state of ionized atomic oxygen. For this to happen it is obviously necessary that the life-time of the atom in the ^1P state must be comparable with, or greater than, the mean time interval between collisions. This condition is satisfied in the D region, where the electron collision frequency is approximately 5×10^7 per second. It is not likely to be satisfied in the E or higher regions, so that we should not expect increased ionization in these regions due to L_α radiation. The abundance of oxygen atoms in these regions is beyond doubt.

The *decrease* of ionization density in the F_2 region during an eruption is also explained by the great increase in L_α radiation. The radio data show conclusively that the region, and the atmosphere below to some yet undetermined level, is considerably heated and expanded during an eruption. This is evidenced by the pronounced rise in the real height of the F_2 region during an eruption, by the reduction of the density of the ionization in this region, by the comparatively rapid recovery of the F_2 ionization due to rapid cooling of the very hot F_2 region, and by the slower recovery of F_2 height due to the slower cooling of the less hot regions below. The work of G. H. Godfrey and W. L. Price, which is in course of publication, shows that in the absence of water vapour these regions would reach an equilibrium temperature of 3,200° K. due to the absorption by oxygen of solar ultra-violet radiation of wave-lengths about 1450 A. It is the presence of water vapour, in concentration of about one part in ten thousand by volume, which keeps the temperature down to the values between 1,000° K. and 2,000 K. which are found experimentally by Martyn and Pulley[6] in the F_2 region.

It has been recently shown by Rathenau[7] that water vapour shows strong absorption bands at the wave-length of L_α, such absorption leading to dissociation of the H_2O molecule into H and OH*. It is clear, therefore, that the strong L_α solar radiation during an eruption must dissociate much of the water vapour present in the upper atmosphere, so leading to higher equilibrium temperatures in the ionosphere. The application of Godfrey and Price's calculations shows that these temperatures are attained in a few minutes, and leads to a detailed explanation of the observed phenomena in the F_2 region during an eruption.

The origin of the numerous ionized levels of the ionosphere is still unknown, progress having been impeded by lack of knowledge of the solar radiation in the ultra-violet. The assumption of black body radiation in this region only increases the difficulties of interpretation by providing an infinite variety of ionizing radiation. It is a fortunate circumstance that the increased radiation during an eruption is confined to relatively few wave-lengths, with L_α almost certainly predominant. We believe that the study of the behaviour of the ionosphere while the sun is providing increased energy at these relatively few wave-lengths must greatly increase our knowledge of the normal structure of the ionosphere, and of the normal solar ultra-violet radiation. With this object in view we are now studying the effects of solar eruptions on the E_1, E_2, F_1 and G regions, in all of which smaller but appreciable changes occur.

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Geographical and Cultural Regions

A JOINT discussion between members of Section E (Geography) and Section H (Anthropology) was held at the British Association meeting at Nottingham on the subject of geographical and cultural regions. The primary object was to clarify the concepts of regional divisions of the earth's surface from various points of view.

A large measure of agreement on the fundamental principles of regional division from the point of view of the geographer was revealed. Its essential object is to distinguish different environments, and there was no divergence from the view that the most permanent contrasts, and those most important in relation to human life, are determined by natural factors (position, physical features, structure, climate, soils and vegetation). The total complex of conditions characterizing the personality of any such 'environment region' is, however, in practically every case profoundly modified by man, who must himself be included as one of the creative factors. Entirely 'natural' regions are now comparatively rare; for example, it was pointed out that very little of the tropical forest of Africa is in a true sense primitive. Subject to this qualification, the concept of major natural regions, as worked out at the beginning of the century by

Prof. Herbertson of Oxford, is of great and lasting value.

It is important, however, to distinguish two aspects of regional division. Regional schemes such as that of Herbertson are *generic* in character. A type is defined, based on fundamental criteria of climate and other factors, and its distribution over the earth's surface examined. All the representatives of the type broadly resemble each other in these particular respects and their 'intrinsic conditions' are comparable. But generic classifications of this kind cannot take into account the factor of geographical orientation, which in its influence on the evolution of human societies and the moulding of the *genre de vie* is often quite as important as the intrinsic conditions. The Sahara and the Atacama in Herbertson's scheme both belong to the category of hot deserts; but the geographical position of the Sahara between the Mediterranean lands and tropical Africa has profoundly influenced the evolution of its trading societies and differentiated its human life from that of the Atacama. So, too, while there is a 'Mediterranean' type of climate, vegetation and production, which is found in five or six widely separated parts of the world, the Mediterranean region of the Old World in the sum total of its conditions and in its geographical setting has no real parallel elsewhere.

Thus, apart from generic classifications, the attempt is made by geographers to distinguish what may be termed *specific* regions with a particular location and a combination of conditions found nowhere else. There are different 'orders' of such regions, ranging from the *pays* of France (Beauce, Brie, etc.) to such large concepts as 'Western Europe'. When over wide areas there is found a particular set of intrinsic conditions in combination with a very definite geographical orientation, we have distinctive theatres of human life which are characterized by a series of closely linked physical and human phenomena. Examples of such large 'human provinces', if the phrase may be allowed, are North China (north of the great climatic, vegetational and economic divide of the Tsin-ling shan), the Lower Yang-tze Basin (below the Gorges) and South-East China (south and east of the Nan-ling and its continuations). In such attempts to define large specific regions it is often necessary to recognize transitional zones and to admit that human agency, as in the case of the North German Lowlands in recent times, may change considerably not only the intrinsic conditions but also the value of the geographical orientation.

The discussion at Nottingham on the concept of cultural regions and their relationship to geographical divisions of the earth's surface was mainly negative. On the ground that race, religion and language are all unsatisfactory and dangerous as criteria, several of the anthropologists present were unwilling to admit the validity of the concept of cultural regions, except in respect of limited areas defined in terms of material culture-traits such as those which Mr. Clark Wissler has determined for aboriginal North America. Owing to its isolation and comparative immunity from new waves of cultural influence, Pre-Columbian North America presented a more favourable field than Asia or Africa for the establishment of relatively stable culture-complexes broadly corresponding to natural 'food-regions'. But even these passed through many phases and interacted in complex ways before the final disintegration caused by the advent of the white man.

Admitting the force of these contentions, the question remains whether it is not still legitimate and indeed important to distinguish regional types of civilization. A notable passage in Mr. R. F. Hudson's scholarly work on "Europe and China" is worth recalling:

"There is a hierarchy and ranking of nationalities in accordance with degrees of community or separateness in cultural inheritance. There is the supreme nationality which is mankind. Within this greatest whole are the few great unities formed by continuous dominant traditions of original civilisation, and within these again are the many lesser groups, determined mainly by present spoken language, which are the only 'nations' known in ordinary speech.

"Europe and China are nations of the first division of mankind: they are great continuities of historical development which may embrace many distinct languages and political units. . . . The real unity in each case has been one of cultural tradition. Europeans are all peoples and states deriving their dominant cultural form directly or indirectly from Hellenism, Chinese those deriving it from the 'Chinese' empire of the Hwang-ho basin in the first millennium B.C."

Is it denied that, in spite of the complexities and new ideologies of the modern world, there are still certain "great unities formed by continuous dominant traditions of original civilisation"? Is it no longer valid to make the distinction between the European and the Chinese type of civilization? Has not the real unity of China been in a broad sense 'cultural'? Or, if 'culture' must be used in a more restricted sense, what other term should be employed to express a unity that has been immensely powerful and yet has been neither national nor political? These questions may be asked with full consciousness of the intricacy of modern civilization and the possibility of rapid change in cultural affinities such as seems to be illustrated by the Turkish national State since the Great War.

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