tific work whenever leisure from their ordinary duties permitted them to do so:—

Members of the Staff of the Zoological Station.	Subjects of Work.
Prof. A. Dohrn (Director)	Comparative embryology of Vertebrates.
Prof. H. Eisig	Anatomy and embryology of Annelids.
Prof. P. Mayer (Editor of Publications)	Morphology of Vertebrates.
Dr. W. Giesbrecht	Monograph of the Copepoda.
Dr. P. Schiemenz (Librarian)	Mollusks: monograph of the Pteropods.
Dr. F. Raffaele	General fishery questions. Development of the skeleton in Vertebrates.
Dr. W. Kruse	Bacteriology.
Dr. E. Herter	Physiology, chemistry.
Dr. Schöbel	Branchial apparatus of Selachians, microscopic drawing.

The whole number of naturalists that have occupied "tables" and worked at the Zoological Station of Naples since its opening, some twenty years ago, is 575. Of these, 228 have been Germans, 127 Italians, 52 English, 48 Russians, 32 Dutch, 26 Austro-Hungarians, 23 Swiss, 18 Spaniards, 14 Belgians, and 4 Americans, while the remaining 12 were of various other nationalities. Much of the good work that has thus been produced has been scattered abroad over the world in articles contributed to different scientific periodicals. But a portion of it, sufficiently solid to show its general character, has been published in a noble series of memoirs on various departments of the flora and fauna of the Bay of Naples, which now extends to sixteen elaborate and abundantly illustrated quarto memoirs. These are:—

(1) "Ctenophoræ," by Dr. C. Chun, 1880, with 18 plates.
(2) "Fierasfer," by Dr. C. Emery, 1880, with 9 plates.
(3) "Pantopoda," by Dr. A. Dohrn, 1881, with 17 plates.
(4) "Die Corallinenalgen," by Graf zu Solms-Laubach, 1881, with 3 plates.
(5) "I Chætognathi," by Dr. B. Grassi, 1883, with 13 plates.
(6) "Die Caprelliden," by P. Mayer, 1882, with 10 plates.
(7) "Cystoseiræ," by R. Valiante, 1883, with 15 plates.
(8) "Bangiaceæ," by Dr. G. Berthold, 1882, with 1 plate.
(9) "Le Attinie," by A. Andres, Vol. I., 1884, with 13 plates.
(10) "Doliolum," by Dr. B. Uljanin, 1884, with 12 plates.
(11) "Polycladidea," by Dr. A. Lang, 1884, 2 Parts, with 35 plates.
(12) "Die Cryptonemiaceen," by Dr. G. Berthold, 1884, with 8 plates.
(13) "Die Koloniebildenden Radiolarien," by Dr. K. Brandt, 1886, with 8 plates.
(14) "Polygordius," by Prof. J. Fraipont, 1887, with 16 plates.
(15) "Die Gorgoniden," by G. v. Koch, 1887, with 10 plates.
(16) "Die Capitelliden," by Dr. H. Eisig, 1888, 2 Parts, with 37 plates.

Besides these memoirs, eight successive volumes of a yearly journal entitled *Mittheilungen aus d. zoologischen Station zu Neapel*, containing smaller contributions to science, have been published during the past twelve years, and, since 1879, a *Zoologische Jahresbericht*, containing a summary of the advances made in the different branches of zoological knowledge during each year, has been regularly issued. In these three undertakings we have ample testimony to the great amount of work carried on at Naples by Dr. Dohrn and his coadjutors, and to the excellent results which they have arrived at.

Having described the nature of the business transacted at the Zoological Station at Naples, let us now consider the cost at which it is carried on, and the means whereby the necessary funds are obtained. Taking the expenditure of the last three years as a basis, we find, from figures kindly supplied to us by Dr. Dohrn, that about £2400 are required for the general expenses of management—that is, for stocking the tanks, preserving specimens, keeping up the laboratories, machinery and pumps, providing additions to the library, and paying taxes and other outgoings. A similar sum of about £2400 is spent on the salaries of the officials, the higher officers (twelve in number) receiving from £220 to £72 per annum, and the lower grades (34 in all) ranging from £72 to £15, the last-mentioned sum being the wages paid to boys.

