

## Geographical Study of Society and World Problems\*

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IT has been assumed in many discussions that mass-production and commerce on a large scale represent a new mode of life, a form of society, that is conquering the world and must disintegrate older modes of social life and organisation. However true this is, there are limitations, obvious now that production far beyond immediate selling possibilities is causing so much difficulty. It is truer to say that various types of society are trying to graft on to their ancient heritage this new scheme of mass-production.

It may have been useful, up to a point, to think out the increase of production through specialisation as Adam Smith does in his famous argument about pins, but there was need for far more thought than seems to have been given to the maintenance and development of social life in the various environments Nature provides and man adjusts. Social forms result from interaction between men and their environments, and the lessons learned and the ideas selected and developed in different cases have been very different. This is a legitimate and important sphere of work for the student of geography. In each case, the people and their form of society are so much a part of the other that, whatever changes mass-production may bring, they want to, they must in fact, keep a large measure of continuity from their past.

They have nearly all once been, in the main, self-contained groups, or, at least, external commerce has been subordinate to internal exchange. The idea of the self-contained unit is thus very deep-rooted. With great effort the village has come to feel itself part of the nation, which has clamoured for opportunities of self-expression. Many a nation naturally, therefore, seeks to be self-contained, all the more if it feels that specialisation and consequent dependence on imports is going to give it an inferior position.

## HUNTING GROUPS

We may distinguish at least three main phases of expansion of hunting cultures, possibly all associated with *Homo sapiens*, from an Arabian-African zone, while another culture has its origins and associations still doubtful. The interest of these ancient cultures here is that the two or three later stages among them occur mingled in South Africa, apparently also in India, and among the Australian natives. In fact, if we use as a hypothesis the idea of drifts from northern Africa and south-western Asia, we have a key to some modern distributions of hunting peoples. These societies are either in what are ultimate corners or in areas of special difficulty; elsewhere they have been superseded by agriculturists. The pygmies of the equatorial forest of Africa are remnants in a region of hot, wet

climate where debilitation makes achievement difficult. The Bushmen of south-western Africa are in a region of sheer poverty in a far corner. The Veddah and some jungle tribes of southern India are in another far corner under conditions that forest or jungle makes difficult. The Australians and recently extinct Tasmanians are in a far corner, isolated by orographical changes. The pygmies and some other hunting groups of Malaya and the East Indies and Philippines are, again, in what are almost ultimate corners, isolated by land-sinking, and also in regions of warm, wet forest.

## AGRICULTURAL PEOPLES

The post-glacial intensification of the desert in northern Africa and south-western Asia caused pressure of population on the Nile and Euphrates and possibly the Indus as well, all rivers with regular floods running through dry or then fairly dry open country with a warm season. In or near these river valleys there arose the art of cultivation. All these rivers permitted and encouraged irrigation, and the deposit of silt from floods gives a renewal of fertility, so exhaustion of the soil was not a problem of early cultivators near the rivers. The courses of the Euphrates and Indus were conspicuously subject to variation, whereas the Nile is confined in its famous slot and its peasantry has gone on from time immemorial until near our own day with a remarkable measure of constancy as regards the economic basis of life.

Domestication of animals was an achievement of very early times too, and, in such regions as the Fertile Crescent with its grass zones, it undoubtedly assumed great importance and led to the beginning of age-long conflicts and interactions between herdsmen and cultivators. The herdsmen, basically a close corporation gathering around the flocks and needing men to add to their strength for defence, as well as discipline and organisation to maintain unity, have often dominated peasant neighbours; but this special ability appears to have been much developed when the horse was acquired as a companion and helper.

The bearings of the introduction of cultivation on social life and organisation have obviously been of the first importance. There was an observable sequence that made argument more solid than it was likely to be in the days of hunting when accidental coincidences loomed larger. The habit of prevision extended itself through calculations of the coming of the floods and correlated study of the heavenly bodies to the framing of a calendar. There was a further extension of prevision beyond that to a succession of years—namely, to a succession of generations specially associated with the domestication of animals and with the family.

