lative difficulty suggests no practical measures for our own case.

More palpable is the following: Complete success in any one method of defense against a particular enemy makes other methods unnecessary; the organism is no longer selected with reference to those other methods, and may lose them. Completely destroy certain pathogenic bacteria, or develop external methods of protection against them; in consequence the internal protective action of the body fluids is no longer necessary; it might in the course of generations be lost. If by clothing, houses, fire, we keep our bodies at the optimum temperature, we may or might lose in later generations the power of resisting high and low temperatures.

The extent of the occurrence of this sort of action is rather speculative. But assuming that it occurs, the result in first instance is merely that the organism no longer retains the power of resisting an enemy that does not attack it; a harmless change.

If, however, by a later change in conditions, as by a sudden overwhelming alteration in climate or an increase in the virulence of a bacterium, the methods of protection hitherto employed become ineffectual, then the organism might be driven back on its second defense; its internal power of resistance to infection, or to cold. If this has been lost, the organism might become extinct. Speculative ingenuity may suggest that this has been a cause of the extinction of some organisms that have disappeared.

But in view of the fact that control of the environment is the very fabric of life; that organisms can not live without it; that they have been practicing it assiduously for uncounted ages; and that some of them are still flourishing, it appears idle to suggest that such control must be abandoned; it appears whimsical to look for imminent degeneration or extinction through that method of action. If such were its necessary consequence, organisms must have disappeared long ago; nay, they never would have appeared. Any organism *must* admit to itself, draw to itself, seek out, those conditions that are favorable to its physiological processes; this is the daily business of life. The practice of hygiene, of public health is but one farther link in a chain that goes back to the beginning of life. Amoeba covers itself with a semi-permeable membrane, admitting some chemicals, excluding others. Protective coverings become in other animals more and more efficient—the skin, hair, feathers, the heavy shell of the oyster, the armor plates of dinosaur and armadillo. Microscopic enemies that penetrate these defences find the body fluids charged with destruction. Elaborate internal mechanisms are developed for keeping the temperature high and uniform. Strength of body, quickness, agility, the development of claws and teeth—these seize the advantage by transforming the defensive into an offensive. Acuteness of senses, cunning, inventiveness, supplement all these methods; supply the lacks in any of them. Cooperative action registers an enormous advance. Shelters, clothes, are found or devised; fire taken into service; food cultivated; weapons invented, machines produced; the properties of substances tested; new ones compounded. Devices come into existence for recording the results of tests once made; for preserving knowledge as it is gained. Some organisms proceed to that systematic elaboration of methods for discovery and application of knowledge that we call scientific research; the most powerful aid yet devised for bringing the environment under control. If environmental control is harmful, the first thing to do is to stop scientific research; only so can we strike at the root of the evil. Hygiene, medicine, the arts of public health—these are not something new in kind; these are but later terms in the long series that begins where Amoeba takes in certain substances and rejects others. With the other practical arts, they result in adapting the organism more and more completely to the environment. Along this road we must indeed watch for the sporadic appearance of defective genes, and these we must cancel by the only possible method—by stopping the propagation of their bearers. But defective genes are not the characteristic result of this process; degeneration and extinction are not its normal consequence. Abandonment of environmental control; cessation of the process of adjusting ourselves to the conditions—this is unnecessary, undesirable, impossible, unthinkable. The proposal for such abandonment is merely a characteristc instance of that modernism or "modernistic-ism" so rife in art and literature, that insists at any cost of sense or plausibility in saying something that has not before been said; doubtless in the hope that by trying all propositions, some time one that is worth while will be hit. The proposal to abandon control of the environment is not a serious contribution to the practice of life.

