what kind of life the ancient carbonaceous remains in the rocks of the Basement Complex represent. Considering the age of 3.5×10^9 yr of the upper lithosphere (*15*), one is tempted to conclude that conditions probably were favorable for the creation of life soon after the making of a solid crust of the earth. In a paper in preparation (*2*), the manner of occurrence of carbon in the early pre-Cambrian argillaceous sediments will be discussed, with special reference to the hypothesis of a reducing primordial atmosphere (*16*).

The validity, in principle, of using the isotopic constitution of carbon in rocks as an indicator of its biogenic or nonbiogenic origin has been questioned on isotope chemical grounds (*17, 18*). These arguments are answered in detail in another paper (*3*). It is sufficient to state in this note that geologic evidence must be considered very carefully when minerals and rocks are investigated and that arguments based solely on chemical evidence obtained in the laboratory may fail partly or totally. Of course, it is not always possible to decide whether the carbon in a rock is of biogenic or nonbiogenic origin. It is known that carbon in igneous rocks may lie in the biogenic range (*17, 19, 20*). In an igneous rock, this gives no proof of the derivation of carbon by biogenic contamination, unless, as in the instance of the Disko Island basalt (*20*), there exists conclusive geologic evidence indicating the origin. Predictions relative to expected isotopic fractionation by natural processes involving exchange equilibria should be based, among other things, on equilibria representing reactions that are probably operative, or at least approximated, in natural processes (*21*).

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Maleic Hydrazide as a Sprout Inhibitor for Sweetpotatoes[1]

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Maleic hydrazide has been used to inhibit sprouting in storage of onions, Irish potatoes, and carrots (*1–4*). There has been no report of the successful use of this chemical (*5*) to inhibit sprouting of sweetpotato roots.

Preliminary experiments by the writers with preharvest foliage applications of the 40 percent sodium salt of maleic hydrazide in a range of concentrations from 0 to 8000 ppm in the fall of 1952 indicated sprout inhibition of the bedded roots at the highest concentration, but the results were erratic.

On September 12, 1953, toothpicks impregnated with the 30 percent diethanolamine salt of maleic hydrazide in concentrations of from 0 to 100,000 ppm in ethyl alcohol were inserted halfway into sweetpotato roots (*2*). Three roots of each treatment were planted in vermiculite in metal flats. Sprouting was inhibited in the roots that received concentrations of 12,000 ppm or greater of the chemical.

In a subsequent experiment, October 9, 1953, 60 roots of the Texas Porto Rico variety of sweetpotatoes were divided into six equal lots and were similarly treated by inserting toothpicks impregnated with the 30 percent diethanolamine salt of maleic hydrazide in the concentrations shown in Table 1. The treated roots were bedded in a hot bed maintained at 80° F by an electric soil-heating cable and covered with 2 in. of sandy loam soil.

Table 1 shows the number of slips over 6 in. in length that were harvested from each root in each

TABLE 1. Sprout production of Texas Porto Rico sweetpotatoes subsequent to treatment with maletic hydrazide* impregnated toothpicks.

Treatments Maleic hydrazide concentrations (ppm)	Average number of sprouts per root			
	Length of sprout			
	Over 6 in.		Over 1 in.	Total
	11/16/53	11/24/53	12/14/53	
0	5.4	6.1	4.7	16.2
1,000	4.8	6.3	3.8	14.9
2,000	4.2	2.0	8.6	14.8
4,000	8.6	1.8	5.0	15.4
8,000	0.0	1.1	2.8	3.9
16,000	.0	1.6	1.9	3.5
Difference necessary for significance between treatments				
			5% level	5.44
			1% level	7.21

* Formulated as the water soluble diethanolamine salt of 1,2-dihydro 3,6 pyridazinedione, and supplied by the U.S. Rubber Co., Naugatuck Division, Naugatuck, Conn.

[1] Technical Article No. 1903 of the Texas Agricultural Experiment Station.

treatment on November 16 and 24. Owing to the failure of the electric cable shortly before the second pulling of slips, the experiment was terminated on December 14, the roots were dug and washed, and the number of sprouts over 1 in. long was recorded in Table 1.

