specific activities of the carbon in the starch and sugars are approximately equal to that of the carbon fed.

Figure 2 shows the radioautographs obtained from the ethanol extracts. The activity first appeared in sucrose and only later in fructose and glucose. This is in agreement with the results obtained by Calvin and Benson (*3*). The fructose and glucose are in approximately equal amounts and contain about the same total activity. Hydrolysis of sucrose revealed that the specific activity of the glucose and fructose moieties are about the same. This suggests that the free glucose and fructose are formed by sucrose hydrolysis. It is interesting to note that in every case the fructose was as abundant as the glucose.

From the results obtained, it is evident that in tobacco leaves during photosynthesis, carbon from CO_2 appears in the "starch" fraction before it does in sugars. This observation brings back to us an old idea of Sachs, that starch is the first visible product of photosynthesis.

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Communications

A Radiocarbon Date of Peat from James Bay in Quebec

The authors have made extensive studies of bog and lake sediments in the Mont Tremblant region of Quebec (*1*). Previous pollen studies were carried out by the senior author in southern Quebec (*2*), the Great Lakes area (*3–5*), the eastern coastal regions of New Jersey (*6, 7*), and Maine (*8*).

The study to which the radiocarbon-dating contributed was made during the summer of 1953 when the authors, with the aid of airplane service, extended their investigations northward into the wilderness regions near James Bay. They sampled 19 bogs forming a line transect from the St. Lawrence valley to the north branch of Jack River (52°N). Analysis of these samples indicates that forests migrated northward during the warm-dry (xerothermic) period of postglacial times. White pine in particular, but also some southern broadleaved genera, had extended their range to James Bay, but have since been depressed southward about 350 mi.

The peat material submitted for radiocarbon dating was collected by the authors with a Hiller-type borer from the bottom level of a bog near Rupert River, Smoky Hills Rapids Bog, 18 mi east of Rupert House (51°28′N; 78°45′W). Repeated sampling within a radius of about 4 ft was necessary to obtain sufficient material for the carbon-14 analysis, but the sharp contrast between the earliest organic deposits and the rock flour bottom sediments facilitated the securing of these multiple samples at a uniform level.

The samples thus obtained were submitted to the Lamont Geological Observatory for carbon-14 determination. Dr. J. Laurence Kulp reported an age determination of 2350 (±200) yr as marking the beginning of deposition of organic matter and doubtless of upland occupation by forests (*9*). During this 2350-yr period the shallow lake (10 ft) has filled in completely. Also, during this period the climate has cooled and become more humid. The change in climate very likely contributed to the establishment of the muskeg condition which favors a forest composed chiefly of black spruce (*Picea mariana*). At the present time the forest distribution is black spruce on muskegs and Jack pine in dry-rocky habitats. Observations from the plane show that much of that vast wilderness region is still in the formative period of forest development, with black spruce barely invading the muskegs.

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April 22, 1954.

An Ethical Problem for Scientists in a Divided World

It is a sad fact that quacks and impostors arise from time to time to prey upon science. Sometimes they are merely a nuisance, but occasionally they become dangerous. The Lysenko scandal in the U.S.S.R. is the most shocking recent instance which has secured international notoriety. It belongs to the dangerous variety, and it would seem that exposing its true nature is a manifest responsibility of scientists competent to do so.

Responsibilities and ethics have, however, become blurred in our divided world. Several colleagues, both biologists and nonbiologists, have argued, in conversations, that nothing should be done that might weaken the domination of the biological sciences in the U.S.S.R. by Lysenko and his followers. Some have

even contended that Lysenko should be assisted to maintain his grip. The argument runs approximately as follows. So far as theoretical science is concerned, the so-called Michurinist biology is merely ludicrous. But Lysenko uses his "theories" in activities that are economically very important, like plant and animal breeding and general direction of agriculture. His influence in these affairs cannot help being disastrous, at least in the long run. Regardless of whether they know it or not, Lysenko and his followers are highly efficient saboteurs who weaken the economic fabric of the lands in which they secure domination. This activity is useful in cold war; it may be even more important in hot war.

