210 are non-commissioned officers or privates. The largest single classified group are the medical officers, of whom there are more than 200, about three quarters of them serving in the Army and a quarter in the Navy. Thirty hold commissions in the Air Services, twenty-four in the Army and six in the Navy. Only eleven Hopkins men are known to be in the Coast Guard, eight of them commissioned officers and three of lower rank. Four hold commissions in the Marine Corps. From this year's graduating class, thirty-seven will receive reserve commissions in the Army as a result of completing the R. O. T. C. course. Many others will enter training schools to prepare for commissions in both Army and Navy. It is probable that nearly half the graduates will go immediately into the armed forces, while the other half will go into wartime industries or advanced training in medicine, chemistry, physics or other essential fields.

Two fellowships are available in the department of geology of the Massachusetts Institute of Technology in the fields of mineralogy and structural crystallography. One of these, a teaching fellowship, carries a stipend of $500 per academic year plus free tuition. Up to eighteen hours per week may be required of the holder of this fellowship. Another fellowship, concerned chiefly with carrying out investigations in structural crystallography and allied fields, requires an investigator with a fairly good background in crystallography and preferably having had some experience in the x-ray study of crystal structures. This fellowship, which is of a more permanent nature, requires the full time of the incumbent and carries a stipend of about $2,000. Any one interested in these fellowships should communicate with Professor M. J. Buerger, Department of Geology, Massachusetts Institute of Technology, Cambridge, Mass., giving full details regarding their qualifications.

A FELLOWSHIP fund, amounting to $500 a year for the next ten years, has been established at the University of Kentucky for students in either mechanical engineering or industrial chemistry as a gift from the Ashland Oil and Refining Company. The fellowship will be awarded on the basis of scholarship and need.

THE American Standards Association has announced completion of a new emergency standard which, while intended for the Army and Navy, will help amateur photographers all over the country to take better pictures. The new standard is a photographic exposure computer—a simple pocket-size device for finding the correct exposure for any time of day in any habitable part of the world. It was prepared at the request of the U. S. Navy for use on ships and planes by the Army and Navy, but it will also be issued in a civilian edition which may be obtained and used by any amateur photographer. The civilian edition is identical with the Army and Navy edition, except for use of priority materials required by the services because of rigorous conditions.

# DISCUSSION

## FURTHER DATA ON THE CULTIVATION OF TOBACCO AMONG THE PUEBLO INDIANS

IN *"Nicotiana rustica* Cultivated by Pueblo Indians," in SCIENCE for July 18, 1941, I reported upon the discovery of this species of tobacco under cultivation in one of the Indian pueblos in New Mexico. This find seemed significant first, because of the extreme paucity of evidence for any cultivation at all among the pueblos, and, secondly, because a previous survey of aboriginal tobaccos[1] did not place *N. rustica* in the Southwest. Since last July new data have come to light; they illuminate our problem, but leave it still unsolved.

Last summer I collected specimens of tobacco, all under cultivation, at Santo Domingo, Cochiti and Jemez pueblos, and at the little Mexican town of San Ysidro, the first two being located in the Rio Grande valley, the latter two in the valley of the Jemez. These specimens were identified by Mr. Volney H. Jones,[2] of the University of Michigan, and by Professor T. H. Goodspeed, of the University of California, as *N. rustica,* Professor Goodspeed adding that they closely resemble a variety called *pumila.* Dr. H. P. Mera, of the Laboratory of Anthropology at Santa Fe, and Mr. Pete Gonzales, also of Santa Fe, sent me a specimen of *punche* (the local Mexican name for tobacco) seed, grown in Rio en Medio, near Santa Fe. This seed appears to be *N. rustica,* but definitive identification should be made from plants grown from them.

From 1925 to 1931, The Consumer Tobacco Company, Mr. R. G. Mewborne, president, grew *N. rustica* experimentally and extensively near Albuquerque. I have discussed this project with Mr. Mewborne at some length. He told me that he used to give seeds freely to Indian and Mexican farmers who "preferred this kind of tobacco to the kind they were growing." Dr. E. G. Beinhart, of the U. S. Department of Agriculture, also had plots of *N. rustica* grown experimentally near Albuquerque between 1926 and 1929.[3] Thus

[1] Wm. A. Setchell, *Am. Anthropologist,* 23: 397–414, 1921.

[2] I am greatly indebted to Mr. Jones for aid and counsel at every point in this investigation.

we see clearly how this species may have been introduced into the pueblos. But our problem is not solved with this new evidence. Tobacco was unquestionably cultivated in the Pueblo country, by Indian and Spanish farmers alike, for decades before these recent experiments. The question is, What species of tobacco was this, and what is its history?