Thought, drawn out towards the future, seems just as naturally to have run back into the past,

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giving rise to genealogies which are one of the germs of history and also to rites of reverence paid to ancestors. These rites, not unnaturally, are specially marked in regions such as China which owe so much of their civilisation to early interactions of herdsmen and cultivators on the ways from central Asia. It is of interest to note that the large household, linked by real or sometimes assumed blood relationship, seems a social feature of basic character among the cultivators of northern China, and in other forms is notable among other cultivators around the edges of the great steppe, the famous Zadruga of parts of the Balkan peninsula being a case in point in a region in which interactions between herdsmen and cultivators have been and still remain most important features of life. The Russian Mir sometimes had a like origin. It is naturally a social development in large measure antagonistic to the growth of nationalism.

Along with the primarily psychical development accompanying the rise of cultivation went the linking of society with a definite piece of land through the establishment of the settled life. This association is one of the most important features of settled society, and leads to the idea that the living hold a trust from their forefathers and will pass it on to future generations.

Whatever may be found hereafter concerning the phases through which the early cultivating societies developed in their primary homes, there is little doubt that the spread of their scheme of life occurred in most directions in two stages. The first went with the hoe, used chiefly by women, and with domestic animals for food or milk, but not for work, and the second with the plough drawn by domestic animals under male control.

The first of these two rather artificially contrasted stages is the one that spread into intertropical Africa. There were special difficulties here. First the climate made steady prolonged efficient exertion difficult in many areas. Then the fundamental crops, wheat and barley, would not thrive in most parts, and inferior grains and other plants became the important crops. Further, there were practically no wild plants in intertropical Africa that the native cultivator contrived to domesticate; so progress depended largely on plants deliberately introduced, as for example via Egypt or by Arabs, Portuguese, etc., in later times. The introduction of maize, manioc, etc., from America has made a huge difference to Africa. Fly belts in several regions, also lack of salt and phosphorus deficiency, and no doubt climatic factors, limited the value of domestic animals in intertropical Africa.

Archæologists think agriculture spread into central Europe at first with the hoe and the non-permanent village that is a feature of parts of intertropical Africa; and there are indications of the same scheme in forested and therefore backward parts of central India and elsewhere in south-east Asia as well as in north Korea.

Agriculture with the plough has now ousted this scheme from Europe and most of Asia and, in this superior stage, the village becomes more permanent: either a rotation in the use of lands is established and the households have their strips in each of the village lands, or a portion of the village land specially enriched by manure from stock folded on it may be cultivated nearly every year, and some portion of an 'outfield' may be used as may be required or may be possible.

In the regions with irrigation or plough agriculture or both, the differentiation of crafts went much further than among societies with hoe cultivation. Exchange developed more considerably and there are towns or cities, fundamentally centres of exchange and of handicraft, and often of a priesthood and government. Cities are not found in inter-tropical Africa save in a few spots where they are due to intrusive influences of fairly recent date.

The nomadic or semi-nomadic societies of inter-tropical Africa live on their cattle, and by hunting and collecting, as well as by raiding those which are more sedentary and less ready for war. The nomadic and semi-nomadic societies of Europe, Asia and northern Africa have in many cases the important auxiliary activity of trade, and use their beasts as carriers. Moreover, they have typically developed or contributed to the development of stations, which have in many cases become centres of trade and religion, that is, sacred cities, near the bounds of the waste or in oases. In China, India and the Fertile Crescent the semi-nomad, especially after he acquired the use of the horse, found it possible to dominate the cultivator, and seems often to have contributed an elaboration of organisation to the group of social units; villages and their focal towns become grouped into larger entities.

#### CONSCIOUSNESS OF KIND

In west, north-west and parts of central Europe, early development was slow because the food plants and animal breeds had to be acclimatised, and the problem of soil exhaustion was serious even if mitigated where the subsoil was of loess or related material. Nevertheless, there can be no doubt that settled populations in central and western Europe practising agriculture and living in villages were much more numerous in far pre-Roman times than it was customary to think a generation ago.

The spread of Islam in the Mediterranean region cut old trade routes for a time, and this increased the poverty following the decline of the Roman Empire, so that towns and cities went through a bad time, but apparently in several areas there was a marked increase of rural settlement.

As a hierarchy of social units re-established itself, growing mainly from local roots instead of from an external influence such as that of Rome, it is natural that such hierarchies should spring up where there was mutual comprehension of language in groups of villages and their focal market towns,

and cathedral cities in France. Moreover, charters and grants and agreements written in the vernacular came to be increasingly important, while the use of the vernacular in courts of first instance developed folk-speech. It is apparently a combination of all these factors that has maintained the distribution of the peasant languages of Europe without any change of great importance since the Middle Ages.

