

PHYSIOGRAPHY AND WAR.

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The relation of physiography and war is clear and pervasive. Most of the wars of history have had their causes, have run their courses and have had their results determined under the influence of geographical environment. Raids were made into fertile territories for plunder or for permanent possession. Desert and mountainous regions have sent out their hungry hordes to conquest and pillage. Mountains, rivers and marshes have furnished favorable lines of defense. Mountain passes, valley ways and easy river crossings have been sought as points of attack. Climatically men prefer to march, go into battle, and carry on other activities of war in good weather. Winter often causes long and almost complete suspension of hostilities. Heavy rains turn fields and roads into quagmires, impede movement of troops, block transportation of munitions and food, and make impossible the handling of heavy artillery, causing unexpected delay, change of plan, and possibly disaster.

Military and naval strategy take into account, even build on the groundwork of natural features. An account of the campaigns of any war of recent times clearly shows this fact. The significance of the Hudson-Champlain Valley, with its nearly continuous line of water communication, in the French wars and in the War of the Revolution, is a striking illustration. The strategy of the Civil War in the United States centers in the Allegheny Mountain barrier, with the Ohio River as a secondary line of operations. The Mississippi River, the Chattanooga Gap, the Potomac River as lines of movement by either of the contending armies are familiar to all students of history. Naval operations to enforce a blockade were carried on along the Southern coasts by the Federal forces, while the Confederates sought to break through and destroy this sentinel cordon.

In the World War the armies of the Central Powers broke into and across Belgium because the smooth Flanders plain gave easier entrance into France than the way across the mountainous frontier between France and Germany farther south, where Verdun withstood shock after shock unconquered. The Somme, Aisne and Marne are names of rivers flowing west in France along which the invading armies undertook to make their way toward the channel ports or Paris, and Amiens, Soissons and Chateau-Thierry are important points of effective resistance, the last a crossing of the Marne, where the Huns were finally stopped and

faced about to a last retreat and defeat. Numerous examples of the dependence of strategy on geographical conditions appear in all the other fields of operation in the war, and volumes on this aspect of the subject might be written.

The importance of physiographic knowledge and science in war is suggested by mention of a few of its contributions to war plans and work. Most countries have war colleges, general staffs, or other organizations for the study of strategical problems and the development and formulation of plans of attack and defense in war.

In our own country the leading geographers volunteered their services and organized in the national capital a Board of Geographical Information that gave valuable aid to the government in the prosecution of the war.

Accurate maps, indispensable for such study and planning, are prepared with great detail and accuracy in many countries. The Ordnance Survey, large scale maps of Great Britain and France, are marvels and models of the map maker's art. The relief of the country, its streams, lakes, railways, roads, canals, cities, villages and even farmhouses are accurately indicated. Outline and slope are shown in contours or shading, height by figures or contour intervals. Shores and off-shore waters are mapped, and depths, channels, shoals, lights and landings are indicated. Such maps are useful and instructive under peaceful as well as belligerent conditions, and, strange as it may seem, are easily obtainable by schools and the general public in and outside of the countries in which they are published. That such maps easily get into the hands of possible present or future enemies admits of no doubt, and those who want them get them by means of indirection or espionage if not openly. The United States Geological Survey maps and the maps of the Coast and Geodetic Survey and of the Mississippi Commission are most excellent in accuracy and execution, and, while not published primarily for military use, have a high value in that direction.

The army Signal Service calls to its aid the expert meteorologist, who observes the changes in the air and reports present and probable future weather conditions for the use of the various branches of the army. The infantry makes use of such information in timing attacks, such movements preferably being made in fair weather, unless in case of intended surprise. The artillery finds great advantage in knowing the air pressure, the direction and velocity of the wind, and even the temperature and humidity conditions of the atmosphere in finding ranges in firing.

Weather observations and predictions are even more important in the Flying Service. The strength and direction of the wind, the prevalence of cloud, or the probability of fog or cloud, are great factors in

successful flight for either observation or combat. London came to expect an air raid on any still, clear night, and the Germans are reported to have taken care to have their best forecasters select the most favorable time and conditions for these attacks.

Many engineering problems are primarily geological or geographical problems, and the education of the civil or military engineer includes a knowledge of these subjects. The location of camps, with the associated matters of drainage, of transportation, food supply and equipment, require geographical knowledge. The location of coast defenses, the laying out of military roads, canals and lines of defense within a country, the improvement of waterways, and many other matters, are in the field of the geographer, and his knowledge and advice are essential to the engineer, whether in the interests of war or of peace.