b. Epispore distinctly warted. warts spinose; spores larger and darker than in a.

5. Stemonitis Morgani Peck.

Spores densely but minutely warted with spinose warts, 7-8μ, reddish brown, dark with purple tinge; capillitium, inner network loose, few branches, outer net large meshed 15-40μ; height of sporangia, 15-18 mm., rich reddish brown, dark with purple tinge.

6. Stemonitis Webberi Rex.

Spores densely and very distinctly warted. 8-9μ, reddish brown; capillitium, inner net open, outer net large, coarse, irregular meshes 50-125μ; height sporangia 18 mm., rusty brown.

c. Epispore reticulate, large, dark, violaceous never brown.

7. Stemonitis maxima Schw.

Spores reticulate, 7-8μ, dark violaceous; capillitium, inner net of medium density, outer net meshes 8-40μ; height of sporangia 5-10 mm., dark purple brown, becoming pallid with age.

The Vegetation of Abandoned Rock Quarries.

Mel T. Cook.

The study of the encroachment of plants on waste land and the order of their succession becomes especially interesting in the case of the abandoned rock quarries because of the very small amount of soil.

The following observations were made from the study of three limestone quarries in Greencastle, Indiana, and vicinity. It is impossible to give the exact ages of these quarries; a small amount of rock is still taken from them. Rough estimates will be given in the following descriptions:

Quarry A.—A small quarry, about ten or fifteen years old; about two-thirds of the floor covered with water, which drains in from a small area; no natural outlet.

Quarry B.—A much larger quarry, about fifteen or twenty years old; very long and narrow and extending east and west; the first work done in

the western end; small stream runs the entire length from east to west; another much smaller stream from a spring enters on the north side, spreads out fan-shaped and joins the main stream. A small marsh in one part of quarry. Heavy woodland on the south.

Quarry C.—Very little larger than B and about twenty or twenty-five years old. Extending north and south; first work at north end; small stream runs through north end; large pond in south end. Almost surrounded by thin woodland.

Fig. 1.

There is no soil in these quarries except the small amount incidentally carried in by the workmen, by the wind, by the streams; and the powdered limestone soil, the result of blasting and crushing.

Although there may be many factors bringing seeds into the quarry, the two principal ones are wind and water.

The order in which the plants appear in these quarries is as follows: Algae, lichens, mosses, scouring rushes, monocotyledons and dicotyledons.

The water naturally brings in the algae, which grow in great variety and abundance. Lichens are not very abundant and are usually found in the higher parts. The peculiar soil formed from powdered limestone forms a muck in which a few species of mosses grow, but not in great abundance. A few very poor specimens of Equisetum arvense were found in quarry B, having come in from the gravel bed of the railroad which runs on the north bluff of this quarry.

Fig. 2.

Of the Spermatophytes the monocotyledons are the first to appear, the hydrophytes leading and invading the ponds. Of these the most showy is the Typha latifolia L. (Fig. 1), which was very abundant in all three quarries. Around the margins of these ponds the sedges were very abundant, gradually giving way to the grasses a little farther back.

Of the dicotyledons, the willows (Salix sp.) and sycamore (Platanus occidentalis L.) were the most conspicuous (Figs. 1 and 2). The willows

were always in great abundance along the streams and on the margins of the ponds. The sycamores were by far the most interesting growth and were found abundantly in quarries B and C. They were more abundant and much larger in the old parts of the quarry and seemed especially well adapted to this peculiar soil; in fact, they seemed to be able to grow with little or no soil except the limestone powder in the crevices. Fig. 3 shows a tree about eight inches in diameter growing out of the apparent solid

Fig. 3.

floor of quarry C. Fig. 4 shows a tree of about four inches in diameter growing out of a crevice between strata in the wall of the same quarry.

In the older parts of the quarry and around the margins, where considerable amounts of surface soil has been carried in, the dicotyledonous plants are very abundant.

The common watercress (Roripa nasturtium L.) was abundant in quarry B, having been carried in by the little stream from the north. Its spread, however, was very slow, seemingly dependent on the amount of surface soil carried in by the stream, since it did not thrive in the limestone soil.

A few plants of the button bush (Cephalanthus occidentalis L.) were found around the pond in quarry C.

Fig. 4.

A summary gives the following conclusions: (1) the first plants are the algae in great variety and abundance. (2) A very few lichens. (3) A few mosses. (4) Equisetum very rare; the soil not suited to its growth. (5) Typical hydrophyte societies in the ponds, the Typha latifolia being most conspicuous. The ponds slowly encroached upon by the sedges and grasses. These plants form a soil for the many dicotyledons which are

found in the older parts of the quarry. (6) The willows and sycamores are the first trees, both being specially well adapted to the thin soil.

The following census of plants was made from quarry B by Mr. Guy Wilson:

1. Typha latifolia L.
2. Alisma Plantago aquatica L.
3. Panicum dichotomum L.
4. Muhlenbergia sp.
5. Phleum partense L.
6. Agrostis alba L.
7. Cyperus sp——.
8. Carex sp——.
9. Ixophorus glaucus (L.) Nash.
10. Juncus effusus L.
11. Juncus tenuis Willd.
12. Juncus nodosus L.
13. Salix sp——.
14. Ulmus Americana L.
15. Rumex crispus L.
16. Polygonum sp——.
17. Roripa nasturtium (L.) Rusby.
18. Draba Caroliniana Walt.
19. Platanus occidentalis L.
20. Potentilla monspeliensis L.
21. Pyrus sp. (cultivated).
22. Melilotus alba Desv.
23. Trifolium partense L.
24. Trifolium repens L.
25. Acalypha gracilens A. Gray.
26. Euphorbia nutans Lags.
27. Rhus radicans L.
28. Impatiens sp——.
29. Onagra Oakesiana (A. Gray) Britton.
30. Daucus carota L.
31. Asclepias incarnata L.
32. Verbena urticifolia L.
33. Scutellaria lateriflora L.
34. Prunella vulgaris L.

35. Hedeoma pulegioides L.
36. Lycopus rubellus Moench.
37. Mentha piperita L.
38. Mimulus alatus Soland.
39. Plantago major L.
40. Micrampelis lobata (Michx.) Greene.
41. Lactuca Scariola L.
42. Lactuca Canadensis L.
43. Ambrosia trifida L.
44. Xanthium strumarium L.
45. Vernonica sp——.
46. Eupatorium perfoliatum L.
47. Solidago Canadensis L.
48. Erigeron Philadelphicus L.
49. Bidens laevis (L.) B. S. P.
50. Bidens frondosa L.

The Germinative Power of the Conidia of Aspergillus Oryzæ.

Mary F. Hiller.

Former investigations of the mould, Aspergillus oryzae, have resulted in many practical suggestions which have determined this mould to be of interest to the commercial as well as to the scientific public.

In 1876 Ahlburg, the first investigator of the mould, described the fungus and named it Eurotium oryzae. Cohn, in 1883, in his study of moulds as industrial factors, called it Aspergillus oryzae. Büsgen, in 1883, gave the first complete description of this mould, and in 1893 Wehmer attempted a structural study. From this time many investigators were at work in many different laboratories working out the life history of the fungus. It was Takamine, a Japanese chemist, who introduced Aspergillus oryzae into the laboratories of this country.

The careful experiments of many investigators, among whom are Jörgensen, Hansen, Klocher, also Atkinson and Hoffman, who have treated it from the industrial standpoint, have resulted in suggesting for this mould many interesting properties, such as the claims that the mycelium,