vance. There is a natural pressure in competition to encourage the industrial needs, but only an intelligent foresight can insure pure, orderly research, because curiosity is usually restrained. These are generalities, and fortunately every subject and every man is complex. So it is that contributions also come from engineering needs. For example, electrons are discovered, their uses become needs. Pure science research is followed by the seven other classes. Electron emission of tungsten is made useful in radio and the phenomenon of electron emission is studied as broadly and freely as possible. Other elements, like thorium, are thus brought into radio service. The theoretical conceptions and mathematical conclusions are published by men in the industry and the advance of the science and the art accelerated. This process is relatively complete in electrical engineering, but much less so in other research fields. It is clear that every item of new knowledge of electricity can probably be made to do service somewhere. It is relatively a new, compact, orderly, but unlimited field. Research in it would not be so pure, so unattached, so remote as not to fit a use. Close cooperation is to be expected in it between its detached pioneers in colleges and those who plow and reap elsewhere, and a single scientist may do much of each.

Mechanical engineering is in a similar position and chemical engineering is rapidly reaching it. Biology, heredity, psychology, on the other hand—in fact, the greater number of sciences—still lack engineering cooperation. Through pure research there will certainly be continually made other as needful and yet unexpected disclosures as those we now enjoy, and perhaps in entomology, for example, there are more interesting possibilities than were seen in all physics before electricity was pioneered out of it by Faraday.

Bacon said of the Greeks that they had no antiquity of knowledge and no knowledge of antiquity. We see now how well they used what they had. But we ourselves have an accumulation of experimental facts of all kinds which, since the discovery of printing and the establishment of national and international scientific societies, has never ceased expanding. It is upon this stock of tested experience that engineering usually draws. The stimulation responsible for that stock is primarily natural curiosity and must be developed in education. The asset of engineering is exact knowledge. The valuable attributes of research men are conscious ignorance and active curiosity. For an engineer "safety first" is a good slogan, but "safety last" is better for the man of research.

H. E. Armstrong said, "The pursuit of science is necessarily an *anti*-human practice, as it involves an all but impossible self-abnegation." It is more nearly an ante-human practice, as it first discloses to human ken created supplies not otherwise humanly available.

Curiosity may be limited, but creation is unlimited. Free or untrammeled research has given engineering far greater bequests than could be suggested by needs or preconceptions. As this reaction is more in evidence now than ever before, it will continue, and our first interest is to encourage the educated engineering mind. The obvious or pressing needs of industry can be relatively easily and safely cared for as at present.

We ought to realize that there may be a more valuable use of knowledge and truth than commercial developments, and by aiming at the full appreciation of creation we may do more than simply conquer and control our local environment. Perhaps industrial uses of new knowledge are after all only by-products or ways for advancing to something better. As Anatole France said, "The present is being built on the foundation of the wisdom of the past and is destined for the use of the future."

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PHYSIOLOGY AT THE NAPLES STATION

THE most significant effort since the reorganization of the Stazione Zoologica is to be found in the development of the physiological division. Specific leadership, so effective in other departments of the laboratory, was happily provided for in January, 1926, by the appointment of Dr. Sereni as resident physiologist. Since then there has been added to the permanent staff as custodian of apparatus an expert instrument maker whose time is devoted to repairs and renovations of the older equipment; to keeping the new in running order and to such constructions *de novo* as may be called for from time to time by the investigators.

In its historical aspects, this physiological renaissance is not without interest. Among the qualities that made Anton Dohrn a great leader was his ability to foresee. Although a systematist and morphologist by predilection, personal interests did not prevent him from realizing where, in the future, biology was likely to make its most active growth. The very first addition to the original plant was intended to foster the earlier steps in comparative and general physiology. Fourteen years later additional space and facilities for physiology became available by the construction of a wing chiefly for pure and physiological chemistry. The first impression made by the total array of large and small laboratories, private rooms, dark chambers, etc., is well preserved in Boveri's Ge-

dächtnisrede of 1910. Commenting from his own standpoint, Boveri spoke of morphology as "die bescheidnere ältere Schwester," who henceforth "sich wie ein Stiefkind vorkommen könnte."