These are the two most serious items on the outgoing side, and make together £4800, besides which about £1300 are required for interest on the debt and sinking-fund, £200 for accumulation towards a pension-fund, which was commenced two years ago, and £100 for the publications, which cost about £1400 a year, and only produce a return of about £1300. Thus the total yearly expenditure of the Zoological Station at Naples, as at present carried on, may be reckoned at about £6400. To meet these annual requirements an income which has averaged about £4800 during the past three years is available. As already stated, the receipts from the admission of visitors amount to about £1000, while the thirty tables, let at £100 a year for each table, produce a revenue of £3000. Besides these principal items, the sale of specimens preserved at the Station produces about £700, and that of waste materials of various sorts another £100. Thus the whole income derived from the institution itself reaches only about £4800, and the Station would be carried on at a considerable annual loss were it not for the magnificent subsidy of £2000 a year granted to its support by the German Empire, which just covers the deficiency. This is a good example of the liberal way in which science is encouraged and supported in the "Fatherland," and is the more noteworthy because the object of its well-bestowed bounty in this instance is localized on foreign soil, and, though established and carried on by a German citizen, is by no means restricted for German subjects. We may appropriately contrast this with the conduct of the Government of our own country, which, in the case of the corresponding institution at Plymouth, situated in England, and founded and carried on mainly if not entirely for the benefit of British subjects, could only be persuaded to grant a subsidy of £500 a year for a limited period of five years. P. L. S.

ATTRACTIVE CHARACTERS IN FUNGI.

On the recent introduction of this subject into the columns of NATURE it was understood, if not so expressed, that the inquiry was to be practically limited to the Hymenomycetal fungi, with the view of restricting it within a definite compass, and preventing too discursive a discussion. The limit was a very natural one, and included the best known and most appropriate objects for exhibiting the presumed attractiveness. Allusions have been made to another remarkable group, the *Phalloidei*, but facts applicable to this group would scarcely serve as illustrations of the *Agaricini*. Moreover, it must be admitted that with the *Phalloidei* the difficulties in the way of arriving at a conclusion are small. Strong fœtid odour and bright coloration are features almost universal, the object of which may fairly be accepted as attractive, to the end that the minute spores may be distributed, and the continuity of the species preserved. On this point nothing has been adduced beyond what is contained in Mr. Fulton's communication in the *Annals of Botany* for May 1889, on "The Dispersion of the Spores of Fungi by the Agency of Insects."

As regards the *Hymenomycetes*—that is to say, fungi of the mushroom type, with naked spores—the question ap-

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peared to resolve itself into this : Are such characters as colour, odour, &c., attractive, and if so to what members of the animal kingdom, and for what purpose? Incidentally, and apart from this, the side issue has been raised whether other characters, such as viscidity, inconspicuous coloration, &c., are not in some sense protective, for it has not been urged, nor do we think there was any ground for urging, that such latter characters were attractive, except perhaps the allusion to *Agaricus radicatus* by Mr. Worthington Smith, which does not seem to be at all conclusive.

