one variety to another. Theophrastus, in his *Enquiry into Plants* (II, ii) stated that "... soil [at Philippi] seems to produce plants which resemble their parent ... [but] a few kinds in some few places seem to undergo a change. . . ." And again, "If anyone were to plant our palm at Babylon it is reasonable to expect that it would become fruitful and like the palms of that country . . . for *the locality is more important* than cultivation and tendance." And a little further on (II, iv), he said, "[in growing plants] when a change of the required character occurs in the climatic conditions a *spontaneous change in the way of growth* ensues." And Aristotle seemed to say about the same, in essence, in his *Generation of Animals* (II, 4): "... foreign seeds produce plants varying in accordance with the country in which they are sown."

Recently Kihara and Sax [*J. Heredity* **44**, 132 (1953)] alluded to a new hope or dream uttered by Lysenko in a Chinese document. Lysenko and his followers hope to apply his "methods" to animal breeding and produce rapid and radical modifications there. In the absence of formal genetics, the Greeks thought of that too. Theophrastus had a 2300-yr jump on the Russian. With a straight face, the Greek philosopher wrote, " . . . so also changes in the nature of the ground produce changes in animals; for instance, the water snake changes into a viper, if the marshes are dried up." Considerable "shattering" of heredity was necessary in all of these cases, if true.

Lysenko claims that he can and did change one genus of cereal grain into another. Mendelian geneticists find no such possibility. The Greeks also thought of such changes, perhaps born of hope and desire. Theophrastus notes that "some say that *wheat has been known to be produced from barley,* and barley from wheat, or again both growing on the same stool." Then he hastens to protect himself with: "These accounts should be taken as fabulous." But on another occasion (II, iv) he wrote, without qualification, that "Wheat turns to darnel, one-seeded wheat and rice-wheat change into wheat," and then he adds the proviso, "*if bruised before they are sown* . . . in the third year." Lysenko apes this when he pretreats seeds to "shock" them into change.

The theory that acquired characteristics are transmitted to offspring, usually identified with Lamarck of the 18th century, has recently been "invented" by Lysenko. The gentlemen of the Lyceum were no strangers to that either. Listen to Aristotle (*History of Animals,* III, 12): "Some animals change the color of their hair with a change in their drinking water, for in some countries the same species of animal is found white in one district and black in another . . . and in Antandria there are two rivers of which one makes the lambs white and the other black." Hippocrates, in his *Airs, Waters, Places,* even constructs a theory to explain and support the idea. It was much like Darwin's Pangenesis and just as lacking in validity.

Those of Lysenko's "new" claims that are 23 centuries old can be enumerated as follows: (i) the "shattering" of heredity by sudden environmental change; (ii) the effective *pretreatment* of seeds of cereal grains to precipitate changes; (iii) the man-regulated *transmutation* of one genus of cereal grain into another; (iv) the quick *change of one genus of animal into another* by environmental control; and (v) the *transmission of acquired characteristics.* The Greeks asserted all of them provisionally.

The great thinkers at Athens may be excused, and even admired, for probing and postulating among the riddles of genetics; their reference libraries had not one datum to enlighten or guide them in that area. Lysenko has mountains of valid data, which he ignores. His claims are really all Greek to us.

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Bedrock Geology of the Montpelier Quadrangle, Vermont

The Montpelier quadrangle covers an area of about 213 mi² in the mountainous region of central Vermont east of the summit of the Green Mountains. The Worcester Mountains trend northeastward through the central part of this area. The Winooski River flows west-northwestward across the southern part of the quadrangle, between the city of Montpelier and the village of Waterbury.

The rocks of the quadrangle are in the east limb of the Green Mountain anticlinorium, whose axis nearly coincides with the north-northeast-trending summit ridge of the Green Mountains 3 to 6 mi west of the western border of the quadrangle. Bedded metamorphic rocks, originally sedimentary and volcanic, predominate. They include numerous intergradational rocks—chiefly quartz-sericite-chlorite schist, graphitic schist, and phyllite—and quartzite, greenstone, and interbedded quartzite and quartz-albite-sericite-chlorite granulite. These rocks, of Cambrian and Ordovician age, are overlain by interbedded slate, phyllite, and crystalline limestone probably of Silurian age.

Intrusive igneous rocks, which underlie less than 1 percent of the area, range in age from Ordovician probably to Mississippian. In the western part of the quadrangle serpentinite, possibly the oldest of these igneous rocks, is intruded chiefly into quartz-sericite-chlorite schist interbedded with greenstone. The serpentinite and its metamorphic alteration products—talc-carbonate rock and steatite—form tabular, lenticular, and pod-shaped masses that strike north-northeast and dip steeply in approximate parallelism with the schistosity and, commonly also, with the bedding of the enclosing rocks. Numerous sills and dikes of greenstone and chlorite schist, which are probably metamorphosed diabase, intrude interbedded quartzite and quartz-albite-sericite-chlorite granulite well east of the bodies of sepentinite. Sills of granite intrude the interbedded slate, phyllite, and crystalline limestone in the extreme eastern part of the quadrangle. A few unmetamorphosed diabase dikes and sills have been found.