There was a highly significant reduction in total number of sprouts produced per root between the roots that were treated with 8000 or 16,000 ppm and those that were treated with the four lower concentrations of maleic hydrazide (Table 1). There were no significant differences among the four lowest or between the two highest concentrations. The striking increase in sprout production on November 16 at the 4000-ppm concentrations (Table 1) was partly due to the retarded proximal dominance of some of the roots (*6*).

The growth of sprouts on most of our present sweetpotato varieties and breeding lines is confined largely to the proximal end of the root. This proximal dominance of roots, like apical dominance in stems, can be broken by either chemical or mechanical means (*6*).

Thimann (*7*) has demonstrated that apical dominance in plants is controlled primarily by auxin and that stems, buds, and roots all react in a comparable way to auxin, their growth being inhibited by relatively high, and promoted by relatively low, auxin concentration. Leopold and Klein (*8*) have shown maleic hydrazide to be an anti-auxin, and many investigators have observed the loss of apical dominance and increases in lateral bud breaks in stems following treatment with this chemical.

Since the sweetpotato slip or sprout arises from adventitious buds on a structure that is morphologically a root (*9*), one should need relatively high concentrations of maleic hydrazide to retard proximal dominance on this root and still higher concentrations to completely inhibit bud development (*7, 8*). Simons and Scott (*5*) have reported a significant increase in the total number of sprouts produced by bedded Porto Rico sweetpotato roots that had been sprayed 6, 4, and 2 wk before harvest with maleic hydrazide at 500 and 2500 ppm. These same investigators also reported a distortion of the stem and leaves of the sprouts similar in appearance to the effects produced by 2,4-D in plants.

A similar reaction of sweetpotatoes to maleic hydrazide occurred in the present study. Relatively low concentrations of maleic hydrazide (1000 to 4000 ppm) induced a distortion of the stem and leaves similar to the one described in the preceding paragraph and, in some instances, reduced proximal dominance over the entire sweetpotato root. The foregoing two phenomena did not always occur together, nor did either one or both occur on all of the treated roots. Relatively high concentrations of maleic hydrazide (8000 to 16,000 ppm), on the other hand, increased the severity of this 2,4-D-like injury and gave a highly significant reduction in the total number of sprouts produced per root (Table 1).

Sprout inhibitions and reduced proximal dominance similar to that described in the preceding paragraph have been obtained with preharvest foliage sprays of maleic hydrazide on a fall crop of sweetpotatoes in 1953. Further studies are currently being conducted on slip production and the storage behavior of these treated roots.

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A New Technique for the Study of Avian Chromosomes[1]

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The study of avian chromosomes presents considerable difficulty because of the large number of small units lying in close proximity to one another. In the case of avian hybrids (*1–3*), there is an additional impediment; the use of embryos or testes for cytological material reduces even further the small yield of specimens obtained from individual matings. Furthermore, in some instances it might be desirable to be able to study the chromosomes of individual adult hybrids or other phenotypically interesting birds without the necessity of sacrificing them. The new techniques circumvent this difficulty by making available for study the chromosomes of growing feathers.

Pin-feather technique. It is well known that the most actively proliferating region of a growing feather is in the proximal epithelium at the base of the feather shaft, the so-called collar. Serial sections of a pin feather or of a growing feather whose tip has already emerged from the sheath also reveal some mitotic configurations in the proximal part of the feather pulp. The latter are fewer in number but larger in size than those in the collar.

By slitting the feather sheath, it is a simple matter to remove collar or pulp tissue under a dissecting microscope. Aceto-orcein squash preparations can then be made in the usual manner. The tissue may be prefixed with Carnoy's fixative (glacial acetic acid and absolute alcohol in a ratio of 1 : 3). Only small pieces should be used, and it is best to avoid any of the tough feather sheath.

[1] A considerable part of this work was done while I was a graduate student in the Department of Anatomy at Stanford University. I acknowledge my indebtedness to members of that department and, particularly, to Professor C. H. Danforth for his friendly and helpful counsel.