differences in solubility and volatility, may have caused the germanium to attach itself to other members of a given deposit. With this possibility in mind the search for germanium is being extended to a number of pegmatite and high temperature vein minerals, as well as to gangue materials. The spectrographic work on topaz, which is completed, proves conclusively that topaz in the massive as well as in the crystalline form contains germanium. Thirty-four specimens of topaz from twenty-seven different localities were examined and all were found to be germaniferous. Some topazes from Schneckenstein, Saxony and from Zinwald, Bohemia, were among those which contained minute traces of the rare element. Their spectrograms included only two of the most persistent germanium lines within the spectral range examined. The majority of topazes contained much more germanium, a fact substantiated by the larger number of spectral lines of this element. Notably among these were specimens from the following localities: Trumbull, Connecticut; Stoneham, Maine; Florissant, Colorado; Naegi Mino, Japan, and Silver Leaf Mine, Manitoba. Work is now in progress on the quantitative determination of germanium in topaz.

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HETEROTHALLISM IN THE RUSTS

THE cytological advances in the study of the rusts which revealed a pairing of nuclei with ultimate fusion, regarded as possible sexuality, definitely led to interest in the origin of the associated nuclei. The question whether the nuclei coming together in the fusion cell originated in separate cells of the same mycelium, or whether two separate mycelia might be involved, was a natural one. The possibility of the latter, heterothallism, has no doubt occurred to many workers and definite suggestions are not wanting (Dodge[1]; Arthur and Kern[2]). Cytological methods have not yielded any evidence. The most suggestive results have been brought forward by Craigie,[3] based on cultural studies.

Working with *Puccinia Helianthi,* Craigie[3] directed his attention toward producing infection from single basidiospores. Such infections lead to what he calls monosporidial pustules. He reports that in approximately 50 per cent. of the cases where monosporidial pustules are near enough together to coalesce aecia are promptly produced. Isolated monosporidial pustules develop pycnia, but usually do not develop aecia within two or three weeks, and then only in a minority of the infections. His results led him to the conclusion that the basidiospores are unisexual, producing unisexual mycelia, which interact when in contact, giving fusion cells in the spore-bed of the aecia. Later, working with *Puccinia graminis* cultures on the barberry as well as with *Puccinia Helianthi,* Craigie[4] reports that, in addition to contact and spontaneous development, there is a third manner in which monosporidial pustules may change from the haploid to diploid condition. This consists in the transfer of pycniospores from one monosporidial pustule to the pycnia of another monosporidial pustule. Flies are said to carry the pycniospores in the nectar. The facts seem to be clear that mixing the pycniospore-containing nectar does lead to early and abundant development of aecia. That this is due to germination of pycniospores, mycelial production and fusion to bring on the diploid condition has not been made clear. Craigie postulates that some of the monosporidial pustules have a + mycelium, others a − mycelium, each of course being haploid. He believes that when + and − mycelia come in contact the diploid condition is effected which results in prompt formation of the binucleate aecial structure.

There seems to be no doubt that the contact of two mycelia of monosporidial origin or the mixing of pycniospores has a positive and stimulating effect on the production of aecia, but no conclusive evidence of what happens has been brought forward. It is a well-known fact that when two cultures of ascomycetes are grown together on opposite sides of a petri dish more ascocarps may be produced along the line of contact than when either culture is grown alone. Many other instances have been cited showing that bacterial or fungous contaminations, as well as different colonies of the same fungus, may have a beneficial effect in stimulating the production of ascocarps. It is evident that the stimulation of the sexual reproductive process when two mycelia are growing in proximity is not necessarily a proof of heterothallism, although it may be admitted as an indication. The subject awaits further experimental investigation, accompanied by painstaking cytological observations, and may yield facts not only of biological interest but of practical importance.

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[2] J. C. Arthur and F. D. Kern, "Conversations with European Mycologists," SCIENCE, 63: 558–560, 1926.

[3] J. H. Craigie, "Experiments on Sex in Rust Fungi," *Nature,* 120: 116–117, 1927.

[4] J. H. Craigie, "Discovery of the Function of the Pycnia of the Rust Fungi," *Nature,* 120: 765–767, 1927.