H. S. JENNINGS

THE JOHNS HOPKINS UNIVERSITY

DR. FRANKLIN P. MALL[1]

I FIRST knew Mall in 1884 (or '86?) when I was an assistant to Professor Welch in the pathological laboratory of the Johns Hopkins University. The laboratory was a small building which stood on the grounds

[1] Contributed to a collection of material relating to the life and work of Dr. Mall, gathered by L. B. Schmidt, of the Iowa State College of Agriculture and Mechanic Arts.

of the hospital, which was then in process of construction. Mall had just returned from Germany where he had worked in the laboratories of Ludwig and His and brought with him the methods and ideals of these remarkable men. He had made a strong impression upon both and retained their interest and friendship as long as they lived.

With the establishment of the university a system of fellowships had been created, but at the time, save in the department of physiology in the university, there were in the country no fellowships or any other positions in medicine which offered a modest support to one engaged in medical research. All the teaching positions in medical schools throughout the country, with the exception of the chair of physiology at Harvard, were held by men who were active practitioners of medicine as well, and the professorial positions were regarded as valuable adjuncts to a medical practice. A fellowship in pathology was established by the university, and Mall was the first incumbent. It seems remarkable when one looks back upon the men who held these early fellowships at the Johns Hopkins, so many of whom have become distinguished, that opportunity for work and workers should have so coincided.

Mall quickly interested all the men who were associated with him and gave them an impression of his character, which constantly deepened and which can never be effaced from their memories. The impression was all the stronger because its production was not consciously sought. I think that our first idea of Mall was that he was unusual, very modest, even shy in manner, perfectly frank and simple. He lived a life of study, and work in the laboratory had little contact with the world outside and little knowledge of it. He had brought a reputation with him and had won the respect and friendship of two of the leading men of science in Europe—not a small accomplishment. Life in the laboratory was extremely simple. We were all young and healthy, there was an atmosphere of work, a happy even joyous, carefree existence and close friendships. I am sure we all thought ourselves much more sophisticated than Mall, but sometimes in our talk he, usually so quiet, would suddenly flash out with an idea, which, when one came to think it over, seemed the wisdom of the ages. He was helpful in criticism and suggestion and in these always modest and tactful.

He had a way of looking at things in his work which was strange to us. He sought to know the details of structure, not merely the cells and the tissues, but the relations of these in the three dimensions of space. Although skilled in the methods of what was called histological research, involving the cutting and staining of thin sections of tissues for microscopic examination, he added other methods by which parts of organs were digested away and the tissues so separated that their relations could be studied. At that time I had never heard Mall refer to Bichat, and yet both the men and the methods they used were very much alike. Mall at that time must have been of about the same age as was Bichat, when the latter was writing his famous "General Anatomy." Bichat endeavored to show the nature of the different tissues which composed organs and the interrelationship of these in structure. To do this he separated the tissues of organs by boiling, maceration and other physical means. Mall with more refined methods carried the same sort of study into the finest details of structure, he subdivided the elementary tissues into those with the same physical and chemical characteristics and studied their relationship in anatomical structure. He was skilled in the technique of injection of the blood vessels, and the course, arrangement and distribution of these in organs claimed special attention. His conception of an organ involved everything pertaining to it, including embryonic development and function. There was never haste in the publication of his researches. His work was so new and original that there was never a question of priority, and so generous was his nature that he would have welcomed and assisted a rival. His great work on the connective tissues was published some years after its completion, and the same was true of his studies of the intestinal canal. When he did publish his work, it was so complete, so well illustrated, so accurate in description, that it seemed to be final. I am particularly fond of recalling in this connection his work on the structure of the liver. Notwithstanding the great amount previously written on the embryology and histology of this organ, it was only after reading the work of Mall that I arrived at an understanding of the liver. His description was based on the lobule, its development, its growth and the relation of size to the length of capillaries. The law which he established and which governs the embryological development has been shown to govern also the growth which occurs under pathological conditions. In the minute subdivision of detail he never lost sight of the whole. He had the rare power of visualizing in the three dimensions of space and of projecting this visualization into the mind of the reader. In the great amount of the work which came from his students and which has been the main influence in giving anatomy in this country the high position it occupies, the principles involved in his early work have been followed.

