aware of the relationship between its own theoretical structure and the social theory on which the development of the U.S.S.R. has itself been based.

Other aspects of biological research which have shown great expansion and activity include the remarkable outburst of exploring and collecting zeal by which the animals and plants of the vast and varied autonomous republics and of China became known. This began immediately after the Revolution and has resulted in a great enrichment of the museums and in works of first-class importance by both zoologists and botanists. At the same time there began the development of institutes of experimental biology from which has issued important work in experimental morphology, on the analysis of growth, in endocrinology, in physiology and in biochemistry. In the latter field for example the discovery that the contractile protein, myosin, which is the basic component of muscle, acts as an enzyme, was of first-rate significance; while we all have increasing reason now to remember that much of the pioneer work on blood transfusion and plasma storage was done in the Soviet Union. The methods of artificial insemination, now used extensively in Europe and America, were developed almost wholly by Russian workers. It was estimated in 1941 that 50,000,000 farm animals in the Soviet Union alone had been produced by artificial insemination.

In recent years there have appeared in the Russian scientific literature new hybrid names indicating the fusion of independent scientific disciplines to focus on problems which transcend particular fields. Such is biogeochemistry, as conceived by Vernadsky and his group of the Biogeochemical Institute of the Academy of Sciences at Leningrad. Vernadsky took as his field the distribution of chemical elements due to living organisms in the biosphere and has added greatly to our knowledge of the chemistry of alluvial soils and the chemical composition of organisms.

Biological progress in the Soviet Union has not been achieved without cost and sacrifice. At a time when food was scarce they still spared some for their experimental animals and for costly scientific equipment. They took the means to build up science literally out of their necessities, not, as we have done, out of our surplus; and they had only themselves to look to, for the great foundations, which poured their funds for pure research so generously into Germany and western Europe, were never able to make the same arrangements in or for the Soviet Union. Yet in the U.S.S.R. was what in 1927 seemed to me to have been the greatest potential source of new scientific strength in the old world.

Some part of the cost was paid too in the creation of the central control of science which led to what we call red tape and the Russians "spoiling paper," and to an appearance of arbitrariness whenever decisions are made by a central authority. I have no doubt there was wailing and gnashing of teeth on the part of the individual investigators when before the war one of the great biological institutes was suddenly moved from near Leningrad to Moscow, but in view of what the Germans did to Leningrad, I can not believe that the regret of those biologists has survived to the present. These costs, together with other and greater ones, have been and are being paid, and we can now see that not only Soviet citizens but those of all countries stand to reap the benefits.

The progress of biological research in the Soviet Union has taught us a very valuable lesson. It is that control and organization of science by and for the whole community does not kill the scientific spirit or initiative nor submerge the individual scientist in a dead level of anonymity. Great individuals have arisen in Soviet biology, fine discoveries have been made and continue to be made even in the midst of war. Ivan Pavlov, one of the greatest of Russian biologists, began his scientific life under the old régime, but he lived to refute both in word and in deed the dire prophecies of those who said that great scientists and a vital and vigorous science could not survive in a socialist state.

For the sake of biological science itself, we biologists should use all our efforts to see that the barriers which separated Soviet biology and biologists from us should never again be allowed to prevent the free flow of persons and ideas, both scientific and social, on which the progress of science and of society depends.

RUSSIAN EXPLORATIONS[1]

By Sir HUBERT WILKINS

THERE have been many great Russian explorers, and the framework of Soviet Russia's exploration was laid down long before the advent of the Soviet Union.

Under the direction of the leaders and organizers of the Soviet Union the platform for exploration, as well as for many other scientific and cultural institutions, was preserved and they have been built up expertly and vigorously by Soviet scientists.

In recent years Soviet explorers have been especially active. I venture to say that in no other country has exploration and the exploitation of the results of ex-

[1] Address at the luncheon of the Congress Celebrating the Tenth Anniversary of American-Soviet Diplomatic Relations, New York, November 6, 1943.

ploration been more energetically and expertly developed and applied than it has been in the Soviet Union.

Modern Russia has been so successfully engaged in so many phases of exploration that it is difficult to say which field has been the most impressive. Political, social, economic, industrial, agricultural, medical, surgical, physical, physiological, geophysical and military phases have each been given intensive attention and the progress the Russians have made in each field is astounding.

There is much that may be said in relation to each and every phase, but because of my association with life in high latitude areas I might be expected to say most about the work that has been done by Soviet explorers in those areas.

They have done much in both the Arctic and sub-Arctic. The Arctic and sub-Arctic areas have long been known to be friendly to those who know and understand them and the Russians, who know them, have found them friendly and profitable. The Russians have done more toward the development and exploitation of their Arctic lands and waters than has either the United States or Canada in their northern territories.

And the developments that have taken place have been of great value to the Russians in relation to the present furious military struggle. From their northern areas the Russians have taken much of the timber and the mineral which have enabled them to so successfully develop the might and power that has already beaten the greatest army and the greatest accumulation of war force the Germans have ever assembled.

From northern lands which were, until a few years ago, known only to the so-called "natives" and the few explorers who ventured into them has come an enormous wealth of supplies.

Rivers which a few years ago were only shown vaguely as irregular lines on a comparatively featureless map, have been harnessed to provide the power which has enabled the production of millions of feet of sawn timber for home use and export. These rivers have also supplied the power to operate mines which have been developed in areas almost entirely unknown, until Soviet geologists recently surveyed them. From these mines have come the wealth of metal which is now being strewn in death-dealing blows at the civilized world's common enemy.

It is not only the foresight and the enterprise of the explorers of the Soviet Union that we must admire, we must admire also the attitude of their political and economic leaders who saw fit to exploit the knowledge the explorers brought home.