During the interregnum from 1915 to 1924 development came to a standstill. With the reappointment of Dr. Reinhard Dohrn as director, the station is once more able to command the universal interest and cooperation of former days. The outcome has been a fairly general renewal of foreign tables and especially the vitalizing gifts from the International Education Board. With these funds the entire station has undergone a large part of its much-needed modernization and, as far as possible, has been brought into harmonious relations with present trends and future likelihoods in biology. The process of readjustment, however, has not reached a stage where one may rest content. It is to be hoped that completion in this direction will soon be made possible.

In common with Woods Hole and similar laboratories, the Stazione, except for its widely useful faunistic and ecological studies, has no institutional program of research. On the contrary, it must be prepared to meet the requirements set by the greatest variety of problems. In fields where the simplest equipment suffices, investigators can be provided for with the greatest ease. Even in physiology it is still true that certain individuals can solve certain problems with the aid of a few dishes and the right organism. For other types of work, however, instrumentation, more or less elaborate, is indispensable.

The repertoire of apparatus at Naples shows the advantages of a sound tradition. Minor equipment aside, there have never been any "a priori" accessions; instead the annual budget contains a reserve enabling the institution to adjust itself promptly to specific needs whenever investigators announce them in advance. The more expensive instruments purchased at the behest of individuals nevertheless have always been scrutinized with reference to their more general utility. As a consequence we find at Naples to-day a stock quite adequate in quantity and variety but indicating very discriminative buying.

In a recent announcement intended merely for the general orientation of prospective visitors, three full pages are devoted to major physiological equipment. Included here, often as duplicates or in variant form, are all the usual instruments for graphic registration, electrical stimulation and the measurements of E. M. F. There are seven galvanometers, one after Broca; another, a large string instrument with photographic registration. For students interested in light, there are two spectroscopes and two spectrophotometers, one for microscopic measurement. Among the newer pieces are two thermo-couples, a Weston standard cell, equipment for ultra-filtration, a colorimeter, potentiometer, refractometer, milliamperemeter, thermopile, Hg-rotational interrupter, diverse kymographs, gas-chain apparatus, etc., etc. There has also been installed a small ammonia ice-plant.

To one knowing Woods Hole at first hand all this may appear meager. However, we can avoid misunderstanding if we remember three things. In the first place, the list is not an inventory but merely symptomatic of the sort of provisions that are being made; secondly, nothing is said about the large and varied stock of minor items, chemicals and glassware; and finally, the number of investigators active at Naples at any one time is small compared with the annual swarming at Woods Hole.

Returning from Naples to-day, one is exposed to a series of cross-examinations from those who have worked there in former years. The questions include inquiries regarding the fauna and whether the laboratory is really in running order. The first are easily answered. The density of the marine population is essentially the outcome of two antagonistic elements—the commercial fisheries and the nitrogen supply. Of these, the former fortunately have not been modernized nor noticeably increased; the second is not likely to decrease as long as the cities lining the gulf maintain themselves or continue to grow. Except for seasonal or rarer annual fluctuations in balance, careful attention to the records fails to reveal any movement either in quantity or diversity of the materials hitherto characteristic of the region.

Against the background of history, the question whether the laboratory is indeed running exhibits delicate shades of meaning. Assurance that Naples, in a material sense, can now satisfy the reasonable demands made by students working on problems of the day apparently does not completely reassure. In the past, somehow, the atmosphere pervading the place left a lasting impression on the visitor. It is impossible to say how the "imponderables" of the present compare with those of yesteryear. However, it may be said without fear of contradiction that a subtle and benign influence is easily detectable by any one who is the least sensitive to such things. In thinking over the situation as it is to-day, I recall with pleasure the words of Professor E. B. Wilson. Referring to the reappointment of Dr. Dohrn, Professor Wilson wrote: "No one is so well fitted . . . to keep alive the ideals of Anton Dohrn and to perpetuate the traditions of international scientific fellowship that he upheld in so large and generous a spirit."[1]

OTTO GLASER

AMHERST COLLEGE

[1] SCIENCE, n. s., Vol. 59, pp. 182–183.