ACCORDING to *Museum News,* Miss Caroline Hazard, honorary president of the Santa Barbara Museum of Natural History, has given the museum an additional piece of property and endowment that will cover upkeep of the new gift and perpetuate her annual subscription to the museum's funds. The land is across the street from the museum and will be used for a residence for the director and for laboratories and work rooms. It consists of ten lots, approximately 300 feet square fronting on Mission Canyon Road. There is a California redwood house on the property.

THE *Times,* London, states that at a meeting on September 8 of the British Parliamentary and Scientific Committee, the recent appointment of three full-time scientific advisers to the Ministry of Production was considered and the following resolution was passed: "This committee, while welcoming the appointment of three full-time scientific advisers to the staff of the Ministry of Production in so far as it establishes the nucleus of a central scientific and technical board, regrets that their field of activity is apparently to be limited to the sphere of production and does not include the scientific and technical activities of the service departments or the other ministries outside the strict field of production. An extension of its functions is needed to ensure that all scientific considerations are coordinated and given full weight over the whole field of the national effort. The committee considers, therefore, that in order to cover this wider field, scientific advisers should have direct access to the War Cabinet and that accordingly the Lord Privy Seal should exercise his supervisory functions over the new body directly on behalf of the War Cabinet." It was reported that 126 members have now added their names to the motion on the Order Paper, which suggests that "present circumstances require the early establishment of a whole-time Central Scientific and Technical Board to coordinate research and developments in relation to the war effort."

DISCUSSION

VERTICAL ORIENTATION OF POWDERY MILDEW CONIDIA DURING FALL

HYDRODYNAMIC theory[1] indicates that flattened or elongated objects fall with the surface of greatest resistance normal to the direction of motion. From extensive observations of the fall of spores of Basidiomycetes and inert objects Buller[2] confirmed this and stated the general principle that "Any homogeneous elongated body falling in still air tends to orientate itself in such a way as to present the maximum amount of surface in the direction of the line of fall and thus fall as slowly as possible." The fall of powdery mildew conidia in a vertical position and in apparent disagreement with the above-stated principle is therefore of interest.

Conidia of *Erysiphe graminis* D.C. grown on barley plants in the greenhouse were mostly used, but limited observations of *Erysiphe polygoni* D.C. indicate that other powdery mildews may behave in a similar manner. Conidia of *E. graminis* are one-celled, ellipsoidal, symmetrical, 13×32 microns, with smooth walls, do not collapse during several hours of drying, have a large central nucleus and fall at approximately 1.2 cm per second in air. They are therefore much larger, and differ in several other important respects from the basidiospores studied by Buller. When caught on glass slides under field or greenhouse conditions most conidia are in a horizontal position with respect to the surface of the slide. However, when caught on glass slides after falling through a glass tube, many conidia are vertical on the slides, and the vertical conidia have fallen at a faster rate than the horizontal conidia. Many of the conidia also fell in a vertical position when suspended in water in a glass tube.

To determine whether the conidia actually fall in a vertical position in air or if the vertical orientation on the slides is an end effect, they were observed and photographed during fall in a glass tube with inside dimensions of 77×0.7 cm by means of a horizontal microscope. Dark-field illumination was obtained from a commercial adaptation of the Edgerton flash apparatus.[3] With intermittent flashes (30 times a second) and with a magnification of about one hundred diameters, it was easily possible to determine the orientation of every spore in focus during fall. Of 403 conidia clearly observed, 204 were vertical and 199 were horizontal. An average of two spore images per photograph was obtained when each frame was exposed with 50 microsecond flashes about ten times during a spore fall period. Of 65 single conidia photographed during fall, 34 were vertical and 31 horizontal. In the direct observations and in the photographs all conidia in focus were readily classified as vertical or horizontal and no conidia with intermediate orientation were found, indicating that the falling spores assume one or the other of these two apparently stable positions. With the same tube and with other conditions similar, but catching the conidia on slides, 307 out of 600 were classified as vertical and 293 as horizontal. On the slides some conidia were

[1] W. Thomson and P. G. Tait. "Treatise on Natural Philosophy." Article 333, 1867, Clarendon Press, London.

