment is to see how they develop in interaction with one another.

One of the most heartening things learned from the experiment so far is that the prairie grasses do prevail. On their native soil they seem to have an advantage over Eurasian intruders. The prairie grasses are seen to be invading areas where they were not deliberately sown and beginning to choke the weeks. The prairie grasses compete especially well in years of drought, Warkins says. Their roots go deeper than those of Eurasian species and so get water while the weeds dry out.

The prairie grass starts slowly. In a recently seeded plot it is only about half a foot tall — a typical first season growth — and invisible unless the weeds are parted, but given time and frequent fires, the grass does grow. The first plot, planted in 1975, is now "a showpiece" of restored prairie. Warkins is enthusiastic as he gives a visitor a guided tour.

Among the Indian grass and bluestem, he points out the forb species: "A pretty flower, aster, one of the species that needs a while. ... Wild indigo *[Baptisia leucanthia]* does well ... wild quinine *[Parthenium integrifolium]* ... prairie dock *[Silphium terebinthinaceum],* one of the largest-leaved plants." Prairie dock's tall flower stalks stick up above the grass. It shows how plants select areas, he says. In one particular spot a lot of prairie dock stands together. "A little knoll, just a foot or two higher." It makes that much difference in the available moisture. "*Coreopsis.* It tends to stick all over your pants. Compass plant *[Silphium laciniatum].* Its leaves always face one direction." Settlers used it to find their way. "Purple prairie clover *[Petalostemum purpureum],* beautiful purple spike on it. You get the feeling of how the settlers felt."

"From year to year your prairie's going to change," Warkins says. "There's not any standard." He points out tracts where already after only a few years grasses are diminishing under the competition of forbs. "You don't have the hundreds of species, but you have got a matrix. The habitat's here. It could be 50 or 100 years before everything finds its place." By then even "some things we call weeds might become part of the prairie ecosystem." Even if they are of Eurasian origin they may acclimate themselves and find their niche.

Another advantage of the Fermilab tract is that it includes both wetlands and mesic (neither too wet nor too dry) prairie. Prairie marsh can thus be developed and the relation and transition between it and the mesic prairie can be studied. "As you get lower and lower here," Warkins continues the tour, "you get these nice cattails. The transition will probably go from mesic prairie to wet mesic. As you go on, you get into the cattails. Then you wind up in a pond." The pond is inhabited by trumpeter swans. Here, too, the mixture of cultivation and wildness is apparent. These birds have spent time in the Brookfield Zoo and are relatively tame. They come right up to humans looking for food handouts. This region is a bit on the eastern edge of their original habitat, Warkins says. Sandhill cranes are expected to be introduced later.

In addition to deliberately introduced animals, insects, small mammals (and even large ones — Warkins says he sees deer in the spring when the grass is still short) and birds are finding their way into a habitat they consider congenial. As we walked, a red-tailed hawk hovered above us, hunting mice and other small animals. The laboratory has a herd of buffalo. Buffalo dearly love prairie grass. Warkins says they will choose it in preference to cultivated hay or bluegrass, but there are no plans to turn the buffalo loose in the prairie. A single square mile is too little for them. They would chew it to nothing in short order. □

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The Cenozoic Era: Tertiary and Quaternary — Charles Pomerol, translated by Derek W. Humphries and Evelyn E. Humphries. A systematic summary of the stratigraphy and paleontology of the Cenozoic rocks. Takes as its central reference point the regions of Western Europe, Northern Africa and the Mediterranean Basin. Wiley, 1982, 272 p., illus., $67.95.

Ellie: A Child's Fight Against Leukemia — Jonathan B. Tucker. This story is a fictionalized composite of three actual case histories that provides a realistic, supportive and optimistic picture of what goes on today in cancer treatment for childhood leukemia. HR&W, 1982, 338 p., illus., $15.95.

Locomotion of Animals — R. McNeill Alexander. Tells how animals travel around on land, in water and in the air. Explains the mechanisms of locomotion, their limitations and their energy requirements. Blackie (Methuen Inc.), 1982, 163 p., illus., $35, paper, $18.95.

The Road to Jaramillo: Critical Years of the Revolution in Earth Science — William Glen. The story of how an international cast of scientists produced the discoveries that led geologists to accept the theory of plate tectonics and continental drift. Working mainly in the decade 1957 to 1966 on separate and seemingly unrelated problems of young-rock dating, geomagnetic polarity reversals and seafloor spreading, these scientists confirmed the theory that has transformed the earth sciences. Stanford U Pr, 1982, 459 p., illus., $37.50.

The Space Shuttle Operator's Manual — Kerry Mark Joels and Gregory P. Kennedy. A book that tells how the space shuttle works. Includes instructions for launch and ascent linked to a foldout reproduction of the shuttle's instrument panel. Tells how to live within the shuttle — what to wear, how to get dressed, eat, sleep, drink and stand. Explains personal hygiene and gravity problems. Describes how to operate each part of the shuttle, including the remote manipulator arm and the space telescope. Discusses emergency procedures. Leads the reader through entry and landing procedures then lists all of Columbia's capabilities. The excellent illustrations give one a feeling of actually being in the space shuttle. Ballantine, 1982, 160 p., illus., $22.50, paper, $9.95.

Test-Tube Babies: A Guide to Moral Questions, Present Techniques and Future Possibilities — William A. W. Walters and Peter Singer, Eds. Explains for the general reader the *in vitro* fertilization and embryo transfer techniques developed by Carl Wood and his colleagues at the Queen Victoria Medical Centre, Melbourne. Articles by moral philosophers, theologians and lawyers then discuss some of the complex moral and legal issues raised by these techniques. Oxford U Pr, 1982, 165 p., $16.95, paper, $8.95.