This writer believes that the foregoing argument involves an ethical issue which should be discussed publicly. Like other humans, scientists are often mistaken; but no scientist should maintain scientific opinions that he knows to be untrue. Some confidence in each other's veracity and integrity is indispensable among scientists if science is to endure and to advance. Competent biologists know that Lysenko's theories are compounded of ignorance or fraud. These theories represent chiefly revivals of outworn notions which were current in scientific biology, mainly during the last century, and which were discarded, one by one, because they were shown, to the satisfaction of at least a large majority of biologists, to be invalid or useless. Of course, the history of science knows instances when a view that was temporarily abandoned eventually came into its own. But the very fact that Lysenko claims these theories to have been invented by Michurin or by himself shows that he either does not know or does not admit their real origin.

It is a remarkable and significant fact that among the many competent geneticists who worked in the U.S.S.R. prior to the establishment of Lysenko's domination in 1948, only one, Noujdin, has become an active protagonist of Lysenko's views. Concerning the others, the information is very scanty. To judge by the contents of the Russian scientific periodicals, those of the geneticists who remain alive and well have either abandoned biological research altogether or switched to "safe" topics. Despite all the threats and inducements they have not followed Lysenko. In the West, a majority of biologists have treated the Michurinist biology with contemptuous silence. To be sure, several books have been published in Lysenko's defence by authors whose primary competence lies in fields not too closely related to Lysenko's main activities. The origins of these books constitute an interesting problem in social psychology. Anyway, it is indisputable that Lysenkoism has very few followers among biologists outside of countries in which its acceptance is prescribed by governmental authority.

To urge that Lysenko's domination of the whole or of a part of biology in several countries is desirable means, then, to wish to perpetuate what a great majority of biologists consider to be an untruth. The present writer believes this to be incompatible with the moral obligations of a scientist. We should desire that scientific enlightenment penetrate everywhere, including the countries which are, for the time being, hostile to us. Let us admit that this involves a calculated risk. Science can be used for good as well as for bad ends. But it is perhaps not overoptimistic to believe that truth will ultimately make us free. Furthermore, a distinction must be drawn between basic science and technological knowledge. Some of the latter may and should be kept secret under certain circumstances. The former should not. Granted that the distinction will at times not be easy to make, it is our collective responsibility to make it. Basic biology certainly should not be made a weapon in any war. The very fact that such an ethical problem could have arisen is distressing; it shows the utter absurdity of a divided world.

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A Challenge to Law

Lawson McKenzie's article on "Scientific property" [*Science* **118**, 764 (1953)] is something of a challenge to the changing law. Perhaps the law can contribute something to improving the social stature of the scientist by offering him new rights and responsibilities. If so, it could at the same time go a long way toward strengthening the weakest link in the chain of application of science generally.

The scientist enjoys a great deal of freedom but sometimes overlooks the fact that freedom implies responsibilities. One of his duties to his fellowmen is to see, as far as he reasonably can, that the fruits of his labor are accessible to all who can profitably harvest them, and not only to his fellow-scientists.

The scientist in the "ivory tower" is the greatest obstacle to the application of science to the common weal. He is likely to resent seeing his work reported in the popular press in what appear to him to be crude and inaccurate terms. He should reflect that there is no absolute truth—at least as far as expression in words is concerned, or even in thoughts. Different people have different habits of thought, and the scientist's—particularly if he has been trained in the "exact" sciences—are really very stylized. He can be about the worst person to choose for the task of getting his work applied in industry or agriculture. Moreover, he sometimes resents another person's cashing in on his discoveries. This is unjustified, for his rewards accrue from his reputation, as McKenzie observed, and all his work goes to his credit—even null results count. He is concerned with discovery, not invention. If he feels resentment at exploitation of his work by others, he should bear in mind that nothing succeeds like success; efforts to apply the fruits of scientific research fail much more often than they succeed, and an inventor or consultant benefits little from all his failures.

A lack of appreciation of the fact that science and