Although not expressly stated, there seems to be an undercurrent of feeling amongst some correspondents that colour and odour are attractive to insects for the purpose either of fertilization or the dispersion of spores. This may be so, but there is no evidence, in the facts elicited, to support it—nothing to show that the attractive species are more in need of extraneous aid than unattractive. And, as to the subject of fertilization, the mystery is still unsolved, whether or no any special act of fertilization takes place, and if so, whether each individual spore is fertilized, or whether there is a fertilization of the young plant in the embryonic condition, or in its earliest stages, as some have contended, rendering all its spores fertile. This subject has been discussed over and over again during the past half-century, and has not been left, as one correspondent seems to think, disregarded. Dr. Karsten, in 1860, and M. Oersted, in 1865, held that upon the threads of the mycelium the male and female elements combined in the production of the rudimentary cap which developed into a fertile individual. On the other hand, Bulliard, Corda, Hoffmann, and others, both before and after this, contended for the fertilization of the individual spores by the cystidia. Mr. Worthington Smith supported this view, based upon experiments with *Coprinus radiatus*, and declares himself of the same opinion still. It is impossible to enter upon the details here, but this carefully written memoir by Mr. Smith merits attentive and unprejudiced perusal. The cystidia are borne upon the gills of the *Agaricini*, side by side with the basidia supporting the spores. Insect agency is not essential for direct fertilization, but, for cross-fertilization, some such aid would be necessary, assuming the theory of fertilization by the cystidia to be established. Here, again, another suggestion must be taken into account, for Mr. Smith contends that usually the cystidia fall out from the gills, and are scattered upon the ground beneath, and the fertilization of the falling spores takes place upon the ground, and not during the time that both spores and cystidia are attached to the gills. If this be the case, it explains why no foramen has been detected in the spore membrane, except the hilum of attachment, and suggests that through the hilum communication is established between the cystidia and the spore contents. On the other hand, fertilization usually takes place, in most organisms, at an early stage of the ovum, and not at its apparent maturity, and full coloration. It is not improbable, if fertilization takes place after the spores and cystidia have fallen to the ground, that the visits of insects, &c., to the gills may assist in releasing both organs and causing their precipitation, and, consequently, promoting fertilization. This hypothesis being true, a viscid stem would be of service to retain many of the spores and cystidia attached until fertilization is accomplished, so also would a woolly or hairy stem. As a rule, we imagine that the brightest coloured species (*Russula*, for example) have neither a viscid or woolly, but a dry and smooth stem, whereas a proverbially dull-coloured sub-genus, such as *Inocybe*, includes a great number of species with a rough scaly stem. We cannot pretend to discuss here the strength or weakness of this theory of fertilization, only to suggest, on the assumption of its being accepted, the probable advantages of insect visitations, and consequently of attractive characters favouring such visitations.

Closer habits of observation, and a larger number of observers, is the only hope for acquiring a more perfect knowledge of this subject, and this may be stimulated by some suggestions offered in the course of this discussion, indicating the direction in which observation is calculated to produce favourable results. However plausible it may appear to hint that bright colours in Agarics are attractive, we fail to recognize any evidence that such is the case. Do insects visit *Agaricus muscarius* more persistently than they do *Agaricus pantherinus*, or *Russula rosacea* more than *Russula consobrina?*

The persistency with which reference is made to the supposed passage of fungus spores through some animal host, in order to produce fertility, provokes as persistent a denial that there are facts to support such an hypothesis, and compels us to insist that such a supposition is untenable, and is not accepted nowadays by mycologists, however much it may have been tolerated in the past. Apart from the question of the attractive colours of fungi, we are reminded of instances in which colour, in the Hymenomycetal fungi, is evidently protective, although these are not numerous. *Cantharellus carbonarius*, as its name suggests, grows upon charcoal, or charred ground where charcoal has been burnt, and its smoky black cap so nearly resembles the soil that it may easily be overlooked. There are also two small species of *Collybia*, usually found growing together on burnt ground. *Agaricus atratus* and *Agaricus ambustus*, with dingy blackish-brown caps, which render them very inconspicuous. One of the most common of fungi on charred ground is *Agaricus* (*Flammula*) *carbonarius*, with a brown cap, so viscid that it is nearly always disguised by a coating of fragments of burnt soil and charcoal which adhere to it. The little *Agaricus* (*Pleurolus*) *acerosus* grows on the side of wet wheel-ruts in woods, and has such a dingy grey cap that it must be sought very carefully to be seen. Whenever we have found *Agaricus* (*Psalliota*) *hæmorrhoidarius*, it has been partly buried in clayey soil, and the whole fungus and soil so nearly of the same colour that even a practised fungus-hunter could easily pass without observing it. *Agaricus* (*Tricholoma*) *vaccinus* growing amongst pine-leaves would be mistaken for a fir cone, and *Agaricus* (*Tricholoma*) *imbricatus* is remarkably inconspicuous amongst dead pine-leaves and old fir cones; and every mycologist knows how very difficult it is to see the little *Hydnum auriscalpium* amongst old fir cones. *Agaricus* (*Tricholoma*) *sordidus*, with its dingy brown pileus, is almost indistinguishable on old dung-hills. *Agaricus* (*Collybia*) *fusipes*, which grows at the base of rotten stumps, is wholly of a dark chestnut brown colour, and, when wet, is not readily seen, unless specially hunted after. *Agaricus* (*Collybia*) *vertirugis* can scarcely be distinguished from the dead bracken on which it grows. Some of the pretty little species of *Mycena* are very difficult to find, because they resemble in colour the dead leaves and twigs amongst which they flourish. The small forms of the bright tawny *Agaricus* (*Galera*) *hypnorum*, with their conical caps, resemble the calyptra of the moss they grow among. Many of the species of *Cortinarius*, although possessing bright colours, are so in harmony with the bright tints of the freshly-fallen autumnal leaves, amongst which they grow, that they are hardly distinguishable. The colour of *Paxillus panuoides* is just that of the sawdust it inhabits. These are only a few instances to which our memory reverts at the moment, but there are many other examples which might be cited, if these were not sufficient, to show that, although some fungi exhibit a very bright and conspicuous coloration, there are others which harmonize with their surroundings to such an extent as to be practically inconspicuous.