Mr. Mewborne tells me of seeing tobacco under cultivation in New Mexican villages in the early 1900's. Dr. H. P. Mera reports that he has seen tobacco grown near Santa Fe 25 or 30 years ago. Mr. Pete Gonzales also informs me that *punche* has been grown in Rio en Medio since "1875, at least." But we do not know what species of *Nicotiana* are involved in these instances of cultivation.

Through the kindness of Professor Clyde Kluckhohn, of Harvard University, a manuscript in the Peabody Museum by Dr. Edw. Palmer, who made extensive botanical collections in the Southwest for many years prior to 1890, was examined for references to *N. rustica* among the pueblos.[4] None was found. Dr. Beinhart, Dr. Rogers McVaugh, also of the U. S. Department of Agriculture, and Mr. Volney H. Jones have made search among Palmer's field notes and elsewhere, but without discovering any evidence of *N. rustica* under cultivation among the pueblos.

Further inquiry among documentary historians supports Bandelier's claim that "tobacco was not known to the Pueblos until Spanish rule became established."[5] Archeologists have no evidence of the use of tobacco among the Pueblos in prehistoric times.

The situation, then, seems to be this: Tobacco was not used among the Pueblos prior to the advent of the white man. All our specimens, collected subsequent to the experiments of Mr. Mewborne and Dr. Beinhart, are of *N. rustica,* and hence may have been introduced by them. But tobacco of some species was grown in the Mexican villages and Indian pueblos of this region for decades before 1925. Was this species also *rustica*? If another species, has its cultivation been discontinued, possibly as a consequence of recent introduction of *rustica*? Or, is it still being grown to-day? These and other questions must be answered before we can write the history of tobacco cultivation in the Southwest.

P.S.—Since the above was written, "Three New Mexico Chronicles," translated and edited by H. Bailey Carroll and J. Villasana Haggard, has been published by The Quivira Society (University of New Mexico Press, Albuquerque, 1942). In this work we find two references to the cultivation of tobacco in New Mexico in the 19th century. The first, from a treatise by Juan Bautista Pino, published in 1812, states that tobacco was cultivated in New Mexico at that time but that its production was limited by a government monopoly (p. 97). The second reference is from notes on New Mexico by José Agustín de Escudero, published in 1849, which states that "a kind of tobacco which the Indians call *punche*" was grown "but which its producers can not sell because of the government monopoly" (p. 120).

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[3] E. G. Beinhart, SCIENCE, 94: 538–39, December 5, 1941.

[4] Geo. Vasey states that Palmer observed *N. rustica* under cultivation among the Indians of New Mexico (Report of the Botanist, p. 76, in Report of the Commissioner of Agriculture for 1886), but all effort to find this statement in Palmer's notes, unpublished as well as published, has failed.

[5] Final Report, etc., Pt. I, p. 37 (Papers of the Archeological Institute of America; Amer. Series III; 1890).

## BREEDING DISEASE-RESISTANT CROPS

IN a recent article Stevens[1] pointed out that the production of new varieties of crops, even those bred for resistance to some important disease, often prove to be very susceptible to some other disease which, even with extensive testing, might not be discovered by the breeder prior to its release. This has happened so often that it has come to seem almost axiomatic to many people.

The danger of introducing a gene for susceptibility to some other disease while introducing one or more for resistance to the disease under consideration may be avoided by using the backcross method of breeding.[2] In a self-pollinated crop like wheat the progeny of a hybrid will become homozygous for the genes of the recurrent parent with a sufficient number of backcrosses. Only the gene or genes being introduced must be maintained by selection. Therefore, the new variety will be exactly like the recurrent parent except for the introduced genes and perhaps some other very closely linked ones.

We have used this method in breeding wheats resistant to bunt, *Tilletia tritici,* and to stem rust, *Puccinia graminis,* and find that the derived varieties are exactly like the recurrent parent in all characters except for resistance to the two diseases mentioned. Their reaction to mildew, septoria, leaf rust and other diseases has not been changed.

In cross-pollinated crops, like corn, backcrossing to a heterozygous parent is equivalent to one generation of inbreeding; therefore, this method of breeding may not be so directly applicable, especially if such a crop loses vigor when inbred. In the case of corn it should be very useful in improving inbred lines.

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[1] Neil E. Stevens, SCIENCE, 95: 313–316, 1942.

[2] Fred N Briggs, *Amer. Nat.,* 72: 285–292, 1938.