He was the greatest teacher of anatomy of his time. Had he been shut up in a cloister, he would have been a teacher, for the investigator has that

quality, without which all teaching is futile, of stimulating the desire of knowing. At the time of his appointment as professor of anatomy, anatomical teaching in this country was on a low plane. With few exceptions the professors of anatomy in the medical schools were practitioners of medicine, usually surgeons, and the anatomical course consisted of formal lectures and demonstrations, so subdivided in the large audience by distance that in demonstrations each student received a very imperfect idea of the objects shown thirty to sixty feet away. The lectures were the main discipline and were supplemented by text-book recitations and by a limited course of dissections. Rarely did the student receive the stimulation to endeavor to find out things by the exercise of his own powers, nor did the discipline involve training in those powers of observation and judgment by which knowledge is obtained. The attempt was made to have the student acquire what was quaintly termed the mastery of a subject by being told or by reading descriptions of what others had seen. The method is one that has by no means been given up and may be said to be the current method of instruction in most subjects in the schools to-day. Mall's departure from this method was radical. He held the view that the essential in teaching should be directed to the development of the power of the individual, and that knowledge comes not from being projected into the student from without, but must grow from within on the material obtained by the skilled use of the senses directed on the object studied. The primary knowledge of the thing so acquired could be expanded and coordinated by lectures, demonstrations and by reading. This is the natural method pursued by children before the unnatural methods of school are substituted and the intellectual curiosity which stimulates the child to seek knowledge is killed. Mall introduced the utmost freedom of study and of teaching into the laboratory. Students have told me that they felt lost when they went into the laboratory and before they understood the spirit of the place. They were so unaccustomed to a lack of direction of their intellects. With all the freedom of study that prevailed the students were well cared for and the progress of each man followed. The teacher was always at hand to assist, often to guide and always to encourage and stimulate. The result is seen in the position of anatomy in this country to-day. There is no teacher, no student of the subject who has not directly or indirectly, consciously or unconsciously profited by the methods, the work and the ideals of this great teacher.

The best men were attracted to him, and his work has been multiplied a thousandfold by his disciples. This method of teaching is one which, though universally applicable, produces the greatest result in the hands of such a born leader as was Mall, a man who was able to say to his students, "*Come* with me along this road." There is a great difference between "come" and "go." His laboratory was a model of good housekeeping, always orderly, and he was a good provider of facilities for work. The anatomical material was abundant and well preserved, and dissection was robbed of many of the unpleasant features usually connected with it. There was an abundant store of carefully made dissections, as available for study as the books in a library.

It is interesting to attempt to form an estimate of a man by comparing him with others; extremely difficult, for men and environmental conditions are so unlike. There is such a difficulty in comparing the work of Mall with that of his colleagues, many of them men of the highest type, all differing, each in a different way exerting a great influence. It is enough to say that Mall stood in the first rank of these men.

As a last word I must speak of the great honesty of Mall which appeared in every relation, and with his honesty his perfect fearlessness. He was not a compromiser, and where his ideals of right showed him the way he fearlessly followed, no matter how difficult the road. The world has sustained a loss in his death, a place is vacant which probably will not be filled, at least not by the same type. His friends whose esteem and affection he won will like to think about him and recall in their minds the old associations, none of these giving pain. To his family he has left a great name, and his descendants may well be proud of their ancestor.

W. T. COUNCILMAN

HARVARD MEDICAL SCHOOL

SCIENTIFIC EVENTS

EXPEDITION OF THE AMERICAN GEOGRAPHICAL SOCIETY TO CENTRAL PERU

AN expedition from the American Geographical Society of New York will leave this week for Central Peru to explore and map the sources of the Maranón River, the principal tributary of the Amazon, and a large section of the vast forested region which lies along the eastern border of the Andes between the upper Maranón and the Ucayali River. In addition to an extensive program of topographic and reconnaissance mapping, studies will be made of the geology, meteorology and plant and animal life of the region.

To the scientific explorer as well as to the explorer for exploration's sake, the region which the expedition