The idea of the city can be traced eastwards and northwards from France and the Rhine in the early Middle Ages, and, in relation with this, often, at the present day, the life of a town connects it with regions farther west, while the peasant life round about knows nothing of this. The Renaissance, being essentially an urban movement, accentuated this, and we note the French leanings of part of the upper classes in Alsace contrasted with the Alemannic tradition of the peasantry, German aristocracy and Danish common folk in parts of Slesvig, German (including Yiddish) affiliations of towns in Poland as against Slavonic life among the peasantry, Polish affiliation of towns and the upper classes in East Poland as contrasted with Lithuanian (in the north) and Ruthenian (in Eastern Galicia) traditions of the peasantry.

#### TRADITIONALISM AND INDIVIDUALISM

The problem was greatly deepened by another sequence of development. The Renaissance, whatever else it may have done, was a potent factor of the rise and spread of individuality. After it, much larger numbers of men in Europe became less members of a traditionalist community and more definitely persons with ideas of their own to express.

In some parts, notably in France, these changes, and even great political convulsions, long left some basic facts of society untouched. The peasantry long remained attached to, almost worshippers of, their soil, even if in parts of the west and south of that country this is no longer the case. The peasant acquired more dignity, but the village remained an entity; men still often make it their main ambition to hand on an improved farm to their descendants. The town too is often still essentially the focus and market for its region, and it often still carries on a number of small industries for the benefit of its neighbourhood. Its bourgeois are peasants only slightly modified. The idea of maintenance, rather than that of expansion on an English, German or American scale, is strong in many minds and France, characteristically, makes external trade subordinate to internal production for use and exchange. The reasonable assurance of her wheat, root crop, potato, and, but for a few calamitous years, vine and apple harvests, thanks to sunshine, has contributed a great deal to this, and has helped the French people to modify into modern forms the age-old feeling of a trusteeship (of the sacred soil) handed along the generations.

Britain's harvests have long been less secure because of summer rains and coolness, and, in the

eighteenth and early nineteenth centuries, there grew first a widespread maritime commerce, and then manufacturing industries—in fact, the Industrial Revolution.

The home population came to exceed by a great deal the numbers that could be kept busy supplying the needs of their fellow citizens. Britain's export trade came to be her mainstay. The contrast between French and British development was thus extreme and startling.

Industrialism spread from Britain to Germany and led to a parallel increase of population. The German effort also had its aim moulded politically by the desire to rise out of an old position of political inferiority and disunion. Further, the historic cities of Germany in several cases, such as Nürnberg, Frankfurt-am-Main, Köln, Leipzig, and so on, had their situations predetermined by major physical considerations, and must be important centres so long as Germany is a land of organised civilisation. This fact and the related one of the finding of coal near the zone of gradation from the hills to the northern plain, that is, a zone of cities, led to the development of modern industry in several cases in historic towns, whereas in England the greatest developments took place in what had previously been small places. Both national and municipal authorities in Germany, therefore, had a larger and more direct share in the directing of industrial growth than was the case in Britain.

If we think along these lines we see why, quite apart from wars and questions of external political ambition on one side or the other, it has come about that the French people have been gravely anxious. Here are two enormously increased units, Great Britain and Germany, both dependent on export trade, neither able to live with any reasonable standard for the great multitude mainly on the produce of its soil.

The spread of large-scale industrialism makes the problems still more serious. There are now several States that have populations exceeding what their soils can support unless science intervenes afresh; all therefore compete for an increasingly precarious export trade, all are in danger of finding groups of their people, with highly specialised machine-tending activities and corresponding inelasticity of mind, suddenly thrown out of employment and unable to adjust themselves to new lines of enterprise.

Meanwhile, nearly half mankind, in the monsoon lands of Asia apart from Japan, is being shaken out of its traditionalist schemes by contact with the west, and nationalist ideas are germinating in various ways alongside schemes of industrial development that borrow from the west to such an extent as to be a danger to indigenous society. Then the newer lands which have received the later overflow of modern Europe, and seemed likely to become producers of raw material for Europe, are also being forced along the same line of nationalist development. They have borrowed

freely from Europe (chiefly Great Britain and France) and more lately from America, and have consequently found themselves faced with the duty of finding large amounts of interest. This interest often is not by any means earned by the working of the schemes on which the money was spent. To meet this call for interest, exports must largely exceed imports, and so tariffs are introduced to keep down imports, and local industries are started.