[2] A. H. Reginald Buller. "Researches on Fungi," II, 35, 1922. Longmans, Green and Company, London.

[3] General Radio Company, Type 648-A Strobolux.

leaning and were difficult to classify as vertical or horizontal. The similarity in the data from these three methods would indicate that for most purposes observation of position after fall is a fairly reliable index of position during fall, and that many powdery mildew conidia actually fall with their long axes in a vertical position. Reduction of convection currents is probably an important function of the tube in causing a high percentage of vertical orientation of the conidia and in one test using a narrower tube than the above, all the conidia were found in a vertical position.

Possible explanations for vertical orientation of falling objects are displacement of the center of gravity, rotation about the axis of symmetry and lateral friction due to close approach to the wall of the enclosing container. It has not been determined to what extent any of these could apply to mildew conidia but the writers believe that slight and not clearly observed displacement of the nucleus and vacuoles from a symmetrical arrangement within the spore might account for its vertical orientation under the conditions of the confined air of the small glass tubes.

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THE REQUIREMENTS OF PARASITES FOR MORE THAN HOSTS

THE introduction from abroad of beneficial parasites for the control of injurious insect pests may attain even greater success if *all* factors essential to the optimum development of the parasite are studied. For too long the entomologist has centered his attention on the beneficial parasitic stage of the parasite, often failing to appreciate the equal importance of the remainder of its life-history.

Some parasites attack their host in all their active stages, as in the case of the Australian lady-beetle, *Rodolia* (*Novius*) *cardinalis,* which feeds as both larva and adult on the cottony cushion scale, *Icerya purchasi.* Any climatic conditions suitable to the host are equally favorable to its specific predator, with no additional factors necessary, and to this is largely due its outstanding success when introduced originally into California, and later in every other country where the cottony cushion scale has appeared.

This is really the very simplest type of parasite introduction, and the comparative ease with which its success was attained gives little indication of the complications attending that of other kinds of parasites. Most of these attack their insect host either as a larva or as an adult, but not as both, and require some additional factor for survival in their non-parasitic stage. No organism can survive in a new environment where any individual factor essential to its existence is lacking. It is the neglect of this principle, which may be considered almost a biological axiom, that in many cases has prevented other parasites from becoming equally effective in the control of their specific injurious host. The following examples, from the personal experience of the writer, have a more than local application.

The successful introduction into Puerto Rico from Brazil of a large wasp, *Larra americana* Saussure, which is parasitic in its larval stage on a mole cricket, the Puerto Rican "changa," *Scapteriscus vicinus* Scudder, apparently depended on the presence in Puerto Rico of two weeds, locally known as "botoncillo," *Borreria verticillata* and *Hyptis atrorubens,* from the flowers of which only do the wasps obtain nectar. Where these weeds were continuously present in abundance in Puerto Rico, *Larra* became established; where they were scarce or absent, even though changas were present in abundance, the wasps failed to survive. It is possible that some other minor factors may in part have been responsible, but we are not aware of them, and the experiment seems to check as well as one can hope in introductions of this kind.

Instances where there is no successful introduction, but only a series of unexplained failures, are much more numerous, and of these only a single instance need be cited. Repeated attempts to establish the Scarabaeid dung-beetle, *Canthon violaceus* Olivier, of Hispaniola in Puerto Rico were made in 1913, and again more recently. The beetles thrive in captivity, and hundreds of the progeny of those originally brought from across the Mona Passage have been released in Puerto Rican environments that would appear to be identical with those in Hispaniola, yet not one has since been found alive in all the years following. The life-history of these scarabs is apparently so simple that we can not see that anything essential is lacking in Puerto Rico that is present in their country of origin, but it must be so, otherwise how explain their failure to survive.

More instructive are instances of abundant and effective parasites which fail to become numerous elsewhere. Throughout the world, white grubs are attacked by wasps of the genus *Tiphia,* which are often an important factor in control. In Puerto Rico, where endemic white grubs became very numerous and were the major pest of all agricultural crops, admittedly *Tiphia* wasps do exist, but are so scarce that not enough specimens have been collected so that specialists can be sure of their specific identity. In Hispaniola, *Tiphia* is abundant, and along the coast is often collected feeding on the sweet secretions of scale