There is another class of phenomena which might be

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alluded to in passing, and this consists of what could almost be termed imitative resemblances, between species otherwise remarkably distinct from each other. We do not allude to fancied resemblances, but deceptive resemblances, so close as to deceive even fungologists, until they apply the test of a scientific examination. Most of these are alluded to by Mr. Plowright in his paper on "Mimicry in Fungi." The renowned orange amanita (*Agaricus* (*Amanita*) *cæsareus*), which is so much praised as an esculent on the Continent, but is not an indigenous species, resembles closely the poisonous *Agaricus* (*Amanita*) *muscarius*, not only in colour and size, but also in the volva at the base of the stem, and the large pendulous ring. The edible *Ag.* (*Amanita*) *rubescens*, one of the safest and best of our white-spored species, has a counterpart in *Ag.* (*Amanita*) *pantherinus*, which has the reputation of being poisonous, and so closely like the edible species as to be liable to be confounded by the inexperienced. Then, again, the typical mushroom *Agaricus campestris* has its resemblance in the unwholesome *Agaricus melaspermus*, and another species, *Agaricus* (*Hebeloma*) *fastibilis*, which Mr. Smith reports came up in great numbers upon a mushroom bed, on one occasion, and might have caused a disastrous result had not the fact been detected by an adept. A no less remarkable similarity is that between *Lactarius deliciosus*, an excellent esculent, and the deleterious *Lactarius torminosus*: the latter, we know from experience, is sometimes not to be distinguished from the former when growing, and not until gathered and examined. We have gathered two or three times a very mild pleasant species of *Russula* which is perfectly innocuous, which in size, and its deep red colour, cannot be distinguished from the acrid and dangerous *Russula rubra*, and yet we can detect no difference between them, except in taste. The false chantarelle (*Cantharellus aurantiacus*) has a bad reputation, and yet it simulates the edible chantarelle (*Cantharellus cibarius*) sufficiently to caution novices against confounding them. Whether its ill name has good foundation or not, *Lactarius aurantiacus* so nearly resembles large specimens of *Lactarius mitissimus*, which is mild and good eating, that mycologists themselves have often confounded them. Then, again, there are other instances in which innocuous species closely resemble each other, as *Agaricus* (*Clitocybe*) *dealbatus* and *Agaricus* (*Clitopilus*) *orcella*, but the former has white spores and the latter pink, and both are edible. On the other hand, *Agaricus* (*Clitocybe*) *Sadleri* is the counterpart of *Agaricus* (*Hypholoma*) *capnoides*, and neither of them is fit to eat. These comparisons might be extended considerably, even to species systematically far remote from each other, but the above will suffice to show that good species have their counterparts, or imitators, in bad ones, and that both good and bad may have analogous resemblances in other distinct species.