On all sides, in the first great burst of mass-

production, local boundaries seemed to have been swept away. It is probable that our social thoughts and plans will have to regain contact with mother earth, each group basing itself on its own soil, but evidently not in the old sense of a self-contained isolation. Interdependence of all on each is a new feature that will become increasingly important, and one of the geographer's tasks is to try to see both the roots of each society in its own soil, and its relations to others.

### White Dwarf Stars\*

IN this year's Halley Lecture, Prof. E. A. Milne presents us with a systematic account of white dwarf stars in theory and observation. There is no doubt that, in view of their peculiar physical properties and the excellent example they provide for a successful application of modern quantum mechanics, white dwarfs are among the most interesting of natural objects. But this interest arises, of course, not so much from the direct observations as from the derived density of the star and its theoretical interpretation. It is therefore very valuable, at least to the non-astrophysical scientific worker, to have the facts and theories about white dwarf stars reviewed in this systematic way.

Owing to the importance of the existence of matter of great density to general physical theory, it is important to appreciate how direct is the evidence and how independent of any detailed theory. The well-established white dwarfs like Sirius B have a mass directly deduced from the law of gravitation and an observed double star orbit. They have an absolute luminosity determined from their distance (parallax) and their observed apparent luminosity. In view of the simplicity and universality of the theories involved in these deductions, no one will dispute that mass and absolute luminosity have the certainty of direct observations. To determine a density, a radius is required as well as a mass, and the radius must be deduced from the absolute luminosity and the surface temperature via the thermodynamic laws of radiation and the theory of the flux of radiation emerging from a gaseous atmosphere. Even in this step the maximal observational and theoretical uncertainties are not very great. If we know the surface temperature and the absolute luminosity, we can determine the surface area of the star, apart from possible uncertainties, at most of the order of 50 per cent, arising from conceivable errors in the radiative theory. All depends, therefore, on a determination of surface temperature, to which parameter the resulting mean density is rather sensitive, as it varies as the sixth power of this temperature.

There are two main methods of determining surface temperature. One can assume that the quality of stellar radiation, apart from line absorptions, follows closely Planck's black body curve; after observing the energy distribution in the

spectrum of the star, one can fit Planck curves to it and thereby determine the temperature from the curves of best fit. This method is known to underestimate the temperature considerably, especially for the higher surface temperatures, and is not reliable for the stars in question. But the theory of ionisation in stellar atmospheres and of the production of absorption lines in an ionised atmosphere enables one to assign a surface temperature when the surface value of gravity is known and also the spectral *type*. The possible resultant uncertainties in this application of theory do not appear to be very great. It is true that the surface value of gravity is not known initially, but it is known when the radius is determined, and the problem of determining the surface temperature is therefore solvable in theory, and also in practice, at worst by a process of successive approximation. This is admittedly the most uncertain step in the deduction of the radius and therefore of the density, but if we suppose that a maximum uncertainty of a factor of 10 could thereby be introduced into the density, we shall have allowed more than amply for all errors at present conceivable, and the existence of excessively dense matter must be regarded as fully established. Taking a reasonable view of probable observational and theoretical uncertainties, it is most unlikely that the current accepted mean densities for the best determined white dwarfs, such as Sirius B, are in error by a factor nearly so large.

Prof. Milne then passes on to the problem of the frequency of such dense matter in our galaxy. There are very few directly well observed white dwarfs, but the conditions for a good determination, owing to absolute faintness and the necessity for a well determined parallax and double star orbit, are very severe, and the fact that we know only four such stars is consistent with a great abundance of such stars in our galaxy. The essential conditions for a white dwarf are a relatively low absolute luminosity combined with a high surface temperature. There is reason to believe that these properties are found together in two remarkable classes of stars, the central stars of planetary nebulae and ex-novae. The evidence is reviewed by Milne, who concludes provisionally that the case is proved.

If correct, this conclusion is of the utmost importance, not so much for the greatly increased abundance of known dense objects as for its possible

\* "The White Dwarf Stars" being the Halley Lecture delivered on May 19 1932, by Prof. E. A. Milne. (Oxford: Clarendon Press, 1932.)