The possibility of such exploitation is, of course, dependent upon ways and means to exploit the fields explored and that is why, in the consideration of Soviet exploration, we must not forget the men who as explorers in the field of mechanics have produced the mechanized transport which has made it possible to enter the areas explored and bring from them the fund of wealth they provide.

With airplanes, suitably winterized for operation in such areas the Soviet aviators have carried out the aerial mapping of the Russian Arctic and sub-Arctic areas on such a scale as has seldom been applied to outlying regions in any other country.

I am told that the charting of the coastal or near coastal waters of the Soviet Union's northern borders is almost as detailed as is the charting of our own eastern shores. This is an achievement of no small order for the charting of the Arctic seaboard is not a simple hydrographic matter. There is the element of sea ice to contend with and the influence of distant meteorological activities to consider, for these meteorological influences are distributed irregularly and over a far greater area than are the meteorological influences transmitted through ice-free water.

With the use of and in combination with observation from airplanes the Soviet Merchant Marine has been able to make valuable use of their Arctic seaboard which for years was thought to be utterly impassable. The Soviet merchant fleet and their navy has now made the Northeast passage an established fact.

The opening up of the Northeast passage has opened up tremendous possibilities for traffic in the many northward flowing rivers in the Soviet Arctic and, in turn, great exploitation of the rich sub-Arctic lands.

The Soviet ventures into the inner realms of the Arctic Ocean have not been simple, adventurous endeavors, nor have they been of purely academic interest. They have had a definite, economic complex. The knowledge gained by the Soviet Scientists Polar Drift Expedition for instance has been exceedingly helpful in the prediction of ice movement and subsequent air temperatures and in turn, seasonal conditions. This knowledge has been of great value to military strategists.

The observations made in regard to the ocean currents have been invaluable in relation to the periodical difference in distribution of fish life and of great value to the fishing industry in general.

The soundings of the Arctic Ocean made by the intrepid Soviet airmen who flew out and landed several times on the pack ice far from shore are of extreme interest to geophysicists who are concerned with the structural formation of the world and the knowledge gained by the Soviet scientists has presented a new aspect of the earth's outline.

Soviet researches in relation to magnetism and

magnetic disturbances have been extensive and they are very valuable. The magnetic charts of the Soviet Union are, I am given to understand, much more detailed in relation to the Western Arctic and Siberia than are any U. S. charts of northern areas.

These magnetic observations are of great help to navigators of the air and sea in those areas which are more than often fogbound and so cloud covered as to restrict astronomical navigation.

But the greatest aids to the detailed exploration of the northern areas are the heavy tractor and the "cat trains" which have ploughed their way through swamps and tundra and over highlands and plateaus. We in this country have heard a great deal about the Alaska Highway and the Burma Road. Within the Soviet Union there are several "Alaskan Highways" and many hundreds of miles of "Burma Road" which winds over terrain equally as difficult as anything to be found in China or Burma.

It is, as a matter of fact, over such roads which lead to Kunming and Chungking that the Russians have delivered to the Chinese so much of the ground-warfare supplies that have been used by the Chinese in their successful resistance against the Japanese.

Great web-ways of tractor roads over Russia have opened great and rich food-producing areas in Central and in Northern districts and have played no small part in the glorious successes of the Soviet Army.

In the far north tractors have provided the means for transport throughout a great part of the year, but they operate most successfully during the depth of winter when the ground and the swamps and the rivers are solidly frozen over.

Such transportation has opened up vast fields for occupation and this in turn has led to much exploration in the Soviet Union in respect to soil chemistry and the development of a quick-growing variety of grain-producing plants. Wheat, oats and barley suitable for growing in the short Arctic summer season have been developed on the agricultural farms for research in the Soviet Union. And in respect to these findings, the Soviet scientists have given liberally to others in many parts of the world. The rich harvests produced in northern Canada are, in a great measure, due to the research and results of Soviet scientific exploration.

The development of such grain-producing, short-season varieties of plants is a matter of great importance to the United States if, for instance, the development of Alaska is undertaken. There are millions of acres in Alaska which are as suitable for development as the millions of acres in similar latitude and climatic conditions in the Soviet Union. The difference is, mainly, that there is no population in Alaska to take advantage of these areas.

There are others at this meeting who will tell you of the civic and cultural explorations within the Soviet Union, but I believe that only those of us who were privileged to see the beginning of that splendid and healthy development and who were in a position to realize the magnitude of the task can appreciate fully the tremendous progress that has been made in the Soviet Union between the years of 1923 and 1943.

How far such developments will effect the friendly cooperation of the two great countries, the U. S. A. and the U.S.S.R., is a matter for mutual consideration. It is my belief that such friendliness and cooperation can and should be boundless.

The magnitude of the cooperation might depend largely on the development the United States is prepared to make in her northern areas. But whatever the efforts of the United States may be, it can be taken for granted that through the field of exploration, followed by healthy, energetic exploitation, the U.S.S.R. will shortly, as world time is measured, be able to stand side by side with the United States in no disproportionate stature. And it will not be long, as world time is measured, before the U.S.S.R., with her multitudinous population and tremendous resources, will stand towering above the United States in material and economic magnitude. This is a matter for pleasant contemplation, provided we encourage and maintain the cooperation that is greatly to be desired.

SOME MODERN CONCEPTIONS OF AMEBIASIS
II

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PATHOLOGY AND SYMPTOMOLOGY

It is not the purpose of this paper to provide a clinical description of amebiasis but rather to analyze some of the fundamental evidence on host-parasite inter-relationship in amebiasis which may assist the clinician in visualizing his problems. A clear picture of the levels at which the amebic lesions occur, their numbers and the depths of penetration of the amebae constitutes the essential fundamental background for a clinical appreciation of the disease. Thus, a mucous