Metamorphic effects, probably of Devonian age, show in all rocks except the granite and the diabase. Most of the rocks in the quadrangle are in the low-grade metamorphic zone marked by the occurrence of chlorite, although a middle-grade zone with hornblende, almandite, and kyanite is centered in the Worcester Mountains. Metasomatic effects include porphyroblasts and quartz segregations and, on a larger scale, steatitization and carbonatization of serpentinite. Most of these effects are the expression of metamorphic differentiation, in which movement of material was confined to a few inches or at most a few feet; but some material, chiefly carbon dioxide, may have moved greater distances. Contact metamorphic effects, chiefly occurrences of cordierite and diopside, have been noted in the vicinity of the granite.

The principal folds in the region, including the Green Mountain anticlinorium, are probably of Devonian age. Most of the strata of the Montpelier quadrangle dip very steeply in the east limb of the Green Mountain anticlinorium, with the tops of the beds facing east; most of those in the southeastern half of the quadrangle are overturned to the east. A northeast-trending anticline centered in the Worcester Mountains is the most notable departure from the homoclinal structure. Minor structural features include schistosity, which is predominantly parallel or nearly parallel to the bedding, minor folds, most of which plunge very steeply, and lineation produced by fine crinkles parallel to the axes of the minor folds.

The leading mineral resource of the area of the Montpelier quadrangle is talc, an alternation product of serpentinite. It occurs nearly pure in steatite and mixed chiefly with the mineral magnesite in talc-carbonate rock. Other products derived from the bedrock include granite, now being quarried, and slate and copper, which have been recovered in the past.

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Fabric Studies of Gravelly Sediments: An Introduction to a New Sampling Procedure

Fabric, the spatial orientation of particles composing a solid, is an important characteristic or parameter of sediments that bears on genesis and post-depositional history. Orientation studies of large particles in sediments are of demonstrated value to research in sedimentation (*1*), but much work remains before diagnostic relationships between sedimentary fabrics and the processes that form and modify sediments are established. One approach, only partly realized, is the application of fabric characteristics of modern sediments to identification and genetic interpretation of older deposits.

Fuller application of orientation studies to the solution of sedimentary problems has been restricted by the labor and time required. Two general methods have been followed: (i) Direct measurement of linear elements of particles partly exposed in outcrop, generally by Brunton compass; (ii) marking of partly exposed particles in a way to permit subsequent reorientation and parameter measurements under laboratory conditions.

Direct measurement at the outcrop is a simpler, faster procedure and obviates preparation, transportation, and rehandling of bulky samples. The marking method, although more elaborate, offers distinct advantages in permitting more accurate and detailed evaluation of orientation elements. The apparent shape of a particle partly exposed in outcrop does not necessarily reflect its true shape. Direct measurement of such particles, therefore, introduces possible erroneous data, may result in an arbitrary selection of particles if sampling is not carefully done, and at best requires removal of each measured particle to ascertain whether the exposed portion is a true reflection of important shape characteristics. In contrast, the marking method involves no selection—except by size—thus eliminating much of the subjective element in sampling.

Karlstrom (*2*) describes improved equipment and techniques that facilitate sampling and analysis of marked particles from vertical cuts. A vertical orientation template is used for marking. A horizontal orientation template is readily devised which extends use of the marking method to the deposits that are more conveniently sampled from near-horizontal surfaces. The two templates are similar in principle and basic design. With the vertical orientation template, the marked lines are referred to a vertical plane in vertical and horizontal directions, whereas with the horizontal orientation template the lines are referred to a horizontal plane in N-S, E-W directions. In combination, the two templates can be used to sample exposures on all slopes intermediate between the horizontal and the vertical. Sampling with the horizontal orientation template applies most directly to fabric studies of such modern gravelly sediments as beach, alluvium, mud flow, lag gravel, outwash, and till; it is hoped that the procedure may stimulate increased use of fabric studies in these areas of research.

A simply designated horizontal orientation template consists of a slotted lucite plate, about 4 in. square and 0.5 in. thick, inset with a bull's-eye bubble level and compass. Slots, in the form of a cross, are cut just wide enough to permit insertion of a marking pencil. For marking, the template is leveled in position directly above the particle with the slots oriented N-S and E-W, and lines are drawn by guiding the marking pencil along the slots. Before removal from the outcrop, the lined particle is marked with an arrow to indicate its attitude relative to north.

To reorient after removal from outcrop, each marked particle is placed in a modeling-clay mount at the center of a horizontal circle to be used for