We have purposely restricted ourselves in these observations to the Hymenomycetal fungi, but if Prof. Saccardo is correct that there is still to be found a *Clavaria ophioglossoides* with all the external features of *Cordyceps ophioglossoides*, and also a *Clavaria nigrita* which is the counterpart of *Geoglossum nigritum*, then we have two remarkable instances of species with naked spores simulating species in far-removed genera with a widely different structure and fructification, bearing large sporidia inclosed in asci. But in dealing with these groups we are in constant danger of mistaking conidial forms of ascigerous species for autonomous fungi, and we cannot help such a suspicion in these instances.

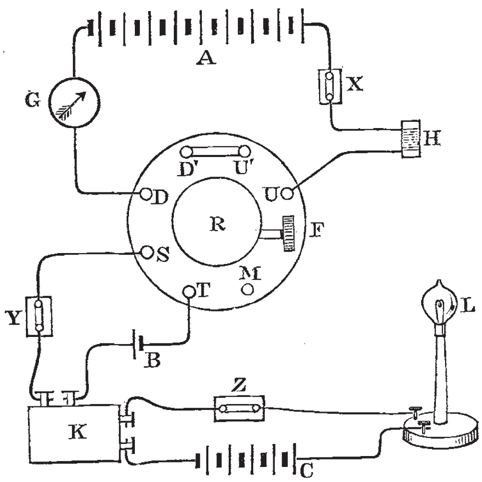
The whole subject is one of considerable interest, but surrounded by difficulties. Facts accumulate slowly because intelligent observers are few amongst the lower orders of Cryptogamia; still every decade of years exhibits some advance, although there is insufficient material for safe generalization at present. It is well to keep in view what has been written on the subject, and to that end we subjoin references, which may be consulted by those who are interested sufficiently to take the trouble. "Mimicry in Fungi," by W. G. Smith, in *Gardeners' Chronicle*, November 16, 1872, and February 10, 1877; also by M. C. Cooke, in *Grevillea*, vol. ix., June 1881, p. 151; and C. B. Plowright, in *Grevillea*, vol. x., September 1881, p. 1, and March 1882, p. 89.

M. C. COOKE.

AN AUTOMATIC LAMP-LIGHTER.

IN illustration of a paper on selenium, read at a recent meeting of the Physical Society (NATURE, vol. xliii. p. 262), I exhibited an electric lamp which was connected with a selenium-cell and a relay in such a manner that the lamp was automatically turned on in the dark and extinguished by the action of light. The details of the arrangement were, however, not described, and I propose to give here a few particulars for the assistance of those who may wish to repeat the experiment.

A scheme of the connections is shown in the annexed diagram. It will be seen that there are three circuits.



The first includes a battery A, of 24 small Leclanché cells, the selenium-cell H, and the magnet coils of the relay R. A Post Office tangent galvanometer G, capable of measuring milliamperes, is a convenient but not indispensable adjunct. In the second circuit is a Leclanché cell B, one pole of which is connected through the terminal T with the tongue of the relay R, and the other through the magnet-coils of the electro-magnetic switch K, and the terminal S, with one of the platinum stops of the relay. The third circuit contains the lamp-battery C, the incandescent lamp L, and the tongue and stop of the electro-magnetic switch K. The three simple switches, X, Y, Z, are useful for breaking any of the circuits.

The selenium-cell H has a resistance in the dark of about 50,000 ohms, which is diminished to one-half, or less, by the action of diffused daylight, or by the light of an ordinary gas jet at a distance of 1 foot The relay R is a "standard relay," as used in the Postal Telegraph service. Its tongue, connected with the terminal T, oscillates between two adjustable platinum stops, which are connected respectively with S and M. (For brevity we will call these the S stop and the M stop.) It contains four magnet-coils which, as the instrument is sent out by the manufacturers, may be connected either all in parallel or two in series and two in parallel. For the present purpose it is desirable that the coils should be joined up all in series, thus greatly increasing the sensitiveness of the instrument to small currents at an im-

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