NOTE ON PROLIFERATIVE POWER OF PINUS sp.

N. M. GRIER, Ph. D.

Near Lakehurst, N. J. is the proving ground of the Chemical Warfare Service, U. S. A. It consists of a large tract of exceptionally sandy loam covered mostly with a growth of conifers (*pinus rigida*, principally *echinata*, *sylvestris*), but with occasional oaks, chestnuts, sassafras, etc., intermingled. Most of this tract has been re-forested within 40-50 years, while in this part of New Jersey, forest fires are by no means infrequent.

Judged by the age of oak saplings, a fire had occurred in one part of this tract within the last 4 years. Its effect had been to completely destroy the undergrowth and residual humus and to kill all other kinds of trees but the conifers, whose charred bark indicated the severe heat. A succeeding flora, principally of huckelberry, bracken, commoner grasses had obtained a thriving footing, while the stumps of the destroyed trees supported luxuriant outgrowths. Examination of the trunks of the conifers showed, that previous to the fire, extensive self-pruning had taken place, indicating the density of shade in the woods at one time, the trees branching about 10 feet from the ground. A large number of these branches had been burned quite short, while many of the higher ones had been killed.

It will be remembered that the branching habit of conifers is a radial one—the trunk might be compared to the hub of a wheel, the whorls of branches to the spokes. Also in old trees these whorls are usually some distance apart from each other. The fire, however, had elicited an elaborate response from the trunks—something which seemed unusual to the writer in view of the common impression of the conservative habits of conifers. While thickest at the top of the trees (in fact, very thick), there appeared between the older whorls, in regions of the trunk never branched before and as near the ground as 3 feet, new and healthy whorls of branches. This proliferation also occurred around the stumps of burnt off branches in all directions above, below, and to the sides.

The writer is not familiar with any literature dealing with the localization of branch forming elements in the conifers, although their highly symmetrical habit of branching had often impressed him. While this proliferation was thickest in the younger part of the stem where material might be considered more condensed, the fact that it was found also on the older portions of the stem seemed to indicate that these branch forming elements are by no means limited in locality. They appear to exist everywhere on the stem, and apparently need only the proper stimulus to cause them to grow out. Moreover the full history of the secondary branches shows that where each primary branch emerges from the trunk it is apparently surrounded by the branch forming elements of the secondary branches—the primary branch then becoming comparable to the hub of the wheel. The writer's observation has been that these secondary branch elements rarely develop under normal conditions into branches at this basal position, but undoubtedly portions of them are carried along in the lateral growth of the primary branches, and under appropriate conditions develop the secondary ones.

The hardy character of the trunk and such a distribution of branch forming material under the circumstances described, may be granted a distinct advantage. While many of the older branches were destroyed, yet the younger proliferating elements were rapidly filling their place, *at their base*, as well as between nodes. Ordinarly, an angiospermous tree sufficiently resistant to fire could supply one or two branches in any given region of the trunk where the conifer could produce a larger number. In the former, it would mean that so far as reproduction and maturity are concerned, a tree burned to the ground has to start over; an injury sufficient to destroy an angiospermous tree leaves unharmed the trunk of the conifer, and the young branches of the conifer find their lines of supply still highly organized. The high pitch and other organic content in the conifer is also of advantage, for such under influence of high temperatures readily carbonizes, and forms a protective layer readily resisting the encroach of the destroying heat. These facts seem to have a direct relation to what we believe to be the conditions under which conifers evolved, and to their persistence in geologic time.

Some opportunity was afforded to observe in the vicinity the effect of the various poison gases, (phosgene, chlorine, "mustard," etc.), on the two types of trees, angiosperms and gymnosperms, in a portion of the proving ground where there had been extensive artillery firing. Here the former seemed more in luck, proliferation seemed to be reduced in the conifers and these trees, although scarcely damaged by shell fragments, apparently were scarcely living and had a comparatively greater number of dead branches. A possible reason is the greater ease of aeration of leaves in the angiosperm, which the thick bushy leaves of the conifers seems to inhibit. The fact that the whole tree seemed to suffer when under such conditions, would seem to indicate that the effects of these substances is by no means localized, but would seem to exist throughout the tree. While dead branches in the other type of tree were not uncommon, yet the impression was gained that on the whole they had suffered less.

Dr. O. E. Jennings, Curator of Botany, Carnegie Museum, has been kind enough to make certain comments on this data, which I have combined in the above.

Hollins College.